The association between school environment and children's general health and oral health outcomes in Australia

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A thesis submitted for the degree of

Doctor of Philosophy

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November 2015

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Abstract

Schooling forms a large part of a child's life experience and schools are recognised as an appropriate setting for health promotion activities. Characteristics of schools have been associated with various health outcomes. The association between aspects of schools and child oral health outcomes was assessed for a sample of children from New South Wales, South Australia and the Australian Capital Territory.

Parents of a random sample of 5,418 children aged 5–14 years responded to self-complete surveys, and children participated in a dental examination. Parent perceptions of their child's school were collected as were administrative data for participating schools from the MySchool website (including school type, socioeconomic information, number of students and teachers and percentage of students from non-English speaking background). Various health outcome measures were assessed across three sample populations: full sample (children aged 5–14 years), deciduous dentition subset (children aged 5–10 years, n=3,477) and permanent dentition subset (children aged 9–14 years, n=3,044). These included parent-rated health and oral health (*PRH* and *PROH*), presence of deciduous and permanent caries (*poc* and *POC*), deciduous and permanent decayed, missing and filled surfaces (*dmfs* and *DMFS*), and deciduous and permanent untreated decayed surfaces (*ud* and *UD*). Multilevel, multivariable logistic regression analyses were conducted on outcome measures, using child sociodemographic information, MySchool information and parent perception of schools at individual-level (collected) and at school-level (amalgamated).

Reference models for all outcome measures showed significant school-level variation. Among dichotomised outcome measures the Median Odds Ratio (MOR) was between 1.09 (deciduous *PROH*) and 1.50 (deciduous *PRH*). Among continuous outcome measures, the Intraclass Correlation (ICC) was between 2.5% (*dmfs*) and 5.3% (*UD*). The effects were small but have the potential for large consequences when considering population-level impact. In adjusted models, child-level parent perceptions of school variables demonstrated a higher number of significant associations with outcome measures in the permanent rather than the deciduous subset, particularly among clinical outcome measures. School socioeconomic status was persistently associated with outcome measures in the deciduous but not the permanent subset. The opposite was seen for teacher workload. Of school-level parent perceptions of school variables, school relations demonstrated the most persistent associations with outcomes. Better parent perceptions of school were generally associated with better oral health outcomes among children. Outcomes in the permanent subset saw more school-level variation explained in models than outcomes in the deciduous subset, potentially representing effects of longer exposure to school environment among older than younger children. School-level parent perception variables explained more variance than individual-level, supporting the concept of relevant contextual differences in school environment.

There was significant variation across schools for all outcome measures indicating the presence of a general contextual effect of the school environment on child general and oral health outcomes. There were numerous significant specific effects seen in the univariable, bivariable and multivariable analyses. Better parent perceptions of school were generally associated with better health and oral health outcomes among children. Well-considered policy instigating appropriate change in school environment could help alleviate children's oral disease experience.

Declaration

I certify that this work contains no material which has been accepted for the award of any other degree or diploma in my name, in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. In addition, I certify that no part of this work will, in the future, be used in a submission in my name, for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint-award of this degree.

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Acknowledgements

My thanks goes first and foremost to both my supervisors for their general belief in my ability to complete a PhD project and thesis. Specifically I am thankful to David Brennan for the enormous amount of help given at various times on various matters and quick turnaround times for provision of feedback on drafts, enabling me to get through the thesis writing process quickly and seamlessly. Thank you to Loc Do particularly for the expertise given during the analytical process.

I would like to express my gratitude to the contributors to the NCOHS project, without which I would have had no data to analyse. These include the NSW, SA and ACT health department personnel comprising NCOHS project coordinators, clinical coordinators and teams of dental examiners and clinical exam data recorders.

I would like to acknowledge the regular members of my crack team of mail out preppers (thank you Annie Nguyen, Brady Stanton, Melissa Crosato, Rachel Varricchio, Olivia Cirrilo and Monique Varricchio) who worked with such speed, consistency and precision, ensuring my mail outs went out on schedule each time with all material where it should be. I'd like to make a special mention of Annie for also being a tremendous friend throughout the entire PhD process.

Many thanks go to the administrative team responsible for inputting the vast quantity of data included in this project. Thank you Gemma Pilkington, Rose Thomas, Bev Ellis, Nikkita Dodds and Sarah Harman.

I am thankful for the various input and general support I received from colleagues/students at ARCPOH. I would specifically like to make mention of Kaye Roberts-Thomson for offering me the opportunity to undertake postgraduate research while working at ARCPOH, Liana Luzzi for providing consistent support and friendship throughout the duration of the project, Serge Chrisopoulos for providing information and assistance surrounding the NCOHS methods and Ali White for providing advice on editing and proofing. I also thank the ARCPOH executive group for allowing me access to the NCOHS data to use for my PhD project.

I would like to acknowledge those that contributed data for my project: schools, parents and children participating in the NSW, SA and ACT NCOHS.

A special thank you goes to my friends and family. Specifically I thank my wonderful mother Didi who helped me proof my work and provided constant love and support, particularly in the trying end times of the project. I also thank my stepfather Kent for providing reliability and stability through some difficult times during my candidature. And I would like to express my thanks to the Australian blues dance community for providing a dependable source of joy, lifting my spirits as nothing else can and keeping me in touch with what is important in life.

This research was supported by a Centre for Research Excellence (CRE) Grant (1031310) from the National Health and Medical Research Council (NHMRC), a Partnership Grant (1016326) from the NHMRC and a Research Grant (10-2012) from the Australian Dental Research Fund (ADRF). The contents are solely the responsibility of the administering institution and authors, and do not reflect the views of NHMRC or ADRF. Approval to conduct this research was granted by The University of Adelaide Human Research Ethics Committee (HREC), and the NSW Health, SA Health and ACT Health HRECs.

1 Introduction

The role of schools has become a major focus globally in terms of academic outcomes. International comparisons of literacy and numeracy skills are output annually by the Organisation for Economic Co-operation and Development (OECD) through the Programme for International Student Assessment (PISA). Comparatively little attention has been given to non-academic consequences of child experience of school and the school environment.

Schools are enrolled in by 100% of children in Australia (OECD 2014) during years of crucial social and individual development. They are the largest state investment in the lives of children (Dyson et al. 2009). Child development theories place great importance on the impact that childhood experiences can have on development and throughout the adult life although the manner and extent of the impact remains uncertain (Hertzman 1994, Hertzman and Wiens 1996). With school being such a major part of a child's experience, it is in a unique position to impact on children's health and wellbeing.

The influence that institutional or organisational environments can have on individual health and wellbeing are recognised, largely through workplace research (Danna and Griffin 1999, Egan et al. 2007), and schools have long been considered an appropriate setting for health promotion activities (Moysés et al. 2003). There is scant research into the associations that may exist between school environments and children's oral health outcomes.

Child oral health has re-emerged as an important area for focus in Australia in recent years, due to worsening oral health indicators in children and ballooning costs associated with dental care. By international standards, the average out-of-pocket costs for health care in Australia are high (Community Affairs References Committee 2014). The expenditure on dental care in Australia has consistently increased and individual outlay has accounted for the largest percentage of total expenditure. Recently, the percentage of expenditure directly from Federal Government has increased eight-fold over a six-year period to 2011–12 (AIHW 2014) yet in this same year, dental services saw one of the highest growths in per person expenditure compared to other areas of health expenditure (Community Affairs References Committee 2014).

Compared internationally, Australian children's dental health is better than in many other countries (OECD 2015). Dental caries is mostly preventable, yet in Australia it remains the most common form of childhood infection resulting in costly treatment and an adverse impact on quality of life (Casamassimo et al. 2009) and decline in the oral health of children has been shown in recent years (Spencer 2004, Mejia et al. 2012).

This thesis assesses the relationship between school environment and oral health outcomes in children. The first chapter addresses the theoretical rationale for the study in detail, culminating in a presentation of the research question. Following is a literature review divided into two main sections; the first reviews information regarding oral health in Australian children and related issues; the second section presents previous research specific to and associated with the current study topic. The subsequent chapters follow standard research reporting practice. The methods chapter details the survey design and analysis protocol. The results chapter presents information on the response and resultant data. Lastly, the discussion chapter considers the implications of the results, addresses limitations and draws conclusions from the project.

2 Theoretical background

The current study assesses associations between schooling and oral health outcomes. The purpose of this chapter is to explore the rationale behind this assessment. The chapter starts with a clarification of the most important concepts related to this section. Following is an account of the relevance of schooling in modern society, preceding an overview of the history of schooling as we know it today. The next sections review positive and negative outcomes associated with schooling, followed by a discussion of the significance of the effects of schooling. The chapter closes with the underlying concept leading to the research question explored in the current study.

2.1 Definition of education

It is important first to distinguish between the concepts of education and schooling. The two concepts have become intertwined, practically inseparable, in current language trends. The Oxford dictionary provides two definitions of education (Oxford University Press 2014):

- The process of receiving or giving systematic instruction, especially at a school or university, and
- An enlightening experience.

The first definition corresponds to the concept of formal education only, while the second definition encompasses the more pure concept of acquiring new skills or knowledge. This is an important distinction because formal education, or schooling, involves more than simply acquiring information. It also involves a multitude of social and personal experiences and comes hand-in-hand with various power and social structures. The current section is concerned with schooling, and hence the terms formal education and schooling are deliberately used instead of education to maintain the delineation of the two concepts.

2.2 Relevance of schooling in society

In Australia in 2014, 100% of children aged five to 14 years were enrolled in school (OECD 2014), which places schools in a position of great responsibility, and provides a rare opportunity to impact on Australia's future society. Over the last two centuries, mass schooling that is government controlled and compulsory has become a central and indispensable feature of developed nations throughout the world (Boli et al. 1985, Ramirez and Boli 1987, Soysal and Strang 1989). In fact, there is no developed nation today that does not have a similar system of schooling to that seen in Australia. In Australia, as elsewhere, schooling is so deeply entrenched in our social fabric that questions of where it came from and what the purpose is are often not asked. Schooling is a taken-for-granted institution. Jepperson (1991) detailed what this means thusly:

…institutions are those standardised activity sequences that have taken for granted rationales, that is, in sociological parlance, some common social 'account' of their existence and purpose. Persons may not well comprehend an institution, but they will typically have ready access to some functional or historical account of why the practice exists. They also have an expectation that further explication is available, should they require it. Institutions are taken for granted, then, in the sense that they are both treated as relative fixtures in a social environment and explicated (accounted for) as functional elements of that environment. p147

Reviewing the origin and function of institutions is an interesting practice. In light of the present topic, this practice is useful in exploring why the current research is justified. The best place to start with this task is at the beginning. The next section gives a brief overview of the history of the current school system in Australia.

2.3 History of schooling

Before the middle of the nineteenth century there were no systems of public education, and bringing in a system that was paid for by tax, compulsory and free was a revolution (Robinson 2008). Historically, it is an anomaly. The history of the school system is a long and detailed one, influenced by social, political, economic and philosophical forces. The modern school system we see today in Australia and other developed nations is founded on the Prussian system (1700–1800s), but the history of compulsory schooling began even earlier.

Religious leaders were the first to attempt to introduce compulsory schooling, in the form of mandatory religious instruction in the sixteenth century. Many parish schools were set up across Europe as part of this, with schooling practices exemplified by hallmarks such as specific training for teachers and schoolmasters, use of only approved textbooks, collective teaching of students and pupils raising their hand to ask a question (Melton 1988).

Prussia introduced compulsory schooling as early as 1716, for all children except those of the elite, with the aim to teach children to 'identify with the state and state goals'. This was in response to a national crisis, and was seen as a way to reconstruct and renew the national identity and support state power. Some decades later after a defeat in war, 'universal, state-directed, compulsory' schooling was more strongly pushed as a way to condition Germans to behave according to the State's needs (Ramirez and Boli 1987).

A Bureau of Education was established in the early 1800s, and the school system was funded by taxes. Teachers were required to be certified and a school for the training of teachers was established. There was a prevailing concern among the ruling class that 'too much' or 'too classical' schooling for the common people would have negative effects on individuals and society. Education was only considered beneficial as long as it didn't raise people above their 'lot' (Ramirez and Boli 1987). The hallmarks of the Prussian system included central control, tax funded schools, compulsory attendance and specific training for teachers.

The Prussian system was adopted in various European countries from the late 1800s, and in England and the United States around the time following the Second World War. England and the United States are important to the modern Australian schooling system. Australia was under English rule for generations after its establishment and consequently so was the manner of schooling provided in the country, but it was the United States that Australian took its lead from in the adoption of the current system.

Mass schooling was given some priority in Australia earlier than in England. In the late 1700s in NSW the majority of the children were convicts or offspring of convicts or lower class soldiers. A common thread among persons of power across time was the need to improve the 'social and moral condition' of children and to diminish the negative effects of the parents, even as the social fabric of the colonies changed (Barcan 1980).

England held sway over the schooling in Australia through the Church of England up until the late 1800s. Towards the turn of the century, the state governments of the day stepped in and, over a period of about 30 years across the country, instigated state-controlled schooling that was secular, free and compulsory. The stimulus for this change continued to be associated with the lower classes and a reduction in criminal behaviour through literacy, and the purported belief that education would foster economic and social progress (Barcan 1980).

Through the early 1900s, most children were still leaving school at the end of elementary, modern day primary, school. It was during this time that an American influence with its Prussian ideals began to emerge. It was realised that the ability to read and write did not lead to a reduction in crime, and the moral objective of schools increased in importance (Barcan 1980). By the end of the Second World War a system modelled on that employed in America was ready to be fully adopted. The minimum leaving age had been raised to at least 15 years of age. Control of schooling became a national concern entirely around 1960. An educational ladder was well-established, with eligibility to progress a matter of assessment. Teaching had become a unified profession (Campbell and Proctor 2014).

In summary, many if not all of the hallmarks of today's schooling system can be traced back to the earliest version of compulsory schooling almost 500 years ago. There is also a running thread of a desire for social control throughout schooling's history.

The concept of social control is worth considering. It can be perceived as either positive or negative, depending on the methods used to achieve social control and its overall aims, and of course the viewpoint of the perceiver. There is historical evidence of brutal and violent social control, utilising psychologically manipulative propaganda, social persecution and even genocide to meet desired ends, such as in Nazi Germany and other fascist regimes. At the other end of the spectrum are laws restricting behavior that is harmful to others, and, on a smaller scale, the gentle moulding a parent gives a child to teach appropriate social behaviours. Consequently, some forms of social control will have negative outcomes on the populace, while other forms may have positive outcomes. The following sections look at the possible positive and negative outcomes of schooling.

2.4 Positive outcomes of schooling

One of the primary early effects of compulsory schooling was its contribution to the elimination of child labour in industrialised nations. In Britain, early in the industrial revolution around the end of the eighteenth century, child labour was viewed as an opportunity rather than a problem (Fyfe 2005). For working class families, the additional income was helpful. For employers, children were cheaper to employ and easier to discipline, and were not protected by any labour laws (The National Archives n.d.). A decline in child labour in Britain began around the middle of the nineteenth century, driven by a small number of concerned parliamentarians (Bloy 2002). Lord Ashley (later Lord Shaftesbury), a parliamentarian of the time, became involved in the push to curb child labour after reading a report from a committee investigating the practice (Simkin 1997).

Lord Ashley also advocated the education of the poor. The fact that both causes were championed by the same person is no coincidence. In 1840, in an address to the House of Commons, he said "The future hopes of a country must, under God, be laid in the character and condition of its children; however right it may be to attempt, it is almost fruitless to expect, the reformation of its adults; as the sapling has been bent, so will it grow. The first step towards a cure is factory legislation. My grand object is to bring

these children within the reach of education." (Simkin 1997). While supportive labour legislation was necessary, legislating compulsory attendance at school served to create a displacement effect on the use of children's time (Fyfe 2005). With so much of the day taken up with school, children were simply unavailable to work.

When changes to child labour were first being brought in, they were fiercely contested (Bloy 2002) while today it would be difficult to find much support for child labour. There is general acceptance that a child attending school is preferable to a child working in a field, factory or mine all day, with no protection for their health or welfare. The very process of legislating compulsory schooling has produced positive outcomes, as it changed the way children were viewed and made exploitation of their labour socially unacceptable.

One of the primary aims of early schooling was to create a literate population, with the idea that this would yield social benefits such as reduced crime (Barcan 1980). Robinson-Pant (2005) reviewed the literature on the social benefits of literacy with a focus on developing nations. Early work in the 1970s and '80s centered on the statistical correlation between women's literacy and health indicators including decreased fertility, child mortality and increased life expectancy. Later, such research was seen as confusing the effects of literacy with those of schooling. From the 1990s, studies have assessed health benefits for women of literacy programs separate to schooling. From longitudinal studies, identified health benefits include lower infant mortality, improved health-seeking among women for themselves and their children, adopting preventive health measures such as immunisation, and increased knowledge of family planning methods. Literacy has been found to affect cultural beliefs, knowledge of and attitudes towards HIV/AIDs, autonomy and empowerment. These are important as behavior change is dependent on changing attitudes and values more so than acquiring new knowledge. Robinson-Pant (2005) observed that there is a persistent focus on women, and women's inequality rather than equality of the sexes and inclusion of men in literacy programs. This can limit the adoption of new practices that require male involvement such as family planning. Her conclusions note that social benefits of literacy are improved when they are accompanied by additional interventions, such as skills training or access to family planning facilities. A literacy program alone or a health intervention alone was less beneficial than both provided concurrently. In developing countries, literacy is not enough to initiate beneficial social change on its own, yet it is a vital ingredient without which beneficial social outcomes would be unattainable.

DeWalt et al. (2004) systematically reviewed literature on literacy and health outcomes in developed regions, including North America, Australia, New Zealand, Japan and Europe. Their review included 73 articles in English from 1980 to 2004 that included original data, assessed a health outcome, measured the literacy of participants and had a sample size of 10 or greater. The review showed that reading ability was related to knowledge of health and health care, hospitalisation, global measures of health and some chronic diseases. It was unable to uncover any information on the role literacy may play in mediating inequality in health outcomes across, for example, ethnicity, culture or age. From this it cannot be deduced that literacy leads to positive health outcomes in developed nations, as the review assessed studies of association not causality, yet there is a clear relationship between literacy and positive health outcomes.

Another key element of education is the development of skills in numeracy. Early versions of compulsory schooling revolved around literacy and numeracy education, encompassing the

fundamental skill-sets of reading, writing and arithmetic that were once commonly referred to as the 'three r's'[1]. There is relatively little information on the benefits of numeracy, and what exists presents the benefits of numeracy alongside those of literacy.

At a conference in Melbourne in 2006 on adult mathematics and numeracy, a presentation by Hartley and Horne (2006) included a summary of benefits associated with literacy and numeracy. Increased literacy and numeracy levels in the UK were associated with better physical and mental health, less difficulty in school among offspring, higher civic engagement such as voting and expressing an interest in politics, more liberal values and less discriminatory attitudes. In Australia, low achievement in literacy and numeracy in school was associated with youth unemployment using data from the Longitudinal Survey of Australian Youth (LSAY). Australian data from the International Adult Literacy Survey (IALS) showed that literacy and numeracy skills can account for approximately half of the total effect of schooling on participation in the labour market. The most recent iteration of the IALS in Australia was the International Assessment of Adult Competencies (IAAC) in 2011–2012 (ABS 2013). IAAC data showed that people with higher skills in literacy and numeracy were more likely to be in the labour force than not, to be employed than unemployed, to earn a higher income and, within each age group, to rate their health as excellent or very good rather than fair or poor.

Peters et al. (2007) reviewed literature on the association between use of health information and numeracy as an element of health literacy. A lower level of numeric skill was associated with lower comprehension and less use of health information including greater difficulty using numeric information to inform choices, less ability to follow complex health regimes and increased likelihood of weighing short-term costs and benefits over those in the long-term.

Both literacy and numeracy, as core parts of schooling, are evidently linked to positive social and health outcomes. There is evidence this relationship can be causal if linked with supportive initiatives. Thus schooling should also be linked to positive outcomes. There is a greater pool of research on schooling and associations than literacy or numeracy. The following paragraphs summarise some key aspects of the research.

From an economic perspective, Gradstein and Justman (2000) demonstrated how public schooling contributes to social capital. They drew the distinction between human capital, being the skills, knowledge, and experience of an individual or population in terms of their value or cost to a country (Oxford University Press 2014), and social capital, which constitutes the "common cultural norms and ethical values that lower economic transaction costs and reduce social tensions between different population groups". Gradstein and Justman asserted that building both human and social capital are primary objectives of schooling and are positively associated with economic growth. The article suggested that public schooling promotes social cohesion and reduces ethnic tensions, but recognises that it does so at the expense of the cultural heritage of the minority or minorities. Such a view thoroughly discounts all other measures of a society, and legitimises cultural suppression, which may not have a significant impact overall due to the group's minority status, but would certainly affect the groups being suppressed. From the purely economic perspective at the national level, however, inequality and long-term consequences of inequality may be viewed as irrelevant. Rightly or wrongly, in the present day political climate, economic growth is a dominant consideration and a strong argument

[1] The phrase 'the three r's' was coined by Sir William Curtis, then MP for the City of London, in a speech given around 1795. Curtis was poor at spelling, and thought the words began with the same letter. (Stevens 2008)

in support of the schooling system. The positive outcomes of schooling highlighted here then are increased social and human capital, social cohesion and a growing national economy.

Compulsory schooling has demonstrated associations with desired social outcomes. The Organisation for Economic Co-operation and Development (OECD) reports that higher levels of formal education are associated with longer life expectancy, greater civic engagement such as voting and volunteering, and higher life satisfaction and happiness (OECD 2013). Longer compulsory schooling has been linked with greater regional mobility, higher employment rates and higher wages (Pelkonen 2009). These associations, however, do not reflect causal relationships without which it cannot be said that schooling results in these positive outcomes.

Generally, causal evidence requires a controlled study. In the case of schooling, this is unlikely. Due to the compulsory nature of the independent variable there is a lack of a ready control group. This limitation has been addressed recently in economic research, through assessment of a causal relationship between changes to compulsory schooling laws affecting length of compulsory schooling and the prevalence of favourable outcomes. This is done using specific modeling techniques which assess a compulsory schooling law as an 'instrument', or a variable that affects measurable change in the independent variable of interest. One of the strongest pieces of evidence produced using the instrumental variables strategy to assess this particular issue was by Lleras-Muney (2005) (Mazumder 2008), assessing the impact of schooling in conjunction with child labour laws on mortality rates of affected cohorts in North America in 1915 to 1939. Lleras-Muney (2005) showed that the laws did impact on formal educational achievement, and had a large causal effect on lowering the rate of mortality.

Similar research has been performed in other countries, including Canada, the UK and Germany. Claims have hence been made that increased length of compulsory schooling is related to reduced long-term illness for men only (Kemptner et al. 2010) and for both sexes (Silles 2009), reduced weight problems (Kemptner et al. 2010), self-reported good health (Silles 2009), having no activity-limiting condition (Silles 2009), financial gain (Oreopoulos 2006), reduced rates of property crime (Stephen et al. 2010) and reduced rates of smoking (Kenkel et al. 2006). It was acknowledged by Mazumder (2008), however, that other reforms, such as improvements in public health and vaccination programs, may not always be adequately taken into account. Mazumder (2008) expanded upon the work of Lleras-Muney (2005), by adding additional data and robustness checks such as state-specific time trends. The results were ambiguous, with the author unable to ultimately reject or accept the null hypothesis.

One idea that emerges from this research is that the schooling system operates within a wider system, namely that of society. Individual health and other social benefits also exist within that wider societal system. It could be that the relationship between schooling and positive health outcomes rests on the close association between the systems that govern our society.

For example, level of formal education is one of the primary indicators of socio-economic status (SES), along with income and occupation (Sirin 2005). Health has a strong socio-economic gradient (Lynch 2003), and accordingly increased formal education has been associated with various health benefits (Feinstein et al. 2006, Cutler and Lleras-Muney 2008). Parental SES has been found to impact a child's academic achievement. A higher SES household provides higher social capital which has been shown to aid success at school and has more resources to access higher quality instruction for their child. Higher quality instruction and greater success along with greater material resources lead to higher likelihood of

continuation of schooling, and consequently higher academic achievement. This will in turn feed back into SES for the child once grown, who will be more likely to have better health outcomes. Both facets of success, health and level of schooling, are interrelated within the societal system. Indeed, the influence of SES on health outcomes and its heritable nature are recognised (Bowles and Gintis 2001, Manor et al. 2003). A completely different social structure may see less distinction between highly-schooled and less-schooled sub-populations. Likewise an un-schooled population in the current social structure may perform just as well as the highly-schooled on other aspects of success, such as health and income. Of course, such assessment requires what does not exist; a comparable yet differently structured society with the same schooling system or a population group of un-schooled individuals within the current society. It may be that the advantages of schooling are reliant on the stability of the societal make-up, and the continuance of the current social structure. Significant social change could, then, render these advantages inconsequential.

As there is no ready way to empirically test the true causal effect of schooling on health and such investigation was never performed before the instigation of the system of compulsory schooling, the populace is running on trust that it is of ultimate benefit to child, community and country. This is of no real issue if all effects of schooling turn out to be positive. If the effect is neutral, besides being an expensive exercise in futility, it is a wasted opportunity, and is pointless but not essentially dangerous. It is negative effects that are of primary concern. The subsequent section discusses potential negative outcomes of schooling.

2.5 Negative outcomes of schooling

The material cited in this section differs from much of that in the previous section. Instead of research articles, the reviewed material is in the form of philosophical, political and social commentary. The ideas presented in this section are not popularly held, yet this does not automatically render them insignificant. In support of this, consider Darwin's theory of evolution. It was hugely controversial originally, as it contradicted long-held beliefs of the Biblical account for man's existence. It has since become enormously significant. Likewise, the concept of the bacterium, helicobacter pylori (h. pylori), being a cause of gastric conditions was widely ridiculed by the scientific community. It is now an accepted fact that h. pylori is a player in gut health. The concept of schooling is a social rather than a scientific issue, in contrast to these examples, yet the principle holds. The introduction of compulsory schooling was not founded on scientific evidence. Its adoption was driven entirely by social and political forces. It is thus valid to consider alternate views arising from these same arenas.

Tolstoy was a popular philosopher, who to the current day has remained well-known and influential. Tolstoy believed that education should be free and voluntary, and that compulsory education was an evil (Simmons 1968). He said,

If education is good …then the need for it will manifest itself like hunger.

He spoke thus at a time when compulsory schooling was being increasingly adopted across western Europe, based on his explorations of institutions in Germany, France and England. He bemoaned the 'terrified, beaten children' and was unsettled by what he called 'experimental pedagogy' observed during his travels. Tolstoy recognised what is widely ignored: the lack of credible evidential support for the beneficial effects of compulsory schooling.

Like those propounding the positive benefits of schooling, Tolstoy had no empirical evidence for his claims. Even so, he ran his own school in Yasnaya Polyana in Russia between 1859 and 1862. Over the door to this school were inscribed the words 'enter and leave freely'. The school was run without prescribed class plans or predetermined times lines for subjects. He claimed that children stayed past the time the school closed of their own accord.

…it is impossible to send the children away — they beg for more.

There is, of course, no record of the outcomes for the children that attended Tolstoy's school, health or otherwise. It simply provides an interesting counterpoint at the time compulsory schooling was being adopted in all developed nations also without evidence of desirable outcomes.

An early critic of public schooling in the United States of America (USA) was satirist Henry Louis Mencken. In a review for The American Mercury magazine, Mencken (1924) wrote of an 'erroneous assumption' underlying the popular understanding of schooling:

That erroneous assumption is to the effect that the aim of public education is to fill the young of the species with knowledge and awaken their intelligence, and so make them fit to discharge the duties of citizenship in an enlightened and independent manner. Nothing could be further from the truth. The aim of public education is not to spread enlightenment at all; it is simply to reduce as many individuals as possible to the same safe level, to breed and train a standardized citizenry, to put down dissent and originality. That is its aim in the United States, whatever the pretensions of politicians, pedagogues and other such mountebanks, and that is its aim everywhere else.

Mencken (1924) makes reference of the 'Puritan' church schools and Prussian public schools as the foundation of the system. While church schools were designed to quell theological heresy, public schools were designed to quell political and economic heresy, to create 'docile and patriotic citizens' and to make any individual citizen's everyday reactions and ways of thinking as similar as another's. One negative outcome claimed here is deception; another is the deprivation of an individual's autonomy and ability or willingness to hold powers to account. Also implied here is the supposed intent to render the populace powerless through a learned sense of subjection.

In 1969, two educators from Denmark, Søren Hansen and Jesper Jensen, released the 'Little Red School Book' (Hansen and Jensen 1969). Translated versions of the book made it to many countries including Australia. It was hugely controversial at the time and was banned in Queensland and Victoria (Stephenson 2010). It covered various topics including sex, illicit drugs and discrimination, and all throughout questioned many aspects of the school system and encouraged students to actively do the same (Hansen and Jensen 1969). In the introduction alone, titled 'All grown-ups are paper tigers' it was written:

Whatever teachers and politicians may say, the aim of the education system in Australia is not to give you the best possible opportunity of developing your own talents… Instead of helping you develop as an individual, schools have to teach you the things our economic system needs you to know. They have to teach you to obey authority rather than to question things.

It further claimed that the people with money determined what children ought to learn, and that the system was developed to output a small number of 'highly educated experts' and a large number of 'less well educated people to do the donkey-work'. The body of the book included encouragement of

students to challenge authority, pursue their own interests despite direction given at school and legitimised boredom in the classroom as a normal and justified response to the school experience.

The book was written as a reference book for school students, with the stated aim of providing ideas for students to improve the situation at their school specifically and more broadly as well. It was an attempt to empower students, which logically could only be a response to circumstances seen as disempowering of students. At the end of the second Australian edition, the translator stated that the book 'emphasises the interests of schoolchildren and shows how they can conflict with the interests of adults', a reference to the perceived imbalance of power represented by the school system. The negative effect of schooling highlighted in this text was indeed its apparent disempowering nature.

A modern detractor of the school system, also in the USA, is Sir Ken Robinson. Robinson was a professor of education in England for 12 years, and has honorary degrees from several educational institutions. He works with various governments and organisations around the world in the area of education, and became most widely known following his TED[2] conference presentation in 2006 entitled 'How schools kill creativity'. Robinson's belief, as espoused in his 2006 presentation and represented by the title, is that the school system is taking away a child's innate capacity for creativity, and by extension stifling innovation and the ability to respond constructively to a changing world (Robinson 2006).

Robinson discusses the origin of the school system. He claims it was founded on the concept of academic ability and the needs of industrialisation. The most useful subjects for an industrialised economy are revered, and others are considered lower priority or disregarded altogether, the result being that children are steered away from the less regarded subjects in the interest of being successful within the industrial economy. Academic ability continues to dominate the common view of intelligence and is the commodity sought for in the schooling system. Robinson argues that intelligence is diverse, dynamic and distinct. It can come in many different forms, it requires interaction between different parts of the brain and is unique in its nature in any one individual; a system that only recognises, rewards and supports one form of intelligence, will as a consequence quash other forms to the detriment of the individual and society.

Additionally, this particular system was adopted over 50 years ago. The needs of 1960s society do not necessarily match the needs of today's society or that of the future. While this system remains tied to an industrial concept and a limited view of intelligence it will to some extent be schooling children for a future that is already in the past. Sir Ken Robinson's account points not just to individual negative outcomes, but consequent negative outcomes for a nation and its progress, including economic progress.

There are common themes throughout these examples: that the school system is driven by economic forces, namely industrialisation, that it is presented as something it is not, and that it is harmful to children. It is also evident that similar criticisms have persisted over quite a long period of time.

Deducing the positive or negative consequences of schooling is complex, and if there are positive outcomes there is nothing to say there cannot also be negative outcomes at the same time. If there are

[2] "TED is a platform for ideas worth spreading. Started in 1984 as a conference where technology, entertainment and design converged, TED today shares ideas from a broad spectrum — from science to business to global issues — in more than 100 languages. Meanwhile, independent TEDx events help share ideas in communities around the world." (TED 2014)

in fact negative outcomes, even occurring alongside positive ones, the effects can be considerable. The next section explores why this is through a review of the significance of schooling.

2.6 Significance of schooling

There are three main reasons why any negative outcome of schooling should be of particular concern. The first is the stage of life at which schooling occurs, the second is the size of the impact, and the third is the nature of a system.

Schooling occurs during childhood, and childhood is a period of intense development. Currently it is believed that much crucial development occurs before school years. Figure 2-1 illustrates the periods during the first years of life that are critical for neural development of specific functions or skills. This is a widely used diagram and certainly highlights the importance of the early years of childhood.

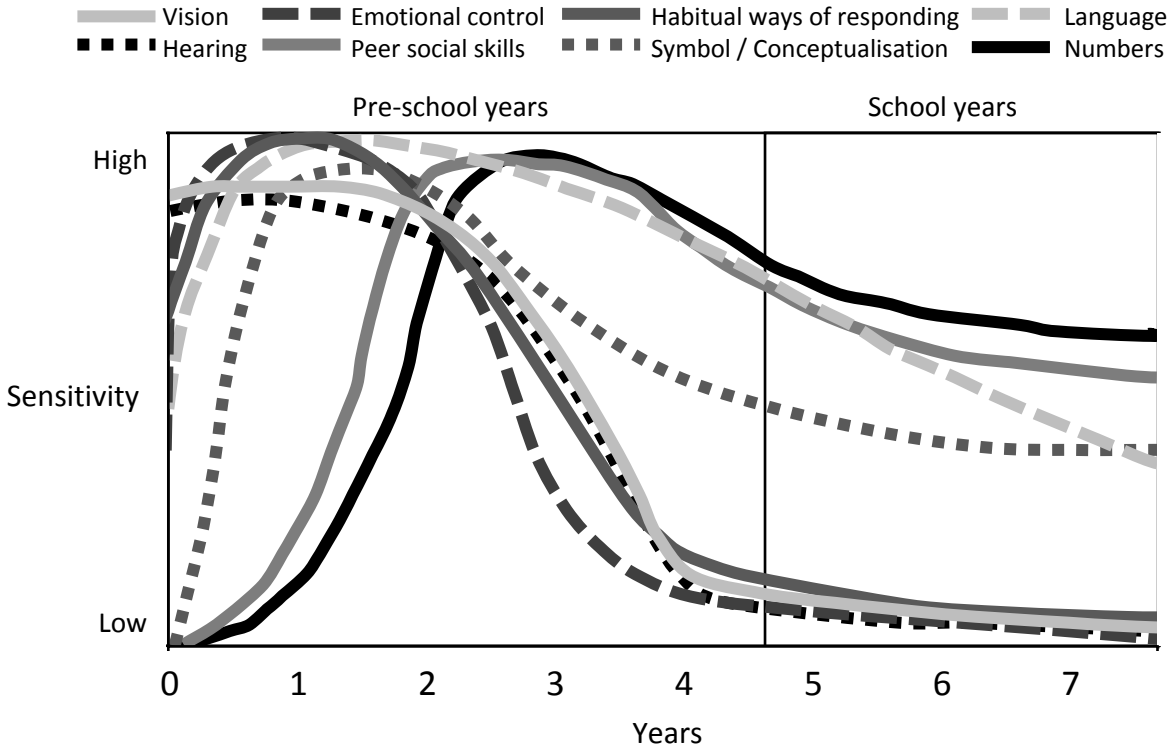


Figure 2-1 Sensitive periods in early brain development

Adapted from figure developed for Council for Early Child Development (Nash 1997, McCain and Mustard 1999, Shonkoff and Phillips 2000)

Until relatively recently it was thought that neural development occurred entirely during childhood, but research has since demonstrated continued significant development through later childhood and adolescence in the prefrontal cortex of the brain (Blakemore and Choudhury 2006). The prefrontal cortex sits at the very front of the brain, and is understood to be involved in executive functions such as planning, reasoning and problem solving. Specific skills shown to be relevant during this time include self-identity, perspective taking (seeing from another's point of view), decision-making and response inhibition skills. Development experienced during this period includes the loss of neural pathways that are infrequently used, and the strengthening of pathways that are frequently used, a process called 'synaptic elimination'. This means that thoughts, ideas and behaviours that are reinforced flourish and those that are not supported fall away. Based on this conception, a school environment which makes up

a large part of the child and adolescent experience can literally shape the minds of individuals with lasting effect. This is of special relevance to the current study as it is those higher-order cognitive processes, or executive functions, that are of keen importance to health-supportive and health-risk behaviours.

The size of the impact of the school system is another reason why any negative outcomes should be of especial concern. In 2014, 100% of children aged five to 14 years were enrolled in school (OECD 2014). In a pure numbers sense, the impact is enormous. Virtually entire generations are implicated at any one time. The cyclical process of schooling, with offspring of schooled individuals being schooled in turn, means that the system is increasingly legitimised over successive generations, strengthening the sense of normality surrounding it and concentrating the effect of any faults that may exist.

The nature of a system is the final major reason for concern over any negative effects of the school system. A system is, by definition, regular, methodical and rigid. As such, any system developed at any one time, remains tied to that time and the circumstances of its conception to some degree. Being a system means being inherently resistant to fundamental change.

As a testament to the system's lack of change, various hallmarks of the institution can be traced back many generations, including special training for teachers, use of prescribed texts, central control and social or moral conditioning. In addition, strong industrial influences can still be seen in the schooling system and the way it operates. Systems of mass education 'mirror the principles of industrial production' through an emphasis on linearity, conformity and standardisation (Robinson 2011).

Despite this is it important to recognise in that some variation is possible within an overarching system. As identified by Barr and Dreeben (1983) there are levels of organisation within the school system, responsible for different contributions to the overall operation. The system contains a managerial component, responsible for centralised control and processes. Schools are responsible for managing the day-to-day activities required to deliver schooling, such as assigning children to specific teachers, allocating learning materials and arranging a schedule to address the prescribed curriculum. The operations at the school level are unavoidably underpinned by the decisions made at the system level, however the levels of organisation are what is relevant to variation within the system.

Within a school, teachers can create different environments in individual classrooms. So too can schools create different environments within the overarching system. As each school is managed by a different individual, naturally there will be variation in how this is achieved. The way a school is managed will be governed to some degree by the opportunities the school has to explore new ways of performing their prescribed functions, which in turn is reliant on the wider community in which the school operates and the members of the school community itself, i.e. teachers, staff, parents and children. The important point is that the system and the philosophies and ideals on which it was founded will be reflected in the way a school organises itself and the fundamental understanding and carrying out of its role, but that this will be influenced to varying degrees by individual school management, opportunities and functioning.

The three factors discussed above combine to make schooling an experience of exceptional influence. It is and has been for many years in a position to shape the minds of almost all individuals in the nation, and can essentially act to mould an entire society and its understanding and beliefs. By virtue of its

nature, reach and timing, the school system has become self-perpetuating and self-justifying. Any harm derived from schooling is thus of extraordinary relevance and should not be ignored.

2.7 Research question

The fundamental question that arises from these considerations is: What is it that is being taught in schools outside of the stated curriculum, and what impact do those lessons have on a child? Such lessons are taught through indirect means, such as relations between individuals in various roles within the school, adequate funding, and every conceivable aspect of the school social and physical environment. Each aspect tells a child something about the school and their place in the world and each is a source of learning. This question underpins the research of the current study, which assesses oral health as the outcome, and the school environment as the input. The research question is:

Is there an association between school environment and a child's oral health outcomes, controlling for the effects of factors at the individual and school levels?

3 Literature review

This section is divided into two main parts: an overview of oral health in Australia, including children's oral health, and a review of research relevant to the topics specific to the current research project. The material presented does not constitute a systematic review. Key articles were identified through searches conducted using PubMed and Google Scholar. Due to limited research into relationships between school environment and oral health outcomes, a creative approach was adopted to build a literature review. This involved looking at the key elements separately. Searches were performed seeking research that reviewed similar associations, in particular the relationship between oral health outcomes and community/family aspects, and the relationship between school aspects and other health outcomes. Google Scholar was utilised to conduct these searches. References of identified papers were also examined.

3.1 State of oral health in Australia

Oral health is an integral part of general health. Poor oral health is likely to exist when general health is poor and vice versa. The definition of oral health provided by UK Department of Health (1994) has been widely used in reports on population oral health. It is defined as 'a standard of health of the oral and related tissues that enables an individual to eat, speak and socialise without active disease, discomfort or embarrassment and that contributes to general wellbeing' (Chrisopoulos and Harford 2013). Oral health is more than simply the absence of oral disease.

The state of oral health in Australia is explored below. The first section assesses recent population data relevant to children's oral health including burden of disease followed by a discussion of potential lifelong impact of poor oral health in childhood. This leads into the second section, which reviews information on impact and burden of oral disease overall.

3.1.1 Oral health in children

In Australian children, oral health enjoyed improvements over the second half of the twentieth century (Harford and Luzzi 2013). The improvements began to reverse from 1996 (Spencer 2004, Armfield and Spencer 2008) at which time average decayed, missing and filled deciduous teeth (dmft) among six year old children was 1.45 and 61.0% were caries free (Table 3-1). By 2000 average dmft among six year-olds was reported to be 1.65, with 56.6% of children having no caries experience. In 2007, dmft among six

year olds was 1.95 with 54.5% of children with no caries experience (Mejia et al. 2012). This data comes from the Child Dental Health Survey, the sample for which is drawn from children enrolled in school and community dental services. While all school age children are eligible to access school dental services, only some may be eligible for free dental care, depending on the state or territory, and enrolment is optional. As such, the population sampled is not necessarily representative of the Australian child population. Despite its limitations, it is an ongoing population survey of dental health among Australian children. What the data shows is that, at least among a sizeable proportion of the population, oral health in Australian children is in decline.

Table 3-1 Caries experience of 6-year-old Australian children, 1990 to 2009

Year	dmft	% dmft =0
1990	2.06	50.0
1991	2.00	52.1
1992	1.95	52.9
1993	1.90	53.2
1994	1.79	53.4
1995	1.73	55.3
1996	1.45	61.0
1997	1.50	60.2
1998	1.51	59.4
1999	1.51	59.1
2000	1.65	56.6
2001	1.89	52.7
2002	1.96	52.6
2003–4	1.96	51.1
2005	2.27	52.3
2006	2.00	-
2007[a]	1.95	54.5

(a) Data from Victoria not included

Source: Child Dental Health Survey (Spencer 2004, Mejia et al. 2012)

In other countries, a parallel improvement was seen to that in Australia (Armfield et al. 2009). Countries have not necessarily experienced the same reversal in the trend that has been seen in Australia (Table 3-2). In a comparison of 33 countries (member countries of the Organisation for Economic Co-operation and Development - OECD), there was evidence of a similar worsening of child oral health in Austria and Mexico, and of a plateau in improvement in Sweden and Switzerland (OECD 2015). Other countries showed continued improvement through to their most recent or second most recent reported figure. Compared internationally, Australian children still had among the best oral health in 2002 as indicated by decayed, missing and filled permanent teeth (DMFT) among 12-year-old children (Armfield et al. 2009). Evidence suggests that oral health among Australian children has diminished by international standards since this time (Table 3-3).

Table 3-2 Average number of decayed, missing and filled permanent teeth (DMFT) for 12-year-old children by country, 1985 to 2014

	Year																													
	1900s															2000s														
Country	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03	04	05	06	07	08	09	10	11	12	13	14
Australia	2.1	2.0	1.8	1.6	1.6	1.4	1.3	1.2	1.1	1.1	1.0	1.0	**0.9**	**0.9**	**0.9**	**0.9**	1.0	1.0	1.0	1.1	1.1	1.2	-	1.1	1.1	1.3	-	-	-	-
Austria	4.3	4.3	-	4.4	4.2	4.2	-	-	3.0	-	-	-	1.7	-	-	-	-	**1.0**	-	-	-	-	1.4	-	-	-	-	1.4	-	-
Belgium	-	3.2	-	-	-	2.7	-	-	-	1.9	-	-	-	1.6	-	-	1.1	-	-	-	-	-	-	-	-	0.9	-	**0.8**	0.9	-
Chile	-	-	-	-	-	-	-	3.5	-	-	-	3.4	-	-	3.4	-	-	-	-	-	-	-	**1.9**	-	-	-	-	-	-	-
Czech Rep.	-	-	3.3	-	-	-	-	-	-	3.1	-	-	3.2	-	-	3.1	-	-	3.0	-	-	**2.6**	-	-	-	-	-	-	-	-
Denmark	2.1	-	-	2.2	-	-	1.3	1.3	1.4	1.3	1.2	1.2	1.1	1.1	1.0	1.0	0.9	0.9	0.9	0.9	0.8	0.8	0.7	0.7	0.6	0.6	0.6	0.6	0.5	**0.4**
Finland	2.8	-	-	2.0	-	-	1.2	-	-	1.2	-	-	1.1	-	-	1.2	-	-	1.2	-	-	-	-	-	**0.7**	-	-	-	-	-
France	-	-	4.2	-	-	3.0	-	-	2.1	-	-	-	-	1.9	-	-	-	-	-	-	-	**1.2**	-	-	-	-	-	-	-	-
Germany	-	6.3	-	-	5.1	4.1	3.9	3.9	2.6	2.4	2.3	-	1.7	-	-	1.2	-	-	-	1.0	**0.7**	-	-	-	**0.7**	-	-	-	-	-
Greece	4.3	-	-	-	4.5	-	-	-	-	-	2.5	-	-	2.7	-	-	-	-	-	-	**2.1**	-	-	-	-	**2.1**	-	-	-	-
Hungary	5.0	-	-	-	-	-	4.3	-	-	-	-	3.8	-	-	-	-	3.3	-	-	-	-	-	-	2.4	-	-	-	-	**1.8**	-
Iceland	-	6.6	-	-	-	-	3.4	-	-	-	-	**1.5**	-	-	-	-	-	-	-	-	2.1	-	-	-	-	-	-	-	-	-
Ireland	2.9	3.0	-	-	-	2.7	-	1.8	-	-	-	1.5	-	-	-	-	-	**1.1**	-	-	-	-	-	-	-	-	-	-	-	-
Israel	-	-	-	-	-	-	-	3.0	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	**1.2**	-	-
Italy	4.0	4.9	-	-	3.0	4.0	2.9	-	-	-	2.2	2.1	-	-	-	-	-	-	1.2	**1.1**	-	-	-	-	-	-	-	-	-	-
Japan	4.6	4.6	4.5	4.4	4.3	4.3	4.3	4.2	4.1	4.0	3.7	3.5	3.3	3.1	2.9	2.7	2.5	2.3	2.1	1.9	1.8	1.7	1.6	1.5	1.4	1.3	1.2	1.1	1.1	**1.0**
Korea	-	-	-	-	-	-	3.0	-	-	-	3.1	-	-	-	-	3.3	-	-	3.3	-	-	2.2	-	-	-	2.1	-	**1.8**	-	-
Luxembourg	-	3.3	-	-	3.0	2.8	2.5	2.3	-	2.3	2.3	-	-	-	-	-	-	0.9	0.9	0.8	0.9	0.8	0.8	0.7	0.7	0.7	**0.6**	**0.6**	**0.6**	-
Mexico	-	-	-	4.4	-	-	-	-	-	-	-	-	2.5	-	-	-	**2.0**	-	-	-	-	-	-	-	3.4	2.4	2.7	3.0	3.4	-
Netherlands	2.4	2.4	2.2	1.8	1.8	1.5	-	1.0	0.9	-	-	0.7	-	0.7	1.0	1.1	-	0.8	-	-	0.9	-	-	-	-	-	**0.6**	-	-	-
NZ	3.2	3.0	2.8	2.5	2.2	2.0	1.7	1.5	1.4	1.3	1.4	1.4	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.6	1.5	1.4	1.4	1.2	1.2	1.2	**1.1**	-
Norway	3.4	3.1	2.9	2.7	2.6	2.4	2.3	2.2	2.1	2.0	1.9	1.8	1.6	1.6	1.5	1.5	1.5	1.6	1.7	1.7	1.6	1.6	1.5	1.4	1.4	1.3	1.1	1.1	**1.0**	-
Poland	4.4	-	4.4	-	-	-	5.1	5.1	-	-	-	-	-	4.0	-	3.8	-	-	**3.2**	-	-	-	-	-	-	-	-	-	-	-
Portugal	-	-	-	-	-	3.2	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	-	1.5	-	-	-	-	-	-	**0.9**	-
Slovak Rep.	-	-	-	-	-	-	-	-	-	-	-	-	-	4.3	-	-	3.2	2.9	2.8	2.6	2.8	2.4	2.3	2.2	2.0	1.9	**1.8**	**1.8**	2.0	-
Slovenia	-	5.9	5.5	5.0	4.7	4.2	3.9	3.7	3.7	3.4	3.6	**3.1**	3.4	3.3	**3.1**	**3.1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Spain	4.2	-	-	-	3.5	-	-	-	-	2.3	-	-	-	-	-	**1.1**	-	-	-	-	1.3	-	-	-	-	-	-	-	-	-
Sweden	3.1	3.0	2.6	2.4	2.2	2.0	1.8	1.6	1.6	1.5	1.4	1.2	1.0	1.0	**0.9**	1.0	**0.9**	1.1	**0.9**	1.0	**0.9**	-	-	**0.9**	-	-	-	-	-	-
Switzerland	-	-	-	1.6	-	-	-	1.1	-	-	-	**0.8**	-	-	-	0.9	-	-	-	-	0.9	-	-	-	**0.8**	-	-	-	-	-
Turkey	-	-	-	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**1.9**	-	-	-	-	-	-	-	-	-	-
UK	-	-	-	1.6	-	-	-	1.3	1.4	-	-	1.1	-	-	-	0.9	-	-	0.8	**0.7**	-	-	-	**0.7**	-	-	-	-	-	-
USA	-	1.8	-	-	1.4	-	1.3	-	-	-	-	1.3	-	-	-	1.2	-	**1.1**	-	1.3	-	-	-	-	-	-	-	-	-	-

Rep. = Republic, NZ = New Zealand, UK = United Kingdom, USA = United States. Canada, Estonia and Russia removed due to too few data points for comparison. Figures in bold indicate lowest score. Source: OECD Health Data 2015

Table 3-3 Average number of decayed, missing and filled permanent teeth (DMFT) for 12-year-old children by country (selected OECD countries), 2000–03 and 2010–13

	2000–03			2010–13	
Country	Year	DMFT	Country	Year	DMFT
Netherlands	2002	0.8	Denmark	2013	0.5
Denmark	2003	0.9	Netherlands	2011	0.6
Luxembourg	2003	0.9	Luxembourg	2013	0.6
Australia	**2003**	**1.0**	Belgium	2013	0.9
Austria	2002	1.0	Portugal	2013	0.9
Belgium	2001	1.1	Norway	2013	1.0
New Zealand	2003	1.6	New Zealand	2013	1.1
Israel	2002	1.7	Japan	2013	1.1
Norway	2003	1.7	Israel	2012	1.2
Mexico	2001	2.0	**Australia**	**2010**	**1.3**
Japan	2003	2.1	Austria	2012	1.4
Greece	2000	2.2	Hungary	2013	1.8
Slovak Republic	2003	2.8	Korea	2012	1.8
Portugal	2000	3.0	Slovak Republic	2013	2.0
Hungary	2001	3.3	Greece	2010	2.1
Korea	2003	3.3	Mexico	2013	3.4

Source: OECD Health Data 2015

3.1.1.1 *Burden of disease and inequality*

The importance in improving the oral health of children is evident from a review of information about the impact and burden of poor oral health. Among children, the most frequently reported long-term condition in 2012 as reported by the AIHW (2012) was asthma at 10%. Compare this to the 45% of six-year-old children and 39% of 12-year-old children that experienced dental decay (Mejia et al. 2012). In terms of prevalence of disease, caries experience in childhood is high. As such, the overall burden of oral disease in children is large due to the great number of people affected.

The immediate burden of childhood caries encompasses loss of health, reduced quality of life and direct and indirect financial costs (AHMAC 2001). A minority of children in Australia experience high levels of dental decay. For example, in 2007, 10% of the six-year-old Australian population experienced, on average, over five times the number of deciduous teeth with decay experience (dmft = 9.34) than the national average (dmft = 1.95) (Mejia et al. 2012). Children with severe caries experience pain, discomfort, disfigurement, acute and chronic infections, and eating and sleep disruption (Sheiham 2005). They are at higher risk of hospitalisation, high cost of care and loss of school days which impacts on their ability to learn. Families are affected through loss of work days having to care for ill children and managing treatment, which adds additional financial burdens on top of high costs of care. Casamassimo et al. (2009) proposed a morbidity and mortality pyramid to illustrate the burden of childhood caries (Figure 3-1). The likelihood of a severe outcome from childhood caries is small overall, but it is a burden that is borne disproportionately across the population.

Figure 3-1 Proposed early childhood caries morbidity and mortality pyramid

Adapted from Casamassimo et al. (2009)

The latest results from the National Dental Telephone Interview Survey into population oral health across Australia showed that the oral health of children aged two to 17 years varied according to socioeconomic status indicated by household income (Harford and Luzzi 2013). Children from households with the lowest income had the highest percentage reporting fair or poor oral health compared to children from households with higher annual income. The percentage reporting fair or poor oral health decreased consistently across income groups from 11.4% among households with less than $30,000 income to 3.6% among households with $110,000 or more income. A similar trend was seen for children experiencing toothache. Such data indicates that socioeconomically disadvantaged children are at highest risk of experiencing poor oral health.

The high prevalence of oral disease in childhood means a large total burden of disease at the population level. In addition to this, a small proportion of the population experiences a very large burden of disease. The largest burden of oral disease is borne disproportionately by children and families with the least resources with which to manage it. There is consequently a risk of compounding oral illness as well as disadvantage leading to an increased burden on the individual and on society across time. Research into the life-course view of oral health demonstrates this principle.

3.1.1.2 *Life-course perspective*

Poor oral health in childhood and its impacts do not remain tied to a single period in time or type of dentition. Li and Wang (2002) assessed caries status among Chinese children residing outside the Beijing

metropolitan area at three to four years of age and again at 11–13 years. They found a significant correlation between caries in the primary and secondary dentition, and that children with deciduous caries at age three to four years were 2.6 times more likely to develop permanent caries by age 11–13 years than children without deciduous caries. Peres et al. (2009) investigated the dental status of adolescents in relation to dental health in childhood in a birth cohort from Pelotas, Brazil. An association was found between untreated dental caries in deciduous dentition at age six years and outcomes of the Oral Impacts on Daily Performances index (OIDP) at age 12 years. The OIDP was used to measure oral health impacts such as eating, cleaning the mouth and smiling. Poor early childhood oral health is a risk factor for poor oral health in adolescence.

Dental caries has proven to be a cumulative and progressive disease. As stated by Macek et al. (2001), the scoring criteria for dental caries is cumulative in nature (the dfs and DMFS indices are irreversible), and teeth that are present in the oral cavity for longer periods are at greater risk of developing disease. This situation is evidenced by DMFT data from the Child Dental Health Survey (Mejia et al. 2012). In Figure 3-2 can be seen a consistent increase in DMFT score across ages among Australian adolescents, reflecting the increasing time which teeth are at risk of developing decay.

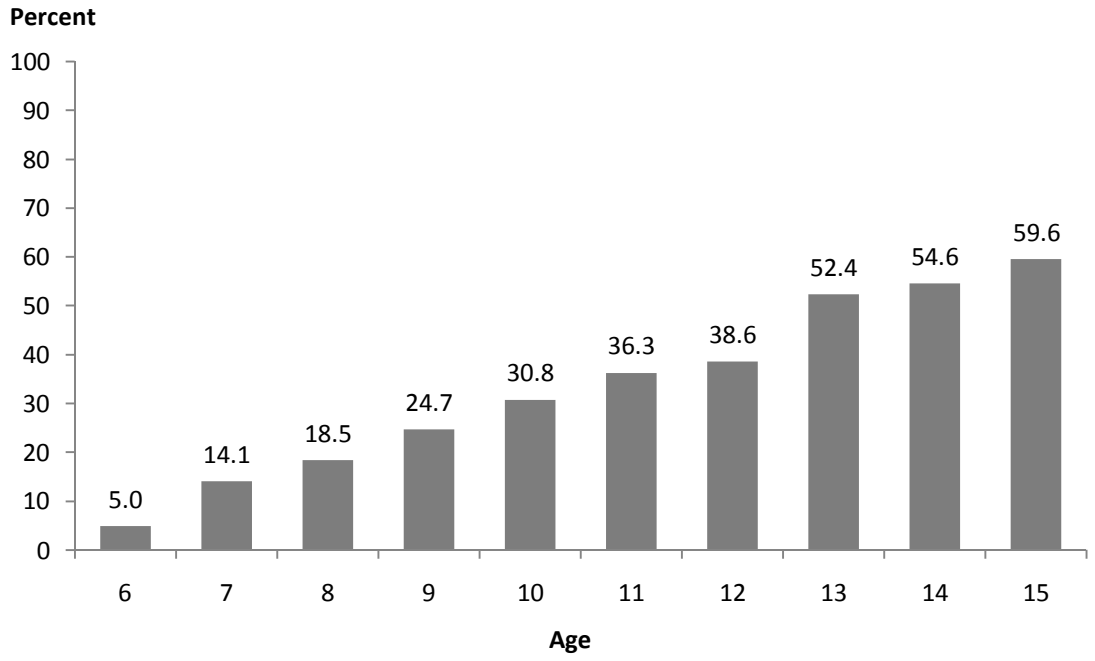


Figure 3-2 Permanent teeth: children with DMFT > 0 by age, 2007

From Mejia et al. (2012)

Mejia (2010) demonstrated an age association with experience of dental decay among young Australian adults aged 17–34 years. The percentage of young adults with no experience of dental decay decreased across age groups (Table 3-4), from 31.8% among 17–25 year olds to 24.9% among 26–34 year olds. Conversely, the percentage with one or more filled teeth increased from 54.1% to 63.3% across the age groups. The percentage with untreated coronal decay and teeth missing due to caries also increased but there was no indication of statistical significance. Not only does poor oral health in childhood increase the likelihood of poor oral health in adolescence, but cross-sectional data suggests that adolescents with poor oral health may be at increased risk of experiencing worsening oral health into and throughout adulthood.

Table 3-4 Percentage of young adults with and without dental caries experience (95% confidence intervals)

Age	DMFT = 0	Untreated coronal decay	One or more filled teeth	One or more teeth missing due to caries
17–25	31.8 (27.8–35.8)*	29.3 (25.3–33.2)	**54.1 (49.8–58.4)**	3.3 (1.8–4.8)
26–34	24.9 (20.7–29.1)*	31.8 (27.2–36.3)	**63.3 (58.6–68.0)**	7.1 (4.6–9.7)

Bold font indicates non-overlapping 95% confidence intervals (statistical significance)
*p-value less than 0.05

Source: Mejia (2010)

There is evidence supporting the idea that childhood caries increases the risk of caries in adulthood. Thomson et al. (2004) used a birth cohort study in Dunedin, New Zealand to explore the association between oral health in adulthood and in childhood. Presence of caries at age five years was associated with the mean number of decayed and filled surfaces (DFS) and surfaces with untreated decay (DS) and the mean number of teeth missing due to decay at age 26 years. A high level of caries (dmfs > 4) at age five years was associated with DFS, DS, mean teeth missing due to caries and the mean percentage of sites affected with periodontal disease at age 26 years.

Investigations into the life-course concept of oral health require a cohort or longitudinal study, both of which are time and resource intensive. As such, the pool of evidence from which to draw conclusions around the lifelong persistence of oral health status is small, yet it is consistent. In these studies, social and economic determinants are included as causative factors. Figure 3-3 illustrates the interplay between 'environment', oral health behaviour and consequent oral health status from childhood to adulthood. If indeed child oral health influences adult oral health as evidence suggests, then the importance of child oral health is amplified. The importance in this context can be expounded upon though a review of information regarding the impacts of oral health in the nation.

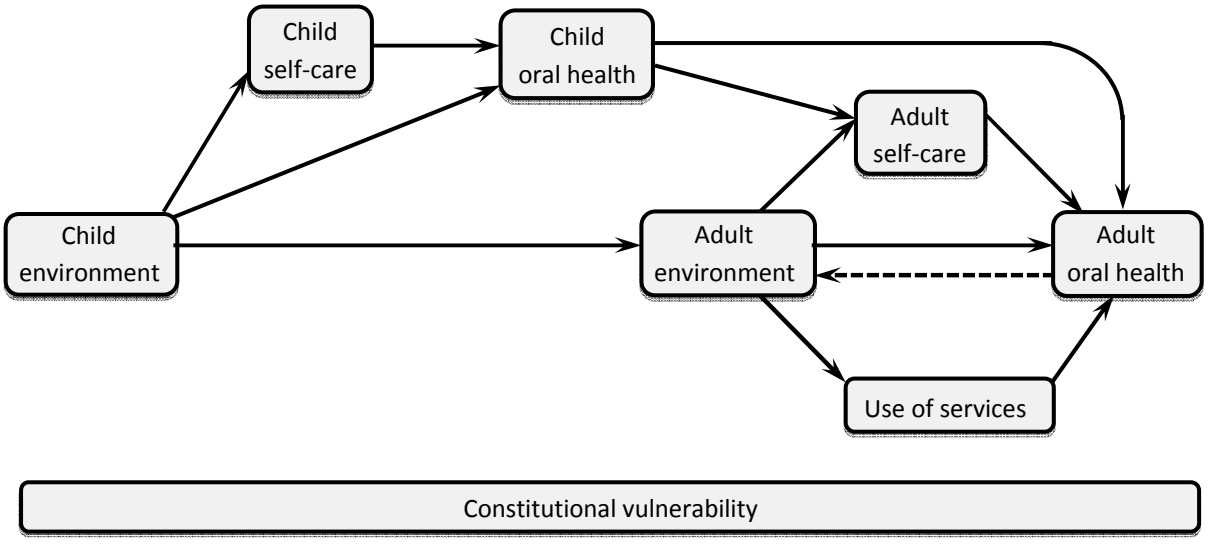


Figure 3-3 Chains of oral health risk through the life course

Adapted from Thomson et al. (2004)
Note: Constitutional vulnerability = the heritable elements of health

3.1.2 Oral health impact and burden

3.1.2.1 *Impact*

In Australia, dental caries is the most prevalent health problem, with periodontal diseases the fifth most prevalent (AHMAC 2001). Decay is preventable, and reversible in its early stages (Rogers 2011). Tooth loss could be mostly avoided through prevention and treatment of decay and periodontal disease. Dental conditions have consistently been the highest cause of acute potentially preventable hospitalisations[3] (PPHs) in Australia. In 2011–12, the PPH was 2.9 per 1,000 population, equal to the PPH for dehydration and gastroenteritis and higher than that for kidney infection (2.7) (SCRGSP 2014). This is particularly alarming as oral diseases are largely preventable and treatable, with the worst impacts able to be avoided if timely intervention is obtained.

3.1.2.2 *Burden*

The burden of disease from oral illness can be quantified in part by looking at dental health care expenditure. In 2008–09, oral health was the disease group with the second highest amount of expenditure at over $7 billion (AIHW 2013) behind the cardiovascular disease group. Table 3-5 shows expenditure on dental services in the 2011–12 financial year. The total cost of dental services was $8,336 million. An increase of 16.5% was seen in the direct expenditure from the Commonwealth government, while state and local government expenditure increased by 0.3%. Individual expenditure in 2011–12 increased by 3.7% from 2010–11, but is approximately equal to expenditure in 2009–10. Nevertheless, the majority of the financial burden continues to be borne directly by individuals (57%). A further 15% is borne indirectly through health insurance funds (AIHW 2013).

Table 3-5 Expenditure on dental services in 2011–12 by source of funds ($millions)

	Commonwealth govt.						
Year	Direct	Premium rebates	State and local govt.	Health insurance funds	Individuals	Other	Total
2009–10	768	509	652	1,076	4,737	32	7,775
2010–11	910	528	716	1,122	4,566	35	7,878
2011–12	1,060	528	718	1,261	4,736	34	8,336

Source: AIHW (2013)

What this burden on individuals means in the real world has been explored as part of the ongoing National Dental Telephone Interview Survey through assessment of financial barriers and hardship associated with dental visiting. In 2010, 37.8%, or two in five adults, reported experiencing financial barriers or hardship. Table 3-6 shows the breakdown of the types of barriers and hardships, with about a third of adults avoiding or delaying visiting due to cost. Just over one in 10 adults who visited the dentist in the previous year reported that it was a large financial burden (Harford and Islam 2013).

[3] "Potentially preventable hospitalisations (PPHs) are hospital separations where the principal diagnosis of the hospitalisation is thought to be avoidable if timely and adequate non-hospital care had been provided. Separation rates, or rates of completed episodes of care for PPHs for dental conditions, therefore provide an indicator of the potential inadequacy of dental care in the community." (Chrisopoulos and Harford 2013)

Table 3-6 Prevalence of financial barriers to dental visiting, 2010 (per cent)

	Avoided or delayed visiting due to cost	Cost prevented recommended treatment[(a)]	Dental visits in previous 12 months were a large burden[(a)]	Difficulty paying $150 dental bill
Male	26.9	21.0	9.4	14.4
Female	35.3	22.3	12.7	23.2
All people	31.2	21.7	11.2	18.8

(a) Dentate people who made a dental visit in the previous 12 months.

Notes

1. Data in this table relate to dentate people.
2. Estimates in this table are aged-standardised to the 2010 Australian population.

Source: Harford and Islam (2013)

These expenditure figures do not encapsulate indirect costs, such as individual costs of reduced functioning and quality of life, or social costs such as lost work or school days or reduced productivity (AHMAC 2001) (Figure 3-4). Recent research has found an association between ongoing income-related socioeconomic disadvantage and oral health-related quality of life. A longitudinal study into the association between income-related social mobility and health-related quality of life among young South Australians demonstrated such an association (Brennan and Spencer 2014). Individuals who were classed as disadvantaged at age 13 and were disadvantaged at age 30, or stable disadvantaged, experienced poorer oral health related quality of life and lower life satisfaction than those who were stable at middle or advantaged status and those that were upwardly or downwardly mobile. The paper demonstrates a link between persistent poor financial status and poor oral health outcomes. In 2010, 9% of Australian adults aged 18 and over were found to have missed one half-day or more from work or study due to dental problems, and 4.6% indicated they had reduced activities due to dental problems for up to one half of a day on at least one occasion. Consequently, Harford and Chrisopoulos (2012) calculated an approximate economic cost of $103m based on a loss of three million hours of work or study. Indirect costs may not always be quantifiable, but those that are suggest the costs are sizeable.

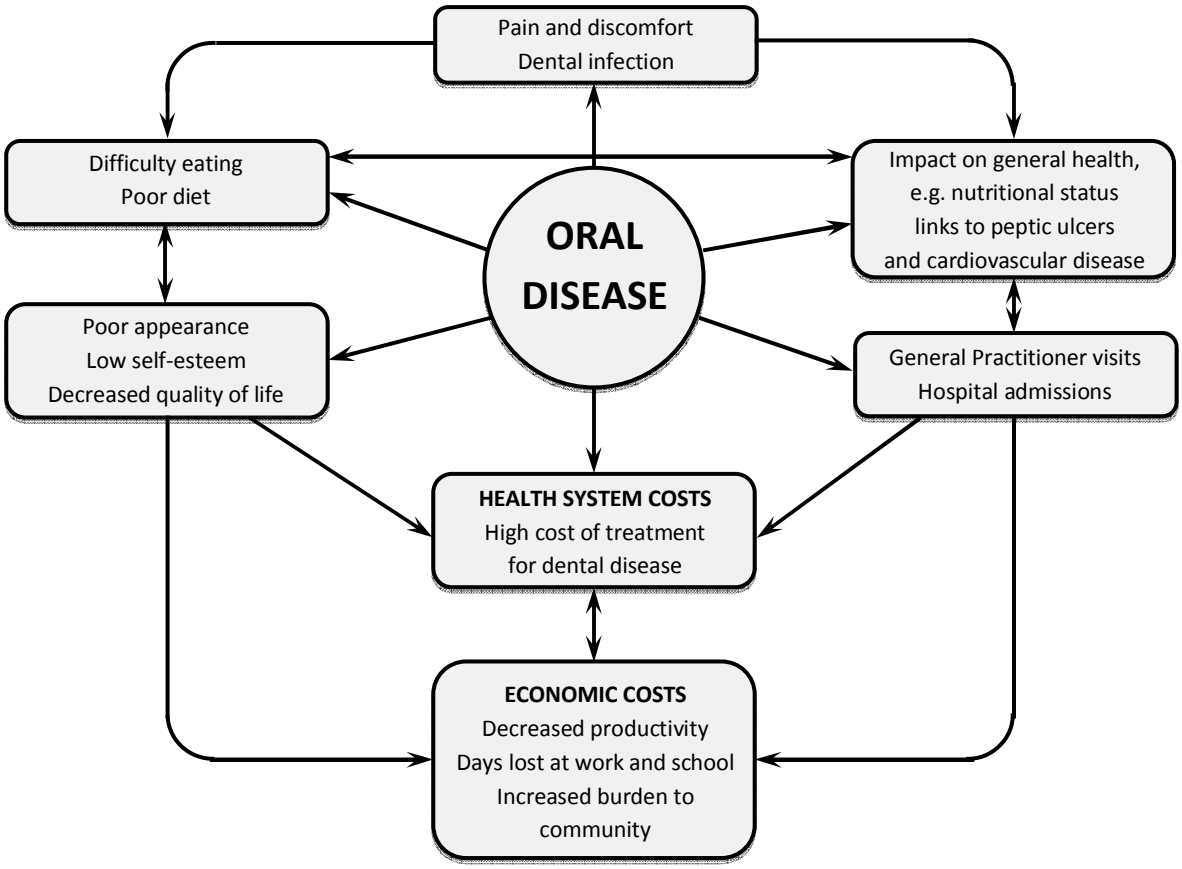


Figure 3-4 The impact of oral disease

Adapted from DHS (1999)

In addition to the burden due to poor oral health, links have been established between oral health and various conditions both as a manifestation of disease and as an exacerbating or reciprocal condition. These conditions include systemic health outcomes such as stroke and premature birth (Garcia et al. 2000), cardiovascular disease and incidents (Khader et al. 2004, Meurman et al. 2004), cerebrovascular disease and incidents (Wu et al. 2000), decreased nutrient intake (Sheiham et al. 2001, Hung et al. 2003), diabetes mellitus (Lamster et al. 2008), upper body obesity (Saito et al. 2001) and low body weight in children (Acs et al. 1999). The overall impact of poor oral health can thus be enormous, affecting the individual, the individual's family and society through loss of health, reduced functioning and quality of life, financial burden and loss of productivity.

3.1.3 Summary

Considering that children who experience poor oral health are likely to become adults that experience poor oral health, the burden of poor oral health in childhood is compounded across a lifetime. Taking all aspects into account, the impact and burden of oral disease in childhood combined with the risk of further impact and burden of oral disease into adulthood makes childhood oral health a matter of grave importance socially, politically and economically.

3.2 Child oral health and school environment

This section reviews literature relevant to the topic of the current study. First is a review of the broad concept of a relationship between environmental influences and child oral health outcomes, leading to a theory on the association between the outcome and the school environment. Next follows a review of

research into the links between environmental influences and child oral health outcomes. The final subsection reviews research looking at the association between school environmental influences and various child health outcomes.

3.2.1 Conceptual model

The most common oral disease and cause of oral related burden of disease in childhood is caries, which is preventable and manageable. The primary causes of caries in children have been labeled “diet and dirt” (Sheiham 2005), which suggests that correct management of nutritional intake and oral cleanliness could virtually eradicate childhood oral disease. Management relies, however, on the behaviour of individuals which has been shown to depend on a variety of factors. Figure 3-5 illustrates a conceptual model of the various levels of influence on oral health in children and demonstrates the complexity of the issue.

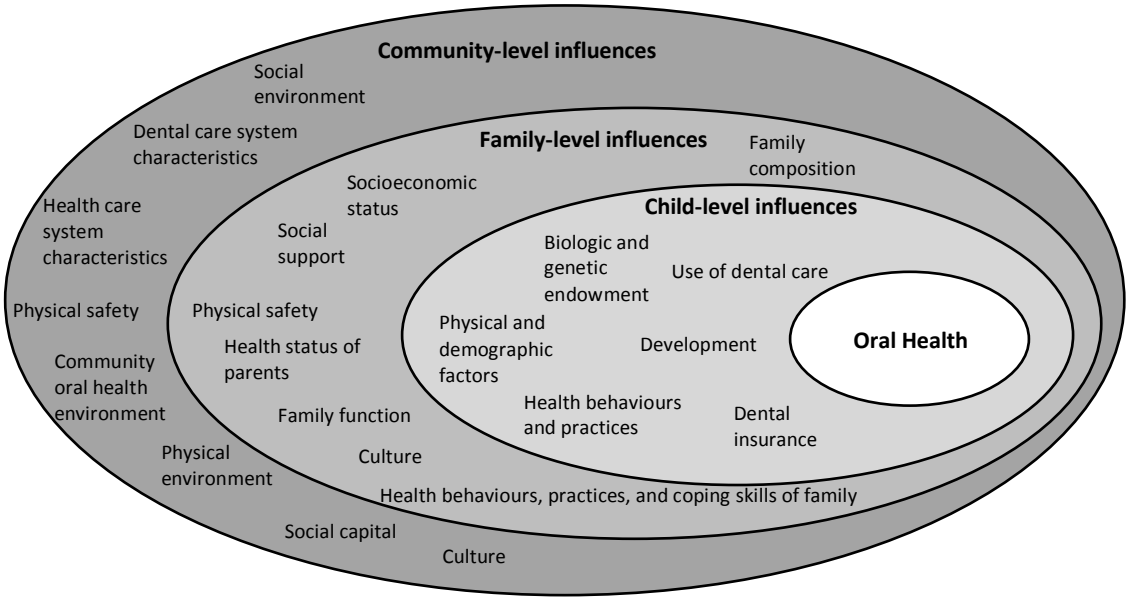


Figure 3-5 Child, family, and community influences on oral health outcomes of children

Adapted from Fisher-Owens et al. (2007)

Bramlett et al. (2010) listed elements in each level of this model. At the family level, for example, family composition, handling of family disagreements, social support and culture were included as relevant aspects for oral health outcomes in children. At community level, social capital, social environment and physical environment were included. Each element listed at each level is part of the overall environment in which a child operates. A level missing from the model is that of the school attended by the child.

It would be difficult to include a school in the above model, as it does not sit neatly around the family-level domain, nor fit within the community-level domain. When a child is at school, they are no longer directly influenced by their family. Conceptually, the school-level domain takes the place of the family-level domain during the periods in which the child is at school and under the care of the school. However a school can also be considered a community. Elements from both family- and community-levels as listed by Bramlett et al. (2010) are relevant in the school-level domain. Table 3-7 includes all those that are conceptually relevant altered to fit the school-level influence alongside the corresponding family- and/or community-level influences from the original model.

Table 3-7 Family-and Community-level influences on children's oral health from conceptual model by Fisher-Owens et al. (2007) and corresponding school-level influences

Identified influences		Corresponding school-level influences
Family-level domain[a]	Community-level domain[a]	School-level domain
Family composition Family structure Household size		Class/school composition Class/school structure Class size
Family function Religiosity Family reading time, family outings, eating meals together		Class/school function Religiosity Class activities
Socioeconomic status Family income		School socioeconomic status Index of Community Socio-Educational Advantage (ICSEA) School income
Health behaviours, practices and coping skills of family		Quality of teachers
Handling family disagreements By arguing		School disciplinary preferences/actions Frequency of disputes
Social support Frequency of residential moves Physical safety	Social capital Neighbours help/ watch out for/ count on/ trust each other Presence of bad influences on child	Social capital Student mobility Frequency of child sick days Frequency of physical hurt School provision of social services, experience of teasing/bullying, parental/community involvement in school Presence of bad influences on child
Culture Language spoken at home, country child born, country parents born	Culture % of population non-English speaking	School culture % Indigenous % from non-English speaking background
	Social environment Metropolitan statistical area status	Social environment School location School climate
	Physical environment Population density % households with standard plumbing	Physical environment Enrolment size Quality of ground, buildings and classrooms
	Physical safety Perceptions of childhood safety in neighbourhood Crime rate	Physical safety Perceptions of safety Presence/magnitude of social problems
	Community oral health environment	School health promoting environment Broad health policies Provision of health services

[a] From Bramlett et al. (2010)

Children, then, operate at different times within two separate models of influence; the one depicted above, and one that includes the school. Figure 3-6 shows the second conceptual model, altered from the first and simplified, to signify the effect school environment may have on oral health in children. In this conception, school-level influences are among the primary influences on the child's oral health with the models of influence operating side by side on an individual child.

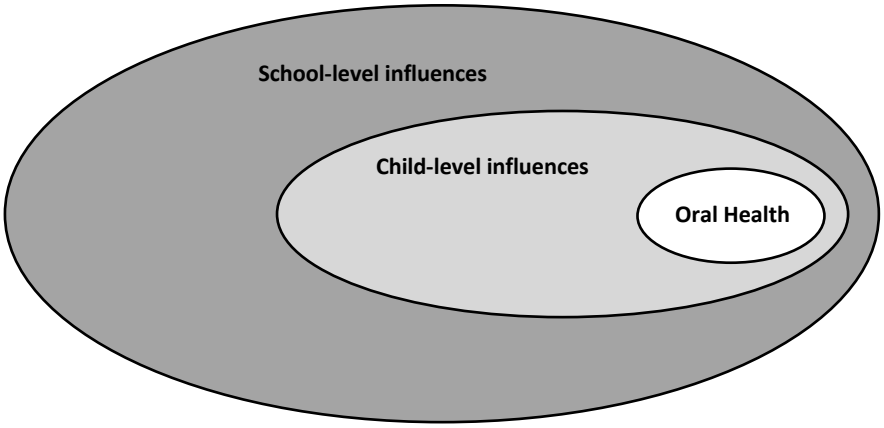


Figure 3-6 Conceptual model: Child and school influences on oral health outcomes of children.

Research into associations between school-level influences is scant, but there is some evidence to support the concept. Moysés et al. (2003) looked at oral health outcomes in Health Promoting (HP) Schools in the south of Brazil, as identified by school health policy, the physical environment of the school, the school social environment, community relationships and a curriculum designed to develop personal health skills. Their hypothesis was that oral health outcomes from populations in HP schools would be better than those in non HP schools. This was partially confirmed. HP school students had better and more homogenous oral health overall. Specifically, a comprehensive health promoting curriculum was related to a higher number of caries-free children, and more commitment towards health and safety at school was associated with fewer children with dental trauma.

Malikaew et al. (2003) investigated associations between school social and physical environments and the prevalence of traumatic dental injuries in the Muang District in Northern Thailand. The social environment was found to have a stronger association with the prevalence of traumatic dental injuries rather than the physical environment, particularly in boys; however the Muang District had fairly good overall standards in its schools' physical environments, which, the authors acknowledged, may account for physical environment being of lesser importance in this study due to less variation.

To date there is very little research into the association between school-level influences and oral health outcomes. As an adjunct, here follows a review of research on associations between similar family- and community-level influences and oral health outcomes and between school-level influences and other health outcomes.

3.2.2 Child oral health outcomes

3.2.2.1 *Parent-rated child oral health*

There was limited literature which assessed child oral health as rated by the child's parent. For all studies included in this section of the review a rating was scored by the parent or caregiver on a five-point Likert-type scale (excellent, very good, good, fair or poor) but the use of this scale in analysis differed across studies. Table 3-8 present the key results of the studies reviewed in this section.

Bramlett et al. (2010) assessed the multilevel model referenced above for parental ratings of child oral health among 26,736 young children aged one to five years using data from the National Survey of Children's Health in the United States of America (USA) in 2003. The dependent variable was based on the question asked of parents: 'How would you describe the condition of (child)'s teeth? (excellent, very good, good, fair or poor)' and dichotomised for analysis as a rating of fair/poor versus excellent/very good/good. Some relevant social determinant variables were significantly associated with the parental rating in the multilevel regression model. Among family level variables, parents were more likely to report fair/poor oral health of their child in households with a higher number of adults or children (used as a continuous measure), with lower parental educational attainment, with lower household income, with reported lower parental coping with raising a child, in which a language other than English is primarily spoken and in which the child was born outside of the United States. Among neighbourhood level variables, a rating of fair/poor oral health was more likely in neighbourhoods with a presence of bad influences on children, in which parents perceived a lack of either social capital or physical safety and which were located outside of a Metropolitan Statistical Area[4] (MSA). The amount of variation at neighbourhood or state level was not specified.

Other research into preschool children's oral health as rated by the parent or primary caregiver in the USA also found a socio-economic status (SES) influence on outcomes. Talekar et al. (2005) assessed data for 3,424 children aged two to five years from the Third National Health and Nutrition Examination Survey (NHANES III) 1988–1994. They assessed average ratings of oral health (excellent = 1, very good = 2, good = 3, fair = 4, poor = 5) across demographic groups defined at the parent, child and family levels. Relevant items included were parental education, mother's country of birth, household income, family size and urbanisation classification. The data showed that parents rated their children's oral health as better more frequently among households with a higher level of parental education and a higher income, with the other demographic variables showing no significant association in a regression analysis.

Iida and Rozier (2013) used data from 67,388 mothers involved in the National Survey of Children's Health in the United States in 2007 to investigate an association between mother-perceived child oral health and social capital for children aged zero to 17 years. The condition of the child's teeth was rated and grouped as fair/poor, good, and very good/excellent for analysis. Perceived social capital was measured by asking for level of agreement on aspects of reciprocal help, support and trust in the neighbourhood. Mother's perceived neighbourhood safety and a measure of Aggravation in Parenting[5] were also included in the collection as well as demographic information. A multivariable logistic

[4] A Metropolitan Statistical Area (MSA) is an area classification used by the US Census Bureau based on population size, density and connectivity. A central city is generally the largest city in a MSA, although others can qualify as additional central cities. (U.S. Bureau of the Census 1994)

[5] The Aggravation in Parenting Scale was derived from the Parenting Stress Index and the Childrearing Scale, to measure day-to-day coping ability.

regression model showed a higher rating of fair or poor condition of teeth among children with the lowest mother-perceived social capital but it was not significant. There was no evident relationship between perceived neighbourhood safety and mother-rated oral health. An association was demonstrated between maternal aggravation in parenting and child oral health, with mother's with high aggravation (low coping) more frequently rating their children's teeth condition as fair or poor. A clear association was also found with mother's mental health status, with mothers with lower mental health more likely to rate their children's teeth condition as fair or poor. Related demographic variables were race/ethnicity, household income, mother's education and language spoken at home. The odds ratios reported in the regression model were adjusted for potential confounders, but it is not made clear what these confounders were.

Research from Australia has also shown SES and social determinant influences on ratings of children's oral health. In the 2010 National Dental Telephone Interview Survey (NDTIS), SES was indicated by household income and cardholder status[6]. The NDTIS used a representative sample of 3,472 Australian children aged two to 17 years (AIHW 2013). There was an evident gradient of increasing percentages of children with fair or poor oral health (vs good, very good or excellent) across lower household income levels (Harford and Luzzi 2013). Only 3.6% of children living in a household with an income of $110,000 or more reported fair or poor health compared to 11.4% of children in households with less than $30,000 income. Children who were cardholders were more likely to be reported as having fair or poor oral health (7.6%) compared to non-cardholders (4.7%) although the difference was not statistically significant.

Victorian school children aged five to seven and 11 to 12 years were randomly selected to assess the influence of psychosocial factors on child oral health (de Silva-Sanigorski et al. 2013). The final sample size was 804 parents. One of the outcome measures evaluated was a parental rating of the child's oral health (very good/excellent vs good/fair/poor)[7]. The dependent variables included parental knowledge of ways to promote good oral health and the concepts of prevention and early detection, and parent self-efficacy or self-reported capability to act positively with regard to their child's oral health unrelated to specific tasks. There was increased likelihood of very good/excellent ratings for child oral health with increased parent oral health knowledge and oral health self-efficacy in a model controlled for socio-economic index for areas (SEIFA), maternal education, healthcare card status, parent age and age and sex of the child. The association was larger and more significant for self-efficacy than knowledge.

Renzaho and de Silva-Sanigorski (2013) used data from the 2006 Victorian Child Health and Wellbeing Study (VCHWS) to assess parental ratings of the oral health status of 4,590 children aged one to 12 by parental psychological distress and level of family functioning, and also by prosocial or difficult child behaviours for children aged four years and older. Child oral health was assessed using the parent response to the question 'How would you rate your child's oral health? (poor = 0, fair = 1, good = 2, very good = 3, excellent = 4)'. The data was assessed across three age groups; ages one to three years, four to seven years and eight to 12 years. The final fully-adjusted model was adjusted for parent age and gender, child age and gender, child general health status, parent education, household income, family

[6] 'Cardholders' are people who hold an Australian Government concession card, generally by virtue of their household income. Cardholder status is used to determine eligibility for free or subsidised dental care provided by state and territory governments. (Harford and Luzzi 2013)

[7] In the methods, the stated outcome measure was a parental rating of the child's oral health as good/very good/excellent compared to poor/ very poor, however the results refer to ratings of very good/excellent.

structure and language spoken at home. Higher family functioning was associated with better oral health for each age group, with the greatest effect seen among one to three years olds (odds ratio 0.42). Lower parental psychological distress was significantly associated with better oral health among one to three and eight to 12 year-old children, but the effect size was small (odds ratio; 0.94 and 0.96 respectively). More prosocial and less difficult child behaviour was associated with better oral health for children aged four to seven years and eight to 12 years, although the effect size was small for difficult behaviour (OR 0.96 and 0.94 respectively). Of the demographic variables, only household income was associated with the outcome variable among four to seven year-old children in the fully adjusted model.

3.2.2.1.1 Parent-rated child health

Self-rated health is a subjective general health measure used commonly in research to assess overall health status (Herman et al. 2014, Herman et al. 2015). It has also been shown to associate with self-rated oral health (Benyamini et al. 2004). It is reasonable to expect parent ratings of child health to associate with parent ratings of child oral health yet there was no evidence identified to support this specific association.

3.2.2.1.2 Summary

The papers discussed in this subsection demonstrated demographic influences on parent-rated child oral health at the family and community level that may be relevant in the school setting. These included household income, household size and cultural variables such as language background. At school level these may translate to school income, class size, school size and percentage of children from a non-English speaking background. Non-demographic items included parental coping, skills and knowledge, neighbourhood social capital, perceptions of safety in the neighbourhood, general family functioning and child behavior, although social capital and perceived safety were not consistently related to parent rating of child oral health. In a school context, these items may translate to quality of teachers, school social capital, perceptions of safety at school, school climate and presence of social problems. Much of this research was on pre-school-aged children. Whether findings would be relevant to older children is undetermined. Parent-rated child health could be an additional indicator of the oral health of children.

Table 3-8 Details of studies reviewed with parent-rated child oral health as a dependent variable

Author(s)	Year	Study design	No. of participants	Study population	Independent variable(s)	Dependent variable(s)[a]	Association
Bramlett et al.	2010	Cross-sectional	26,736	Parents of children aged 1–5 years	Number of adults in HH, higher number of children in household	Parent-rated child oral health	Negative
					Parent educational attainment, household income, parent coping with raising a child, language other than English spoken at home, child born outside the US	As above	Positive
					Presence of bad influences on children in neighbourhood, parents in neighbourhood perceive lack of social capital / physical safety, neighbourhood outside MSA	As above	Negative
Talekar et al.	2005	Cross-sectional	3,424	Parents of children aged 2–5 years	Parent education, household income	Parent rated child oral health	Positive
Iida and Rozier	2013	Cross-sectional	67,388	Mothers of children aged 0–17 years	Perceived social capital, perceived neighbourhood safety	Mother-rated child oral health	None
					Mother's aggravation in parenting (lower = better)	As above	Negative
					Mother's mental health status	As above	Positive
Harford and Luzzi	2013	Cross-sectional	3,472	Parents of children aged 2–17 years	Household income	Parent-rated child oral health	Positive
					Cardholder (vs non-cardholders)	As above	Negative
de Silva-Sanigorski et al.	2013	Cross-sectional	804	Parents of children aged 11–12 years	Parental oral health knowledge, parental oral health self-efficacy	Parent-rated child oral health	Positive
Renzaho and de Silva-Sanigorski	2013	Cross-sectional	4,590	Parents of children aged 1–3 years	Family functioning (lower = better), Parent psychological distress	Parent-rated child oral health	Negative
				Parents of children aged 4–7 years	Household income	As above	Positive
					Family functioning (lower = better)	As above	Negative
					Parent psychological distress	As above	None
				Parents of children aged 8–12 years	Family functioning (lower = better), Parent psychological distress	As above	Negative

[a] For the purposes of consistency in this table, the outcome for some studies has been reversed so that higher parent-rated oral health always indicates a positive outcome

3.2.2.2 *Caries*

The primary outcomes included in the literature reviewed in this section include decayed, missing and filled teeth in the deciduous and permanent dentition (dmft and DMFT respectively), decayed, missing and filled surfaces in the deciduous and permanent dentition (dmfs and DMFS respectively), untreated decay in the deciduous or permanent dentition, and caries prevalence in the deciduous or permanent dentition (the percentage of the population with caries experience, i.e. dmfs/dmft > 0 or DMFS/DMFT > 0).

3.2.2.2.1 Socioeconomic Status

Socioeconomic status (SES) is a frequently used measure to assess socially driven differences in oral health outcomes. Table 3-9 presents the key results of the studies reviewed in this section.

Data from the Child Dental Health Survey (CDHS) has demonstrated the association between SES and caries among children aged five to six years and 12 years of age. The SES measure used was the Socio-Economic Indexes for Areas (SEIFA) Index of Relative Socio-Economic Disadvantage (IRSD), an area level measure, of the location of the dental clinic attended by the child. Children aged five to six years in the highest SES group had a significantly higher percentage with no caries experience (60.7%) than children in the second (48.2%), third (48.9%) and lowest (45.7%) SES groups (Ha 2011). The percentage for both the middle SES groups was significantly higher than the lowest, although the percentage point difference was much smaller than in the comparison with the highest group. A very similar pattern was seen for mean dmft and untreated decay across SES groups. In all three measures, the highest SES group had the best outcome, the lowest the worst. The two middle SES groups were similar to each other, and significantly different to the lowest and highest groups. Among the highest SES group, mean dmft was 1.5, compared to 2.6 among the lowest SES group. Untreated decay was present in 29.2% of children in the highest SES group compared to 47.9% in the lowest.

Data for 12 year-olds followed the same pattern. The percentage of children in the highest SES group with no caries experience (62.9%) was significantly higher than the lowest SES group (46.9%). Mean DMFT was 0.9 for the highest SES group and 1.4 for the lowest. The percentage of children with untreated decay in the lowest SES group (30.8%) was almost twice that of the highest (17.9%).

Other research from Australia looked at area SES measures as associated with dmft among four to nine year-olds and DMFT among 10–16 year-old children (Armfield 2007). Clinical data was obtained through the South Australian School Dental Service. Area-level socioeconomic variables were taken from Census Basic Community Profile and Snapshots from the Australian Bureau of Statistics matched for the residential postcode of the child. Measures included income, education, occupation, employment, housing and mobility, separated into quartiles for analysis. The SEIFA was also used as an area-level composite measure of SES. Regression modelling demonstrated an effect at least the size of that for the SEIFA IRSD for all discrete SES measures in a model controlling for age and sex of the child. When controlling for IRSD as well as child age and sex, all discrete measures again accounted for at least as much variance as child age, sex and IRSD combined, although the measure of percentage living in public housing for dmft among four to nine year-olds was not significant. Among 10–16 year-olds, percent without motor vehicles was not significant for DMFT. Nevertheless, the results demonstrated that despite a relationship between the composite and discrete SES measures, each contributed independently to caries prevalence.

A systematic review in 2001 included literature on socioeconomic status and its relationship with dental caries in various age groups (Reisine and Psoter 2001). The research reviewed encompassed papers in English from 1990 onwards, with a minimum sample of 100 and relevant dependent and independent variables. For young children aged less than six years, the researchers concluded that there was strong and consistent evidence supporting the notion of an inverse relationship between dental caries and SES. The relationship was apparent for studies which included a multivariable analysis, allowing for the effects of other variables, although the presence of fluoridated water in an area diluted the effect. The same was true in the research on children aged six to 11 years. Among studies involving multivariable analysis, however, they acknowledged that this finding was inconsistent. For children aged 12 to 17 the study pool was relatively limited than for the younger age groups, and the evidence supporting an association between SES and caries was consequently weaker, yet still apparent.

Table 3-9 Details of studies reviewed with SES as an independent variable

Author(s)	Year	Study design	No. of participants	Study population	Independent variable(s)	Dependent variable(s)	Association
Ha	2011	Cross-sectional	20,673 8,841	Children aged 5–6 years Children aged 12 years	SEIFA	Caries prevalence, dmft, untreated decay	Negative
Armfield	2007	Cross-sectional	58,463	Children aged 4–16 years	SEIFA	DMFT, dmft	Negative
					Area % low income, % without university degree, % labourers, % unemployed males, % living in public housing, % without motor vehicles	As above	Positive
Reisine and Psoter	2001	Systematic review	Min. 100 (106 papers)	Children aged 0–17 years	SES (family)	Caries prevalence, dmft/s, DMFT/S, or ECC[8] prevalence	Negative

3.2.2.2.2 Income

Income is a part of the measure of socioeconomic status, and is often used as a standalone measure indicating social differences. Table 3-10 presents the key results of the studies reviewed in this section.

Do et al. (2010) investigated the relationship between income and child caries across a decade, from 1992/93 to 2002/03. Data was from South Australia and Queensland, collected as part of the Child Fluoride Study Mark one (1992/93) and Mark two (2002/03) designed to provide a representative sample of children aged five to 12 years in the two states. Deciduous caries experience (dmfs) was measured among children aged five to 10 years and permanent caries experience (DMFS) among children aged six to 12 years and adjusted for age and sex. Equivalised income, or income adjusted for household size and composition, was divided into quartiles for analysis. A gradient of dmfs and DMFS was evident across income quartiles, showing an inverse relationship. Rate ratios demonstrated that the inequality of caries experience was worse in 2002/03 for deciduous dentition. The lowest income quartile had a rate 1.73 times that of the highest quartile in 1992/93, but this figure was 2.25 in 2002/03. The Slope Index of Inequality (SII), as the absolute rate differences between the lowest and highest income groups, rose to 3.31 in the later study from 2.69 in the first study. This was not the case

[8] ECC: early childhood caries defined as the presence of decay on one or more of maxillary anterior teeth among children less than 3 years of age

for permanent dentition, which showed a slight improvement in inequality of caries experience based on income. The SSI was 0.38 in 1992/93 and 0.33 in 2002/03 for the permanent dentition group. Despite this, the lowest income group had a rate of permanent caries 1.38 higher than that of the highest income group in 2002/03.

Slade et al. (2006) assessed risk factors for dental caries among South Australian children aged five years using a case control sample of attendees of the South Australian Dental Services (SADS). Parents completed a mailed questionnaire which incorporated various sociodemographic and behavioural variables. The group with the lowest annual household income had a prevalence of caries 1.55 times that of the highest income group. Associations were also found for other demographic variables, with prevalence higher for Indigenous children than for non-Indigenous children and for children covered by a health care card than children not covered by a health care card. The behavioural elements associated with higher prevalence of caries were regular consumption of sweet drinks, having slept with a bottle of sweet drink as a baby, being weaned off breast milk at 18 months or older and later commencement of tooth cleaning.

Table 3-10 Details of studies reviewed with income as an independent variable

Author(s)	Year	Study design	No. of participants	Study population	Independent variable(s)	Dependent variable(s)	Association
Do et al.	2010	Cross-sectional	14,121 (1992/93) 6,868 (2002/03)	Children aged 5–12 years	Equivalised household income	DMFT, dmft	Negative
Slade et al.	2006	Cross-sectional	1,398	Children aged 5 years	Annual household income	Caries prevalence	Negative
					Indigenous (vs non-Indigenous) , Health care card holder (vs non-health care card holder	As above	Positive

3.2.2.2.3 Cultural background

The cultural background measures most relevant in Australia are non-English speaking background (NESB) and Indigenous Australian background. Both have been shown to have an association with child oral health outcomes. Table 3-11 presents the key results of the studies reviewed in this section.

Hallet and O'Rourke (2002) assessed the association between dental caries experience and social and demographic variables in a cross-sectional sample of preschool children ages four, five and six years from north Brisbane. The findings included that a higher average dmft was found among non-Caucasian children and children from a NESB. Also associated with higher average dmft was being male, being born at least the fourth child, lower household income and lower maternal education.

Kilpatrick et al. (2012) used data from the Longitudinal Study of Children (LSAC) to investigate patterns of inequality in oral health among children aged two to three years and again at age six to seven years. Children from a NESB had a higher level of parent-reported caries experience than children from an English speaking background at age two to three years. This difference was not evident at age six to seven years. At both age groups Indigenous children had higher caries experience than non-Indigenous children. An association was also demonstrated with socioeconomic position (SEP, like SES), with children from lower SEP households having a higher percentage of parent-reported caries experience at both ages.

The association between dental health and Indigenous status was explored using data from the Child Dental Health Survey (CDHS) collection from New South Wales (NSW), South Australia (SA) and the Northern Territory (NT) (Jamieson et al. 2007). These particular states and territory were used due to their reliable reporting of Indigenous status. Caries experience in deciduous dentition was higher among Indigenous children than non-Indigenous at all ages from age four to 10 years. Among children aged four to six years, the percentage was around double among Indigenous children than non-Indigenous children. For example, 72.0% of Indigenous six-year-olds had a dmft greater than zero compared to 37.7% among non-Indigenous six-year-olds. The average dmft score decreased across ages for both groups but was much higher among Indigenous children. At age six, dmft was 3.68 among Indigenous children and 1.54 among non-Indigenous.

There was a higher percentage of Indigenous children aged six to 17 years than non-Indigenous with caries experience at all ages although the differences were less patent than in the deciduous dentition (Jamieson et al. 2007). Among 12-year-olds, 44.7% of Indigenous children had caries experience compared to 29.2% of non-Indigenous children. Likewise, average DMFT was high among Indigenous than non-Indigenous children at all ages. Indigenous 12-year-olds had a DMFT of 1.25, while for non-Indigenous 12-year-olds the average was 0.75.

Jamieson et al. (2006) sampled Indigenous and non-Indigenous four to 13 year-old Australian children from the Northern Territory School Dental Service to describe oral health inequalities accounting for area-based SES. Both dmft and DMFT were higher among Indigenous than non-Indigenous children at all ages, from four to 10 years for dmft and six to 13 years for DMFT. This was evident once SES was taken into account, with the gap between Indigenous and non-Indigenous children closing with increasing age for average dmft, and widening with age for average DMFT.

Table 3-11 Details of studies reviewed with cultural background as an independent variable

Author(s)	Year	Study design	No. of participants	Study population	Independent variable(s)	Dependent variable(s)	Association
Hallet and O'Rourke	2002	Cross-sectional	2,515	Children aged 4–6 years	NESB (vs ESB), Born at least fourth child	dmft	Positive
					Household income, Maternal education	As above	Negative
Kilpatrick et al.	2012	Longitudinal	4,606	Children aged 2–3 years	NESB (vs ESB)	dmft	Positive (age 2-3 years)
			4,464	At age 6–7 years			None (age 6-7 years)
					Indigenous (vs non-Indigenous)	As above	Positive
					SES	As above	Negative
Jamieson et al.	2007	Cross-sectional	341,195	Children aged 2–17 years	Indigenous (vs non-Indigenous)	Prevalence of caries (deciduous/ permanent), DMFT, dmft	Positive
Jamieson et al.	2006	Cross-sectional	12,584	Children aged 4–13 years	Indigenous (vs non-Indigenous)	DMFT, dmft	Positive

NESB = Non-English speaking background, ESB = English speaking background

3.2.2.2.4 Dental beliefs/behaviours

A better understanding of parental beliefs about and behaviours associated with dental health and the impact these can have on child dental health outcomes is essential if such aspects are to be influenced in the pursuit of improved child oral health. Table 3-12 presents the key results of the study reviewed in this section.

Researchers in Finland assessed the associations between parent's and children's oral health knowledge, attitude and behaviour and the presence of active child caries (Poutanen et al. 2007)[9]. Parent factors included attitude towards toothbrushing for social situations, health and appearance and the acceptance of close persons, knowledge regarding dental care and parent distress about getting caries. An interesting child factor was child's reported knowledge about their parents' dental health, recorded when the child response was 'I don't know' to a question on their mother's and/or father's possible dental caries. This item may represent parental inclusiveness of children in important health-related discussions, or a higher level of information-sharing between parents and children. Some basic demographic data was also collected. Overall, both parent- and child-related factors were associated with the presence of active caries. A lower frequency of active caries was associated with a high occupation level compared to a low occupation level of fathers but not mothers. Parent's poor self-assessed dental health and poor oral health-related behaviours were associated with higher odds of active dental caries (odds ratio 1.8 and 1.6 respectively). Children that did not know the caries state of their parent's teeth had higher odds of active dental caries (odds ratio 1.5). The results were different for boys and girls, with the associations with parental factors present among girls but not among boys. The association between knowledge of the caries state of parent's teeth was present among boys but not among girls.

Table 3-12 Details of studies reviewed with dental beliefs and behaviours as independent variables

Author(s)	Year	Study design	No. of participants	Study population	Independent variable(s)	Dependent variable(s)	Association
Poutanen et al.	2007	Cross-sectional	489	Children aged 11–12 years	Father occupation level	Prevalence of active caries	Negative
					Mother occupation level	As above	None
					Parent self-assessed dental health, Parent oral health-related behaviours	As above	Negative (total and females only)
					Child knows caries state of parent's teeth	As above	Negative (total and males only)

3.2.2.2.5 Family functioning and social support

A more recent field of study is that of the influence that familial functioning aspects may have on child oral health. Table 3-13 presents the key results of the studies reviewed in this section.

A recent case-control study on a sample of 54 children aged five to eight years in the Netherlands investigated an association between aspects of parenting, family interaction and the presence of child caries (de Jong-Lenters et al. 2014). The cases were children with four or more decayed, missing or filled teeth and the controls were children with no caries experience matched by age and sex. Participants were recruited from a referral centre for paediatric dental care for cases and a general dental practice

[9] Active caries are lesions which progress or change over time, contrasting non-active caries which do not

for controls. A minimum sample of 42 children was assessed as necessary for the study. Parenting practices and parent-child interactions were observed during Structured Interaction Tasks, for example planning a fun weekend activity and problem solving on a topic selected by the child. The underlying dimensions assessed were positive involvement, encouragement, problem-solving, discipline[10], monitoring, coercion and interpersonal atmosphere[11]. In terms of the presence of disputes relevant to the current study, the dimensions of coercion and particularly interpersonal atmosphere are the most relevant. Observations were videotaped, blind-coded and calibrated. A parental questionnaire collected demographic and oral health behaviour information.

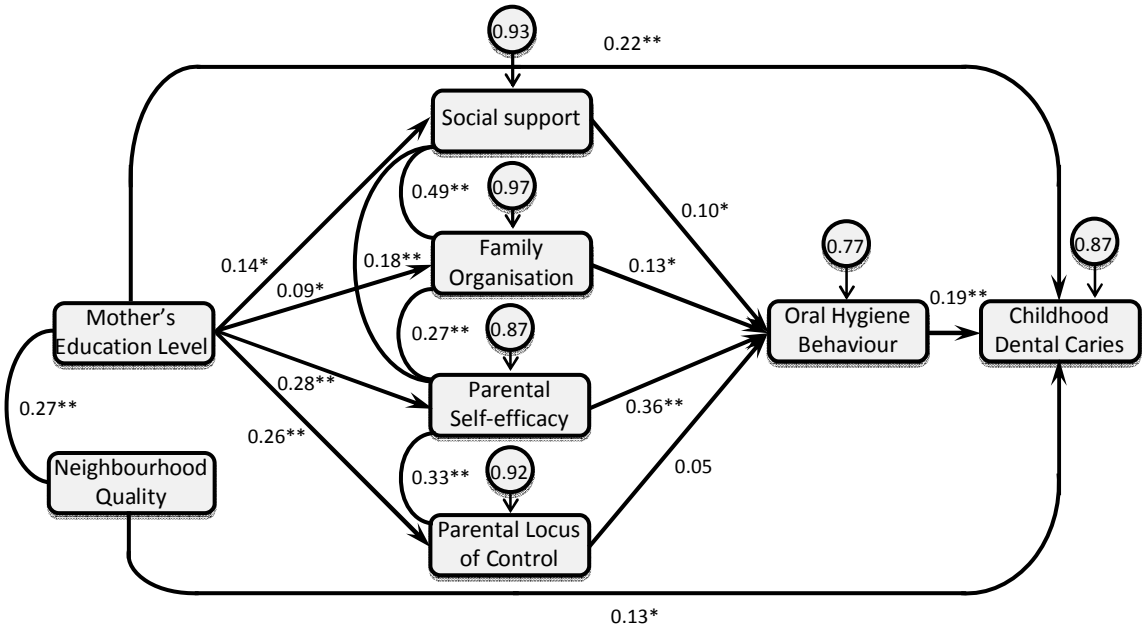
All parenting and interaction items were dichotomised as present or not present except for coercion, which was categorised into three groups: not coercive, slightly coercive or quite coercive. Caries cases were associated negatively with the presence of positive involvement, encouragement, problem solving, discipline and interpersonal atmosphere and positively with higher coercion. Once placed in a model controlled for mother's education level, tooth brushing frequency, the frequency of sugary foods between meals and the frequency of sugary drinks between meals the significance remained for encouragement and problem solving, though the upper confidence limit was 0.99. The significance also remained for interpersonal atmosphere, but disappeared for positive involvement, discipline and coercion.

Another Dutch study looked at dmft among five- to six-year-old children and its relation to family functioning (Duijster et al. 2013). A total of 630 children were recruited from paediatric dental centres. A parental self-complete questionnaire collected demographic information, oral hygiene behaviours and family functioning, which assessed responsiveness, communication, organisation, partner-relation and social network. Of particular interest are communication, which encompasses interaction regarding trust and empathy, conflict, openness and parents' behavioural control, and social network, which encompasses the extent to which the family can rely on support from friends, family and neighbours. The elements of family functioning were coded as either normal (functional), sub-clinical or clinical (dysfunctional) based on normative data. Higher scores were associated with higher dysfunction.

Differences in dmft were significant between groups based on responsiveness, communication, organisation and social network based on the Kruskal-Wallis Test. The association was positive in direction, with higher dysfunction associated with higher dmft. When assessed in multilevel regression models, however, the significance disappeared for all family functioning dimensions except for organisation. Organisation remained significant when in a model controlling for the family functioning dimensions, and mother's education level in addition, but not with the addition of oral hygiene behaviours. The authors concluded that any relationship between family functioning and child caries may operate through oral health behaviours. Family functioning dimensions were also assessed against socioeconomic position based on mother's highest level of education. The data indicated an association between these measures, potentially indicating that family functioning could partly explain the socioeconomic inequalities in childhood dental caries experience, although most elements of family functioning did not maintain a significant effect on dmft after adjusting for mother's education.

[10] "Discipline relates to parents' adequacy of setting appropriate limits for their child, and their efficiency in responding to their child's unacceptable behaviours in terms of timing, consistency, intensity and clear use of instructions/commands."
[11] "Interpersonal atmosphere describes the extent to which parent-child interactions are pleasant, comfortable and free of conflict and frustration."

Using the same sample, Duijster et al. (2014) assessed a multilevel model of determinants of caries. The model was developed based on the multilevel model by Fisher-Owens et al. (2007) and included factors based on previous research. Included factors were oral hygiene behaviours, family organisation as the degree of family functioning and the quality of relationships, social support as the extent to which the family can rely on support from people in their social environment, parental dental self-efficacy and parental dental health locus of control. Also included were mother's education level, ethnic background and neighbourhood quality based on postal code area and measuring numerous underlying dimensions, such as housing and safety. Based on the data, ethnicity had a strong relationship with mother's education and was excluded to improve model fit. The final model (Figure 3-7) showed various relationships with the outcome variable as well as interrelations between explanatory variables. There was an indirect and direct association for mother's education level, a direct association for neighbourhood quality and dental behaviours, and indirect associations for social support, family organisation, parental self-efficacy and parental locus of control.



Standardised path coefficients, *P < 0.05, **P < 0.001. Arrows imply that a variable has an influence on another variable. Connecting lines imply that variables are associated. Values in circles represent unexplained variance of variables.

Figure 3-7 Revised model with standardised path coefficients in a sample of 6-year-old children from the Netherlands

Adapted from Duijster et al. (2014)

Table 3-13 Details of studies reviewed with family functioning and/or social support as an independent variable

Author(s)	Year	Study design	No. of participants	Study population	Independent variable(s)	Dependent variable(s)	Association
de Jong-Lenters et al.	2014	Case-control	54	Children aged 5–8 years	Family positive involvement, discipline	dmft = 4+	Negative, disappeared in FA model
					Family encouragement, problem-solving, interpersonal atmosphere	As above	Negative, remained in FA model
					Family coercion	As above	Positive, disappeared in FA model
					Family monitoring	As above	None
Duijster et al.	2013	Cross-sectional	630	Children aged 5–6 years	Family responsiveness, communication, social network (lower = better)	dmft	Positive, disappeared in FA model
					Family organisation (lower = better)	As above	Positive, remained in model with mother education level, disappeared in model with oral hygiene behaviours
					Family partner-relation	As above	None
Duijster et al.	2014	Cross-sectional	630	Children aged 5–6 years	Oral hygiene behaviours, Neighbourhood quality	dmft	Direct negative
					Family organisation, Social support, Parental dental health locus of control (lower = better)	As above	Indirect positive
					Parental dental self-efficacy	As above	Indirect negative
					Mother education level	As above	Direct and indirect negative

FA = fully adjusted

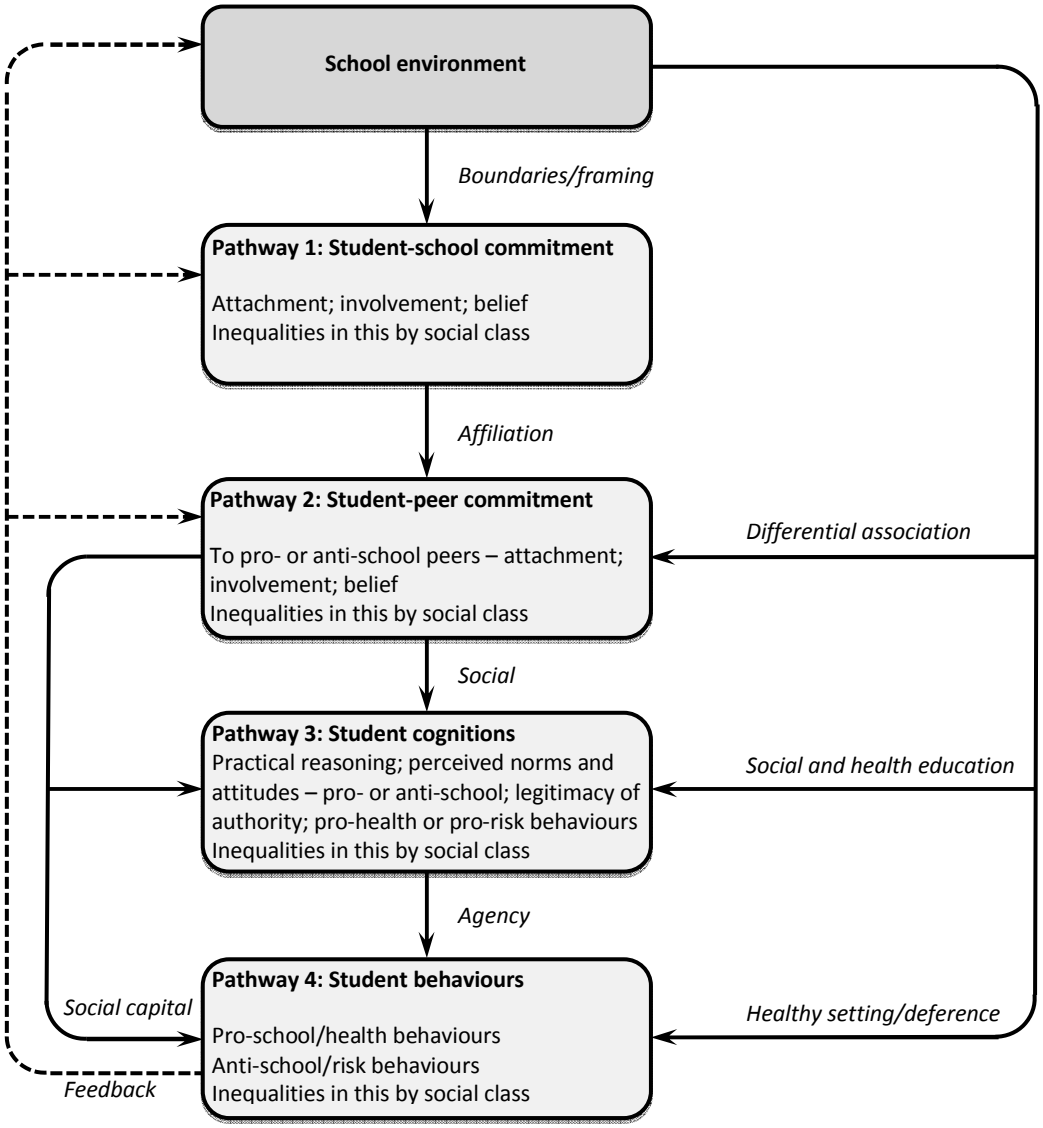
3.2.2.2.6 Summary

The studies cited supported the general concept of the social determinants of caries experience in children at all ages. Specifically, household and area measures of SES, household income, parent occupation and education, Indigenous background, household size and parent knowledge/attitudes/behaviour were found to be associated with caries outcomes in children. Contradictory evidence was found for an association between childhood caries and non-English speaking background particularly depending on the child's age, and aspects of family function. Whether the determinants will translate in a school setting is unpredictable. Relevant school-level items indicated by the above review include school SES, school income, quality of teachers, class and school enrolment size, school culture, disputes at school and child social support.

3.2.3 School environment

Bonell et al. (2013) systematically reviewed 37 reports on various theories of how school environments can influence health in children. These theories were then synthesised to create an integrated theory (Figure 3-8) aimed to encapsulate the complexity of the causal relationship between school environment and health more accurately than any one theory alone. The authors identify four pathways in their theory by which school influences health; firstly, through influencing student commitment to school; secondly through influencing student commitment to peers and whether those peers are themselves committed to the school; thirdly, through influence on student cognitions; fourthly, through influencing individual student agency in deciding what behaviours to engage in. The theory acknowledges direct and indirect influences as well as feedback effects from student behaviours. Through its complexity, it highlights the challenge of clearly elucidating the social determinants of health outcomes in a school environment. Yet it also validates the idea that a school environment can influence health outcomes for its students.

Bonell et al. (2013) conducted a systematic review of multilevel studies into the effects of the school environment on student health. Studies were included if they involved a school-level measure which was from a different source than the health outcomes, used multilevel analysis, assessed a relevant health outcome and was in English. Ten studies were included in the final synthesis, after a further exclusion of studies that did not adjust for key potential confounders, such as gender and socioeconomic status, or that adjusted for potential mediators, such as smoking behaviour and school attachment or connection. The age of students in the included studies ranged from 10 to 21 years, and study outcomes primarily included cigarette, alcohol or illicit drug use with one study also reporting on fighting behaviour. Lower rates of substance use were consistently associated with schools that had higher attainment and attendance than expected based on student intake. There was mixed results for associations between outcome measures and substance use policies, physical environment, year structure, school size and pupil to teacher ratio. Overall, the studies supported the concept that student health outcomes could potentially be influenced by school environment. Other studies have investigated child health outcomes as associated with specific elements of the school environment.



This figure illustrates an integrated theoretical model of the ways in which the 'school environment', at the top of the figure, influences at multiple inter-acting levels: (1) student-school commitment; (2) students-peer commitment; (3) student cognitions; and (4) students' behaviours. Key theoretical concepts addressing upstream, medial and proximal pathways are identified in italics. The 'feedback' loops in the diagram illustrate how both the school environment influences health, but also the enactment of health behaviours influences the school environment and each preceding pathway.

Figure 3-8 Integrated theory of school environment influences on student

Adapted from Bonell et al. (2013)

3.2.3.1 *Structural factors*

3.2.3.1.1 Sector and socioeconomic status

Socio-economic status (SES) at the household and area level was shown to be associated with oral health outcomes in children. It is also an important measure for a school environment when looking at socially driven health outcomes. As there is some relationship between sector and SES in Australia (ISCA 2014) research for both measures is presented together. Table 3-14 presents the key results of the studies reviewed in this section.

Olds et al. (2003) assessed the effect of school sector on the fitness performance of students aged 12–15 years in Australian schools. The sample was taken between 1995 and 2001, in SA, Tasmania and WA as part of the Australian Sports Commission's Talent Search program. Student's aerobic, explosive and anaerobic performance was tested through a 20 metre shuttle run test, a vertical jump test and a 40 metre sprint. A total of 27,334 students were included from 223 schools; 129 government, 52 independent and 42 catholic. SES of the school was also assessed using the School Card Register (SCR), which is the percentage of students in a school that receives government assistance for school expenses. The SCR was used as it correlates with census measures of SES. Between 10 and 15 percent of the difference in fitness performance was attributable to between-school factors. Among both boys and girls, there were differences in fitness performance between sectors. Most of this (90%) could be explained by the socio-economic indicator. It was also found that single sex schools had a beneficial effect for boys compared with combined sex schools, but there was no difference for girls in single or combined sex schools. School region had no effect. The analysis performed was not a multilevel analysis, but a grouped multivariable analysis of variance.

Research in Canada examined adolescent food behaviour across schools categorised by sector (public vs private) as a proxy for SES (Minaker et al. 2006). School region variables were also tested for association, categorised by SES using an aggregate measure of household income for the region and by urbanisation. A total of 2,615 grade nine and 10 students from 53 schools participated, comprising 45 public and eight private schools. There was little difference for food group and nutrient intakes in public and private schools. Public schools had a higher intake of high calorie beverages and a lower intake of fibre. Higher school region SES was associated with higher average fruit and vegetable consumption, higher average daily fibre intake, lower average daily added sugar intake and a higher frequency of breakfast consumption. Students from schools in an urban location drank less milk and had lower calcium and vitamin D intakes. It is of note that the only factors controlled for at the individual level were grade level and gender. The amount of variation between schools was not reported.

O'Dea and Dibley (2010) evaluated the rates of overweight and obesity in children aged six to 18 years in selected Australian schools in 2000 and 2006. The same 32 schools were included in both years of the study but the children were resampled from the new student population in 2006. The sample size was 3,819 children in 2000 and 5,524 in 2006. Overall the prevalence of overweight and obesity at the schools increased between 2000 and 2006, by 16.6% and 17.3% respectively. These were not statistically significant changes based on the calculated confidence intervals. For obesity, the prevalence increased by the largest amount in low schools with a low SES, from 5.8% to 8.6%. The prevalence of obesity increased by about the same amount in middle and high SES schools, from 5.5% to 6.3% for middle and 3.3% to 4.2% for high SES schools. The prevalence for overweight, however, increased most among middle SES schools (15.6% in 2000 and 19.6% in 2006), with similar prevalence in both years

among low SES schools (19.9% and 19.3%). Logistic regression modelling demonstrated that children in low SES school were almost twice as likely to be obese than children in high SES schools, with children in middle SES schools 1.64 times as likely to be obese. The same gradient was evident for overweight, although it was only significant for low SES schools compared to high SES schools (OR 1.32). The amount of school-level variation was not reported.

The association between adolescent depressive symptoms and school socioeconomic status was investigated in the United States (Goodman et al. 2003). The study used data from the 1995 National Longitudinal Study of Adolescent Health (Add Health) for adolescents in grades seven to 12, with a sample of 13,285 students from 132 schools. The variables analysed included individual-level household income, school-level income, school-level income inequality[12], depressive symptoms using a validated scale, and various individual- and school-level covariates. A multilevel regression model demonstrated that school-level income was negatively associated with adolescent depressive symptoms even when household income and covariates were controlled for. The effects were small but significant. Income inequality was not found to be associated with the prevalence of depressive symptoms once covariates were included in the model. The percentage of total variance that school-level variance accounted for was 2.7% in the first model including only household income, and reduced by more than half to 1.1% in the fully adjusted model. School income accounted for more of the variation between schools than household income.

Table 3-14 Details of studies reviewed with school sector or socioeconomic status as an independent variable

Author(s)	Year	Study design	No. of participants	Study population	Independent variable(s)	Dependent variable(s)	Association
Olds et al.	2003	Cross-sectional	223 schools, 27,334 children	Children aged 12–15 years	School sector-independent (vs Catholic, vs govt.)	Fitness performance	Positive
					School Card Register (low SES)	As above	Negative
Minaker et al.	2006	Cross-sectional	53 schools, 2,615 children	Children in school grades 9 and 10	School sector-Private (vs public)	High calorie beverage intake	Negative
						Fibre intake	Positive
					School region SES	Fruit / vegetable and breakfast consumption, fibre intake	Positive
						Added sugar intake	Negative
					Location-urban (vs rural)	Milk and calcium / vitamin d intake	Negative
O'Dea and Dibley	2010	Longitudinal	32 schools, 3,819 children (00) 5,524 children (06)	Children aged 6–18 years	School SES	Overweight	Negative
						Obesity	Negative
Goodman et al.	2003	Cross-sectional	132 schools, 13,285 children	Children in grades 7 to 12	School-level aggregate household income	Depressive symptoms	Negative
					School-level income inequality	As above	None

[12] School level income inequality reflects the relative distribution of household incomes within each school. This measure, based on the shares method used by the Census Bureau, assesses the proportion of total income held by the lower half of the population by using the less-well-off 50% of the population as the reference group.[21,22] The measure ranges from 0.0% (perfect inequality) to 50.0% (perfect equality). Thus, a higher number suggests lower inequality.

3.2.3.1.2 Class size

The number of students in each class at school can be considered indicative of two additional aspects of school environment. The first is the resources available to the school, in the form of the number of teachers employed. The second is the level of attention available to individual students, which is increased in a smaller class size. Table 3-15 presents the key results of the studies reviewed in this section.

Wilde et al. (2011) undertook analysis using Project STAR (Student Teacher Achievement Ratio), an intervention study, to assess the effects of small class sizes on health and economic outcomes. Children in kindergarten in 1985–1986 were randomly assigned to a small class size (13–17 students), a regular class size (22–25 students) or a regular class size with a teacher's aide for years K-3 in Tennessee. The final sample for analysis included 6,174 children from 80 schools. Social Security Administration (SSA) records were collected for the participant for the period from 1997 to 2008 to assess employment, earnings and disability claims. Regression analysis showed no significant differences in outcomes between the intervention and control groups overall. There were differences among subgroups in terms of earnings and employment, but not in disability claims.

Using the data from Project STAR, Meunnig and Woolf (2007) assessed the health and economic costs and benefits of reduced class sizes through school years K-3. To do this, project data on differences in educational attainment was used in conjunction with population, medical expenditure, welfare and crime data. The total sample available for this purpose was 12,000 students. The effects were assessed on the whole sample and on low income students only, as identified through the use of a free-lunch program. Overall, students that had attended smaller classes had an increased rate of school completion, and this was particularly evident in children from low income households. A hypothetical cohort was created using the information, and 'followed' from age five to 65 years. An average of 1.7 quality-adjusted life-years[13] was gained from applying small class sizes. When the intervention was targeted towards free-lunch students only, the resultant gain was 1.5 quality-adjusted life-years. The authors recognise the possibility of confounders, such as innate intelligence as well as family and community level factors, which were not accounted for in their assessment.

Table 3-15 Details of studies reviewed with class size as an independent variable

Author(s)	Year	Study design	No. of participants	Study population	Independent variable(s)	Dependent variable(s)	Association
Wilde et al.	2011	Intervention	80 schools, 6,174 children	School years K-3	Small class size (vs regular class size)	Disability claims	None
Meunnig and Woolf	2007	Intervention	80 schools, 12,000 children	School years K-3	Small class size (vs regular class size)	Quality-adjusted life years	Positive

[13] Health-related quality of life scores were scaled from 0 to 1.0, with 0 representing death and 1.0 representing perfect health. Thus, 10 years lived at a health-related quality of life rating of 0.7 is equal to 7 (10 · 0.7) quality-adjusted life years. A quality-adjusted life-year is a year of perfect health.

3.2.3.1.3 Health promoting environment

The Health Promoting School (HPS) framework is part of a World Health Organization (WHO) initiative to mobilise and strengthen health promotion and education activities. An HPS is a school "that constantly strengthens its capacity as a healthy setting for living, learning and working" (WHO 2014). Table 3-16 presents the key results of the studies reviewed in this section.

A Cochrane Review was conducted on the effects of schools adopting the WHO's HPS framework in terms of health and wellbeing of students as well as their academic achievement (Langford et al. 2014). The framework is defined as "holistic, settings-based approach to promoting health and educational attainment in school". HPS interventions could be implemented through school curriculum, ethos or environment of the school or both or engagement with families or communities or both. A range of health and wellbeing outcomes were included. The final review incorporated 67 studies, from primarily high-income countries (59 of 67). Meta-analyses supported beneficial intervention effects on BMI, physical activity or fitness, fruit and vegetable intake, tobacco use and experience of bullying, but no evidence of effect for alcohol and substance use, violence, mental health or perpetration of bullying. For other outcomes a meta-analysis was not possible. These included sexual health, hand-washing, accident prevention, body images, sun safety and oral health.

Recent research in Ireland looked at associations between school participation and health and wellbeing outcomes in Health Promoting and Non-Health Promoting School (HPS and NHPS) in Ireland (John-Akinola and Nic-Gadhainn 2014). Data was collected through a self-report questionnaire administered to 231 students from school grades four to six (aged nine to 13 years) from nine primary schools. Three of the participating schools were HPS and six NHPS. The questionnaire included basic demographic information, four measures of school participation (participation in school decisions and rules, participation in school activities, participation in school events, positive perception of school participation) and four measures of health and wellbeing. Health and wellbeing responses were used to create a single scale for analysis. Socioecological measures were also collected but were not analysed in terms of health and wellbeing outcomes. In univariable analysis there was one difference in school participation measures between HPS and NHPS, with HPS relating to lower positive perceptions of school participation. There was no difference in health and well-being between HPS and NHPS. There were positive associations between measures of school participation and student health and wellbeing. In a multivariable model, positive perception of school participation was associated with better health and wellbeing overall, in NHPS and among boys. Greater participation in school decisions and rules was associated with better health and wellbeing in HPS and among girls. This study performed a comparison between different school groups rather than adopting a multilevel analytical approach.

Lee and Stewart (2013) assessed the effects of an HPS approach on students' resilience in a quasi-experimental study in Queensland Australia. Resilience is the ability to adapt to or cope with adverse, risky or stressful situations. Twenty schools were involved in the study; 10 intervention schools and 10 matched control schools. In the pre-test phase, 1,526 students participated from intervention schools and 1,232 from control schools, with 828 students participating in the post-test phase from intervention schools and 449 from control schools. Students selected were aged eight, 10 and 12 years. The intervention was an 18 month application of HPS strategies with a focus on constant communication and shared vision, staff empowerment, providing a structure that supports a culture of HPS, and support for school partnerships with families and communities. Participating students completed a questionnaire covering the outcome measure of resilience through perceptions of individual

characteristics. The elements of the measure of resilience were empathy, communication and cooperation, self-efficacy and problem solving. The questionnaires also gathered information on protective sociocultural elements, including family, peer, school and community factors. In the final analysis there was a significant change in the difference in resilience among students from intervention and control schools. The HPS intervention had a positive effect on resilience. The intervention significantly affected measures of family connection, community connection and peer support. A structural equation model demonstrated direct and indirect effects on student resilience (Figure 3-9).

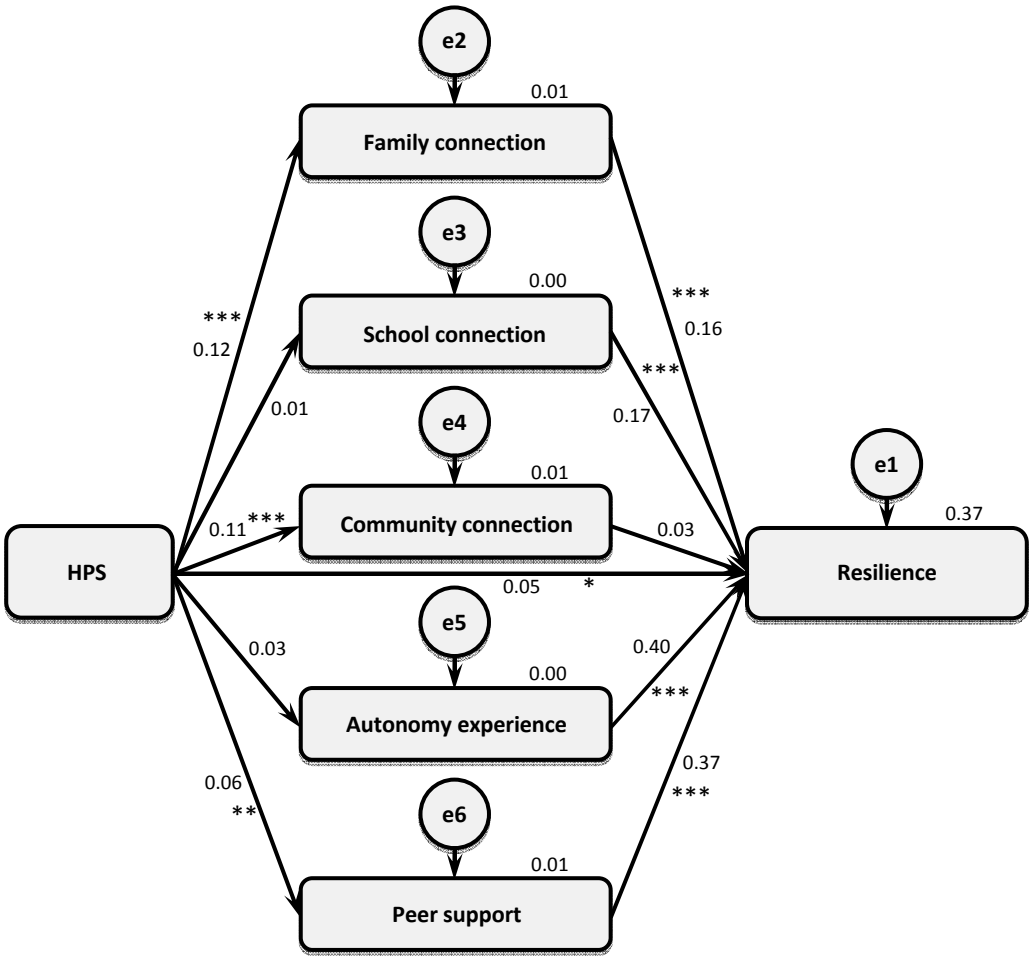


Figure 3-9 Hypothetical Model Predicting Students' Resilience as a Function of HPS Intervention and the Protective Factors (R^2 = 0.37)

Adapted from Lee and Stewart (2013)

Table 3-16 Details of studies with school adoption of the Health Promoting School framework as an independent variable

Author(s)	Year	Study design	No. of participants	Study population	Independent variable(s)	Dependent variable(s)	Association
Langford et al.	2014	Cochrane review	67 studies	Children aged 5–15 years	HPS (vs NHPS)	BMI, tobacco use, experience of bullying	Negative
						Physical activity/fitness, fruit/vegetable intake	Positive
						Alcohol/ substance use, violence, mental health, perpetration of bullying	None
John-Akinola and Nic-Gadhainn	2014	Cross-sectional	9 schools, 231 children	Children aged 9–13 years, school years 4-6	HPS (vs NHPS)	Health and wellbeing	None
Lee and Stewart	2013	Quasi-experimental	20 schools, 2,758 children (pre-test), 1,277 children (post-test)	Children aged 8, 10 and 12 years, school years 3, 5 and 7	HPS (vs NHPS)	Resilience	Positive

HPS = Health Promoting School, NHPS = Non-Health Promoting School

3.2.3.2 *Social factors*

A vital characteristic of any environment is the interpersonal or social interaction therein. Quantifying social interaction and related concepts is complex and hence there are various measures and specific types of interactions that can be assessed. Table 3-17 presents the key results of the studies reviewed in this section.

A study in Quebec, Canada, looked at the longitudinal association between school socioeducational environment and students' depressive symptoms (Brière et al. 2013). The study was performed as part of a large-scale evaluation of a governmental initiative to improve school success in disadvantaged populations. Sixty-one disadvantaged schools and 10 of average socioeconomic status were sampled. Students were recruited in school grade seven at age 12–13 years, and followed annually for four years until grade 11, with a final student sample number of 5,262. Self-reported questionnaire collected data on elements of the school socioeducational environment including social climate, learning opportunities, fairness and rules and safety as well as demographic information and, in the initial and final years of the study, depressive symptoms. Potential confounders were controlled for at the individual and school levels. A multilevel model demonstrated an association between school socioeducational environment and depressive symptoms in students. The socioeducational environment was the strongest predictor of the outcome after other multiple school and individual factors. The predictive effect was more pronounced among girls than boys. The amount of variation between schools is not reported.

Virtanen et al. (2009) examined the association between school psychosocial climate and adolescents' health in Finland. Data was used from two ongoing studies. Student health was measured as part of the Finnish School Health Promotion Study undertaken annually for 14–18 year-olds, with specific measures

of self-reported depression and physical and psychological symptoms. The school psychosocial climate was measured as part of the 10-Town Study, which looks at the health of local government personnel including school teachers. School climate information was presented across four facets; trust and opportunity for participation, support for innovation, orientation towards high quality work, and accepted and clear goals. Data was collected for 136 schools, from 1,856 teaching staff and 24,289 students. Only one facet of school climate showed an association with student health outcomes and it is interesting to note that it is the aspect that relates to relationships. Poor trust and opportunity for participation was associated with depression (OR 1.14) and physical and psychological symptoms (OR 1.17). Variation at the school level was not reported.

In Scotland, Henderson et al. (2008) assessed school factors underlying school-level differences in rates of smoking. They used a sample of 5,092 students from 24 schools for a randomised control trial assessing a school sex education program. Students aged 13–14 years in 1996 and 1997 were sampled, with follow-up at age 16 years. Relevant school-level variables were teacher ratings of the quality of relationships between teachers and between teachers and pupils and qualitative information on the school's focus, categorised to either primarily academic focussed, focussed on caring or inclusiveness or a mixed focus. Other school-level data captured included affluence measures such as the deprivation score of the local area, employment in the school catchment area and the proportion of students receiving free school meals and school size. A multilevel regression model showed that higher rates of smoking were associated with greater school affluence but not poor quality relationships. There was however an interaction between school affluence and poor relationships, with smoking rates higher for schools with higher affluence and poor relationships. When the sample was split by sex, there was evident a large and significant amount of between-school variance among males and a smaller but still significant variance among females after socioeconomic and cultural factors were accounted for. Among females, the difference became insignificant after relevant individual-level variables were taken into account. Among males, the difference remained significant when school-level affluence and quality of relationships were included separately, but including the interaction between the two rendered the difference insignificant indicating that the school level variables included accounted for all significant differences in smoking rates. The qualitative data on academic focus was assessed separately. Schools with a primarily academic focus had the highest rates of smoking and schools with an emphasis on caring and inclusiveness the lowest. The amount of school-level variance was reported by sex, but the proportion of total variance accounted for by school-level variance was not included in the output.

Walsemann et al. (2011) investigated the interaction between school racial composition and student race/ethnicity in relation to depressive and somatic (physical) symptoms in adolescents. Data was taken from the 1994/5 National Longitudinal Study of Adolescents (Add Health) wave one, a representative study of students from school grades seven to 12 in the United States of America. The sample was of 132 high schools and 18,419 students aged 11–21. The outcome variables of depressive and somatic symptoms were assessed through a student interview as was race along with various covariates including perceived discrimination and school attachment. Other covariates were gathered from a school administrator for school-level variables and from a parent interview for household variables related to the student. Racial composition was analysed as the percentage of students in a school that were non-Hispanic white.

When assessed in multilevel models controlling for both individual- and school-level covariates a higher percentage of white students was associated with higher levels of depressive symptoms among African-

American students. Similar results were seen for somatic symptoms. An interaction was evident between African-American race and the percentage of white students in a school, but this effect became insignificant once student perception of discrimination and school attachment were added to the model. This demonstrated the importance of quality relationships in the school for minority students. School socio-economic status (SES) did not attenuate the interaction effect as had been expected by the authors. The amount of school-level variance was reported. The percentage of total variance accounted for by school-level variance was evident from output of models for depressive symptoms (1.4% in the first model) but not for somatic symptoms.

Table 3-17 Details of studies with school social factors as an independent variable

Author(s)	Year	Study design	No. of participants	Study population	Independent variable(s)	Dependent variable(s)	Association
Brière et al.	2013	Longitudinal	71 schools, 5,262 children	Children aged 12–13 years, school year 7	School socioeducational environment	Depressive symptoms	Negative
Virtanen et al.	2009	Cross-sectional	136 schools, 24,289 children	Children aged 14–18 years, school years 8–11	Trust and opportunity for participation among teachers	Depression, physical and psychological symptoms	Negative
					Support for innovation Orientation towards high quality work, Accepted and clear goals (among teachers)	As above	None
Henderson et al.	2008	Longitudinal	24 schools, 5,092 children	Children aged 13–14 years	Quality of relationships at school	Rate of smoking	None
					School affluence, Interaction: schools with higher affluence and poor relationships, Academic focus (vs focus on caring and inclusiveness)	As above	Positive
Walsemann et al.	2011	Cross-sectional	132 schools, 18,419 children	Children and young adults aged 11–21	% white students, Interaction: % white students and African American race	Depressive and somatic symptoms	Positive[(a)]
					Interaction: % white students and African American race	As above	None[(a)] (in model including student perceptions)

[(a)]Among African-American students

3.2.3.3 *Summary*

There was limited research into the effect of the school environment on children's health outcomes. Some evidence was available that suggested links between aspects of school environment and various health outcomes, including substance use, physical fitness, nutrient intake, overweight and obesity, mental health and general health and wellbeing. Of the school environmental aspects investigated in the above review, sector and SES was convincingly associated with children's health outcomes. There were mixed results for class size, HPS environment and social environmental factors. Much of the material was related to adolescents, and although some studies did include children of primary school age the relevance that school environments have to the health outcomes among younger children was not established.

3.3 Chapter summary

Oral health is recognised as a key health indicator. It is of great importance in children as poor child oral health can have lifelong implications. From a population perspective, the burden of oral disease is enormous. Social determinants of children's oral health have been identified at the individual, family and community levels. Both parent-rated oral health and caries experience in children have been associated with various social determinants at all three levels. A major and largely overlooked environment of influence in a child's life is the school environment. The school environment has been associated with health outcomes among adolescents.

Figure 3-10 shows a complete conceptual model including the detailed school-level influences identified in the above literature review. This model focuses on operational aspects of the school environment rather than overarching concepts, consistent with information uncovered in the literature review, and does not consider potential interaction between these aspects. Despite these possible limitations, it provides a plausible and parsimonious framework with which to pursue the aims of the thesis. Additional factors of parent and community involvement and physical environment are included based on information in Table 3-7 however papers specific to the factors were not identified for inclusion in the review. These aspects were, however, part of the HPS concept in reviewed papers.

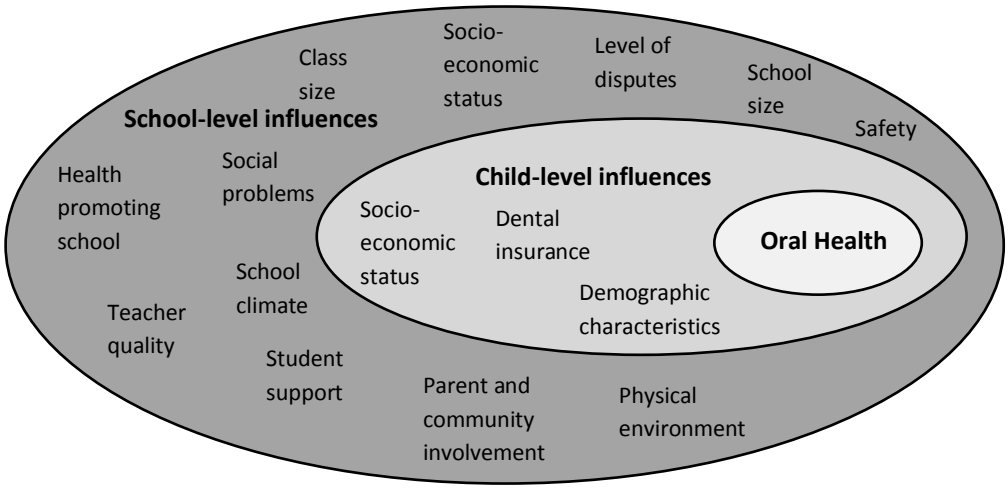


Figure 3-10 Detailed conceptual model: Child and school influences on oral health outcomes of children.

3.4 Aim, objectives and hypotheses

The overall aim of this research is to assess the relationship between school environment and Australian children's general health and oral health outcomes. The specific objectives are:

1. To examine school-level variation in child general health and oral health outcomes (general contextual effect)
2. To determine the relationship between aspects of school environment and child general health and oral health outcomes (specific effects).

The hypotheses considered in this study are:

1. There is significant school-level variation in child general health and oral health outcomes (presence of general contextual effect)
2. Schools with a more positive environment (as indicated by individual aspects of schools) are associated with better child health and oral health outcomes (positive directional specific effects).

4 Method

This section covers the methods of data collection, which included a survey collection and an administrative collection. Also detailed are the methods adopted to analyse the data.

4.1 Survey data collection

4.1.1 Design

The current study is a nested study within the National Child Oral Health Survey (NCOHS). The NCOHS is a nationwide survey of school-aged children (ages five to 14) comprised of a parent questionnaire, a dental examination of the child and a second or follow-up parent questionnaire, using a cross-sectional, representative sample from each state. The Survey was conducted by the Australian Research Centre for Population Oral Health (ARCPOH) at the University of Adelaide in conjunction with government health departments from each state and territory. For the purposes of outlining the method in this paper, the initial parent questionnaire and the dental examination of the child are labelled 'phase one' (P1), with 'phase two' (P2) comprising the second questionnaire.

The current study was a cross-sectional survey of children from schools in New South Wales (NSW), South Australia (SA) and the Australian Capital Territory (ACT) using self-complete questionnaires to collect data from parents of children.

4.1.2 Participants

Parents of children aged five to 14 years who participated in P1 of the NCOHS in NSW, SA and ACT formed the sample included in the current study.

The selection of participants for the NCOHS was achieved using a two-stage sample design. In the first stage, a sample of schools was drawn from a sampling frame of schools within each state/territory. In the second stage, children were sampled from each selected school.

The NCOHS school sample frame for NSW, SA and ACT was all pre-schools and schools in the states and territory identified as public, religious (Catholic) and independent private. Pre-schools and schools were then selected from each of the three groups using a random selection proportional to population size.

Schools were excluded from the frame if they were;

- Located in very remote locations
- a special school

A special school is defined by the Australian Bureau of Statistics (ABS) as a school which caters specifically for children;

- with mental or physical disability or impairment
- with slow learning ability
- with social or emotional problems, or
- in custody, on remand or in hospital.

Information provided on the sampling frame for each school was school name, sector, school type, Index of Community Socio-Educational Advantage (ICSEA) and enrolment size. For sampling purposes, schools were matched on ICSEA score to ensure representation of all demographics.

The second stage of sampling was to select children within each school. An equal sample of children was drawn for each age level within a school. This number was the same for each school regardless of enrolment size.

Table 4-1 shows the target number of schools and children to participate in the NSW, SA and ACT components of the NCOHS and consequently the expected size of the sample for inclusion in the current study.

Table 4-1 NCOHS school and child target respondent numbers for NSW, SA and ACT

	NSW	SA	ACT	Total
No. schools	156	76	33	265
No. children	6,000	3,200	2,200	11,400
Ave. no. children per age per school	3.8	4.2	6.7	4.3

The number of children selected within the schools was adjusted during the survey process to account for lower than expected rates of secondary school involvement. Specifically, the number of secondary-school-aged children selected was increased in NSW and SA to offset the expected shortfall in the final sample.

4.1.3 Methodology

Data was collected during 2012–2013 using a mailed self-complete questionnaire sent to parents of children included in the NCOHS. Data collection followed the Total Design Method (Dillman 1978) with a brochure as a primary approach letter to introduce the P2 questionnaire, followed by an initial mailing of the questionnaire, then a reminder card, and two further follow-up mailings of replacement material to non-respondents. Respondents were provided with a 'Do not wish to participate' card as an easy way to indicate their refusal to participate in the P2 questionnaire.

In some cases, the respondents had moved residence since participation in P1 of the NCOHS and a return to sender (RTS) was received. In other cases a record was missing the postal address information. In these instances, the parent was emailed with a request for a relevant postal address, with the questionnaire and other documentation attached so that the parent alternatively could respond without having to provide an address. Non-responding parents were then telephoned a maximum of three times, with each call at a different time of the day, to obtain either a new address or a completed questionnaire from the email copy sent. If the record was missing the email address, telephone contact was made only. If the record was missing a contact telephone number, an additional attempt at contact via email was made. If both email and telephone contact information was omitted from the record then no further action was possible.

Sociodemographic and examination data for participating children was extracted from the P1 questionnaire data.

4.1.4 Instrument

The questions on school environment for parents were constructed based on theory and an exploration of issues identified in previous papers that relate to the school environment, with the aim to include measurements of as many different aspects of the school environment as could be identified and sensibly asked of a parent of a student attending the school. Questions were, as much as possible, taken from large studies designed and conducted by reputable institutions. In most cases, the questions were designed to be asked of principals, teachers or students, and were adapted to be suitable for a parent respondent group of the current study. The questions included below were the final draft of questions after pre-testing had been conducted.

4.1.4.1 *Preliminary questions*

Two preliminary questions were asked (Figure 4-1). The first question was to ascertain whether the child had moved school since their initial involvement in the NCOHS. The second preliminary question was asked to provide an additional source in the event of missing information for school environment questions, as many of the questions on school environment could be answered the same for children in the same household that attended the same school.

What is the name of the school your child currently attends?	.....
Are you filling out this questionnaire for more than one child in your household?	☐1 Yes ☐2 No

Figure 4-1 Preliminary questions from the School Environment questions for parents

4.1.4.2 *Health focus*

The questions in this section (Figure 4-2) were based on the results from a paper by St Leger et al. (2002) which assessed the application of items of the Health Promoting School model across Victorian schools. The items found to be evident in Victorian schools were retained or discarded dependent on the likelihood of eliciting a parent response and the appropriateness in both primary- and secondary-school settings. For example;

- The item 'Broad range of parents involved' under 'Community relationships' was discarded as this was unlikely to be accurately assessable from a parent perspective
- The items under 'Student personal health skills and knowledge' were discarded as they related only to secondary schools and would be potentially difficult to assess from a parent perspective (e.g. student communication, decision making and procedures for social problems).

St Leger et al. (2002) developed the questionnaire based on the WHO (Western Pacific) Guidelines defining a Health Promoting School (HPS), the Western Australian HPS project ('The Healthy School Index'), the NSW HPS guidelines and two HPS surveys that had been undertaken by the University of Sydney. The resultant questionnaire was piloted in six schools before being finalised.

15 **Has your child's school provided the following health services in the last 12 months?**
(Tick one box only for each row)

	Yes	No	Don't know
Health screening services (e.g. hearing, vision, scoliosis)	☐1	☐2	☐3
Services for mental and social health of students (e.g. student counselling)	☐1	☐2	☐3
Student support services (e.g. to assist students with learning needs)	☐1	☐2	☐3
Visits by a school dental service for students	☐1	☐2	☐3

16 **Does your child's school have policies covering the following health issues?** *(Tick one box only for each row)*

	Yes	No	Don't know
Protective clothing	☐1	☐2	☐3
Sun protection	☐1	☐2	☐3
Immunisation	☐1	☐2	☐3
Use of backpacks	☐1	☐2	☐3
Recycling	☐1	☐2	☐3
Environmentally friendly	☐1	☐2	☐3
Playground equipment safety	☐1	☐2	☐3
Nutrition/health canteen	☐1	☐2	☐3
Bullying/behaviour	☐1	☐2	☐3
Other health-related policies *(if other, please describe)*	☐1	☐2	☐3

17 *(Tick one box only for each statement)*

	Strongly disagree → Strongly agree				
Families of children at your child's school are involved in health decisions for the school.	☐1	☐2	☐3	☐4	☐5
Parents are encouraged to be involved in decision making at your child's school.	☐1	☐2	☐3	☐4	☐5
Local groups participate in school activities at your child's school.	☐1	☐2	☐3	☐4	☐5

Figure 4-2 Health focus questions from the School Environment questions for parents

4.1.4.3 *Resources*

This question (Figure 4-3) is a simplified adapted version of a segment of questions on schooling used by Marks (2010) to assess what aspects of schooling are important for student performance for tertiary entrance in Australia. The wording of the question was altered to better reflect the aim of the study; Marks used the wording 'potential factors hindering instruction at school' whereas the current study focuses on school environment, not the ability of the school to provide instruction.

18 **How would you rate the following aspects of your child's school?**
(Tick one box only for each row)

	Very good	Good	Adequate	Poor	Very poor
1. School buildings and grounds	☐1	☐2	☐3	☐4	☐5
2. Classrooms and other learning spaces	☐1	☐2	☐3	☐4	☐5
3. Teachers	☐1	☐2	☐3	☐4	☐5

Figure 4-3 School resources question from the School Environment questions for parents

The data used by Marks (2010) was from questions included in the longitudinal extension of the Organisation for Economic Co-operation and Development's (OECD) Australian Programme for International Student Assessment (PISA) 2003 study.

4.1.4.4 *Climate*

4.1.4.4.1 Student morale

This scale (Figure 4-4), taken from the questions used by Marks (2010), was one of a number that assess various permutations of the student relationship to school, such as school attachment, bonding and

connection (Libbey 2004). Other scales were conceptually difficult to adapt to and be answerable by a parent respondent group, while the scale used by Marks covered areas of interest such as attitude towards the school and school work and interpersonal relations, and the topics could be assessed by a parent respondent.

The data used by Marks (2010) was from questions included in the longitudinal extension of the OECD's Australian PISA 2003 study.

19 *(Tick one box only for each statement)*	**Strongly disagree** →				**Strongly agree**
Your child enjoys school	☐1	☐2	☐3	☐4	☐5
Your child is enthusiastic about school work	☐1	☐2	☐3	☐4	☐5
Your child takes pride in his/her school	☐1	☐2	☐3	☐4	☐5
Your child values academic achievement	☐1	☐2	☐3	☐4	☐5
Your child is co-operative and respectful at school	☐1	☐2	☐3	☐4	☐5
Your child values the education they can receive at their school	☐1	☐2	☐3	☐4	☐5
Your child does his/her best to learn as much as possible	☐1	☐2	☐3	☐4	☐5
Your child gets along well with teachers at his/her school	☐1	☐2	☐3	☐4	☐5

Figure 4-4 Student morale question from the School Environment questions for parents

4.1.4.4.2 Sick leave

Student absenteeism can be associated with aspects of school environment (Moos and Moos 1978, Ehrenberg et al. 1989) including the school social environment. The number of sick leave days a child takes off school in this study was included as an adjunct assessment of overall connectedness, or disconnectedness, with their school.

The response categories for this question (Figure 4-5) were created to roughly approximate no sick days (none), a rare sick day (1–3), a sick day roughly once a term (4–8), a sick day roughly once a month (9–15), and a sick day more than once a month (Over 15).

23 **In the last 12 months, how many sick days has your child taken off school?** *(Tick one box only)*	**None**	**1–3**	**4–8**	**9–15**	**Over 15**
	☐1	☐2	☐3	☐4	☐5

Figure 4-5 Student sick leave question from the School Environment questions for parents

4.1.4.5 *Integration*

In the Avon Longitudinal Study of Parents and Children (ALSPAC) (Gutman and Feinstein 2008) the percentage of parents that attended parent meetings at the school was part of a measure of 'school ethos', the characteristic spirit of the school (not defined in paper). As the target population of the current study was parents of children, parent involvement was investigated on an individual- rather than a school-level. This created a recognisable limitation of the study's ability to ascertain school-wide parent participation. Due to this restriction, other potential areas of involvement were integrated, namely committee involvement and volunteer work.

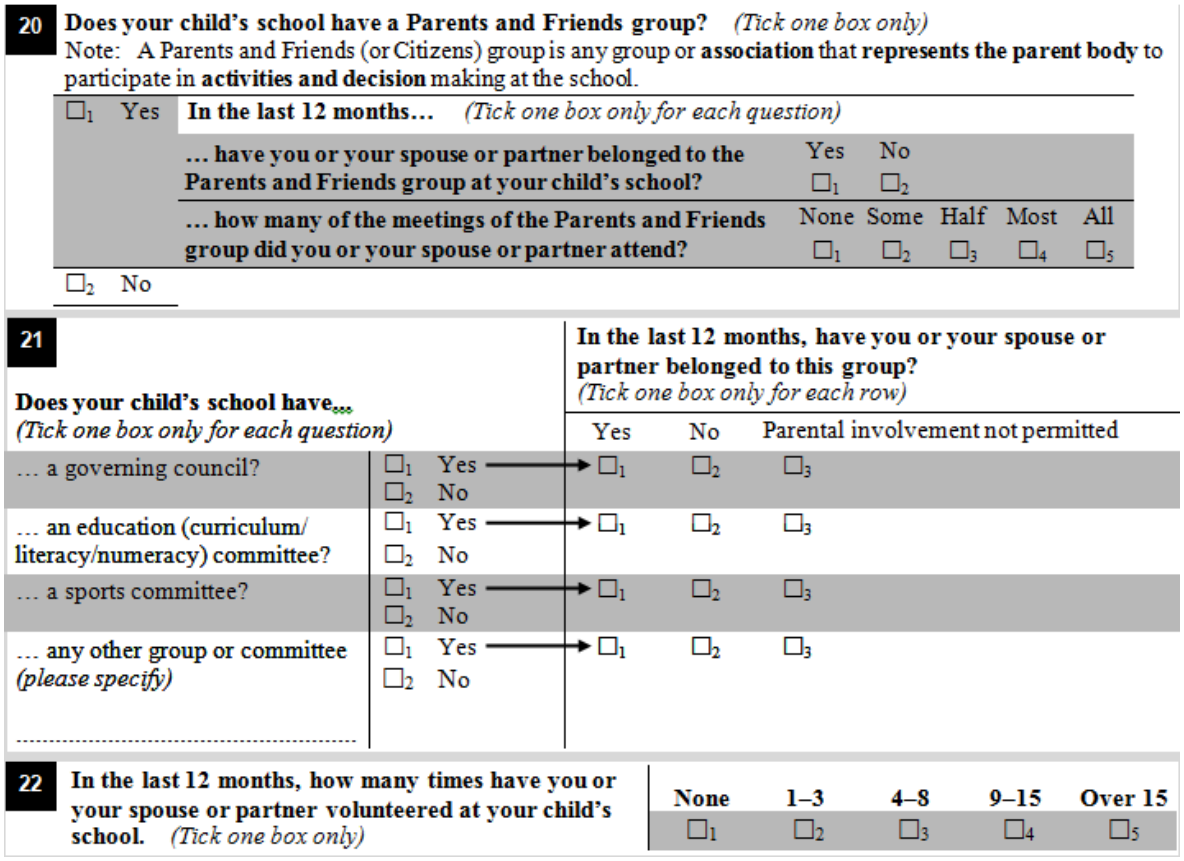


Figure 4-6 Parent involvement in the school questions from the School Environment questions for parents

4.1.4.6 *Safety*

4.1.4.6.1 General safety

Safety was flagged as a 'relevant aspect' of the school environment by the OECD in their first report on the results of the Teaching and Learning International Study (TALIS) (OECD 2009). These two questions (Figure 4-7) were developed from this concept.

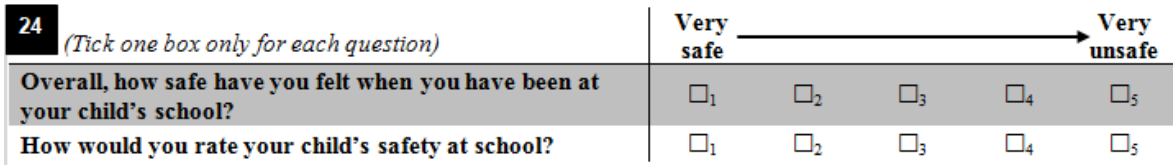


Figure 4-7 Safety questions from the School Environment questions for parents

4.1.4.6.2 Social problems

These questions (Figure 4-8) were based on segments from two major research studies which assessed social problems as an aspect of school social climate. The principal questionnaires from both the TALIS (OECD 2009) and National Longitudinal Survey (NLS) (National Opinion Research Center 1996) included a list of social problems that may be present in school environments. This list was trimmed to cater for the parent respondent group. The response options were taken from the TALIS (OECD 2009) as they were more appropriate for the respondent group than the response option in the NLS of citing the number of incidents in the school. The second question assesses individual experience of a specific social problem, bullying, as a complement to the school-level valuation in the first question.

26 **In the last 12 months, how big a problem do you think the following have been at your child's school?**

(Tick one box only for each row)	No problem	Small problem	Fair problem	Big problem
Bullying of students	☐1	☐2	☐3	☐4
Bullying of teachers	☐1	☐2	☐3	☐4
Cigarette possession or use	☐1	☐2	☐3	☐4
Alcohol possession or use	☐1	☐2	☐3	☐4
Illicit drug possession or use	☐1	☐2	☐3	☐4
Theft	☐1	☐2	☐3	☐4
Vandalism/graffiti	☐1	☐2	☐3	☐4

25 **In the last 12 months, how often has your child been...**

(Tick one box only for each row)	Never	Hardly ever	Once a term	Once a month	Once a week	More than once a week
... teased at school?	☐1	☐2	☐3	☐4	☐5	☐6
... physically hurt at school?	☐1	☐2	☐3	☐4	☐5	☐6
... bullied at school?	☐1	☐2	☐3	☐4	☐5	☐6

Definition: Bullying is repeated, aggressive behaviour that involves a real or perceived power imbalance.
Note: 'At school' means being on school grounds, during school hours and includes time spent engaged in school activities and being dropped off / picked up by parents.

Figure 4-8 Social problems questions from the School Environment questions for parents

4.1.4.7 *Disputes*

This question (Figure 4-9) was adapted from a question in the Avon Longitudinal Study of Parents and Children (ALSPAC) (Gutman and Feinstein 2008) questionnaire developed by the University of Bristol. The number of disputes was part of a measure of 'school ethos', the characteristic spirit of the school. The original question asked about disputes between head-teachers and parents only, while the current question has been expanded to cover a wider scope of disputes in the school environment.

27 **In the last 12 months, how often have you or your spouse or partner had a dispute with...**

(Tick one box only for each row)	Never	Hardly ever	Once a term	Once a month	Once a week	More than once a week
... the principal of your child's school?	☐1	☐2	☐3	☐4	☐5	☐6
... a teacher at your child's school?	☐1	☐2	☐3	☐4	☐5	☐6
... administrative staff at your child's school?	☐1	☐2	☐3	☐4	☐5	☐6
... a parent of a child at your child's school?	☐1	☐2	☐3	☐4	☐5	☐6

Figure 4-9 Disputes question from the School Environment questions for parents

4.1.5 Pre-test

4.1.5.1 *Expert review*

Four teachers were sent a copy of the school environment section of the phase two (P2) questionnaire to represent as experts in the field of schools and their environment. Three respondents were female with one male. The age range of respondents was about eight years, from age 26 to 34 years.

General remarks and responses included that overall there were no major issues. Some queries pertaining to specific questions were raised. One respondent wondered whether parents would know much about the policies and practices in place within the school and that it would be interesting to see the responses. Another respondent thought that a school must always have governing council, although could not be certain, potentially making the question asking whether the school has a governing council irrelevant. The questions pertaining to safety at the school were queried on whether they were aimed

to assess a certain type of safety. As the question was intended to gauge a subjective sense of overall safety it remained unchanged.

There were a number of specific points raised that led to a change in the questionnaire. One question asked about health screening services available in a school. It was recommended that these services be defined. Another part of this same question referred to students with 'disabilities' and it was recommended this be changed to 'learning needs'.

A respondent identified there was no health-related policy covering bullying, which many schools have. They suggested the addition of a bullying or behaviour policy to the list of health-related policies that may be held by the school.

One of the questions asked about parental involvement in various committees. The committee list included an education committee. One respondent indicated that this could also be called a curriculum, literacy or numeracy committee. The question wording was altered to cater for these differences in terminology across schools. A respondent also indicated their uncertainty about the ability of parents to answer this question, but the question was retained for further testing.

One of the questions regarding social problems at school asked the parent if the child had been bullied at school. It was suggested that the concepts of bullying and teasing be separated as they are considered different things in a school environment. Another respondent said that a definition of bullying was required for clarification. The question was altered to assess teasing, physical injury and bullying separately and a definition of bullying was devised and included.

Other issues were raised which did not result in changes to the questionnaire. One respondent indicated that many schools had 'locker policies' relevant to the use of backpacks. This type of policy was not included in the questionnaire list as a review of three locker policies available on the internet revealed that while the purpose of providing a locker may involve consideration of the student's wellbeing, the policy itself is geared at protecting the wellbeing of the locker, not the student (King's Baptist Grammar School 2003, Taroona High School n.d., The Illawarra Grammar School n.d.). As such it was not considered a health-related policy.

A couple of alterations of the question pertaining to school resources were suggested. The addition of a rating of school sporting or extracurricular areas and resources was suggested. The rationale for this was that these are very important to some schools. As the question was focussed on assessing resources relevant to all schools this could not be included. A rating on the leadership of the school was also suggested. This required serious consideration but was ultimately not included in this question because it was not a resource in the same way that buildings, grounds and teachers are resources, in that they can be scarce as well as of lesser quality. There will always be leadership in a school of some sort.

It was queried whether a question on cyber-bullying should be included alongside other bullying-related questions. This also required serious consideration. Computer access by students, however, is often an outside-of-school-hours and -grounds occurrence, thus cyber-bullying is likely to occur outside of the school environment. While there can be no doubt that this outside-of-school experience is both related to and likely to impact on school environment the topic of cyber-bullying is moving into a grey area of the in-school social environment concept. As such it was decided to maintain the focus on bullying that occurs within the school environment proper.

4.1.5.2 *Skirmish*

A skirmish was conducted concurrently to the expert review. The skirmish was performed for the entire second questionnaire. The second questionnaire was sent to staff at the Australian Research Centre for Population Oral Health (ARCPOH) in the University of Adelaide. Six responses were received, four from parents of children of varying ages.

Most comments and resultant changes were made concerning the other sections of the questionnaire. All comments on the school environment section were regarding typographical errors and wording or formatting. No major changes to the schooling questions were made as a result of the skirmish.

4.1.6 Ethics

The final questionnaire on school environment was part of the second questionnaire for the NCOHS (appendix 7.1). The second questionnaire was approved under ethics applications to the state/territory health departments.

The original application to The University of Adelaide did not specify a second questionnaire. A proposal was required explaining the reason for the second questionnaire as well as its aims, methods and expected outcomes along with copies of the questionnaire and accompanying documentation. Approval was granted in August 2013.

Approval to use data from the NCOHS was obtained through ARCPOH as owners of the NCOHS data.

4.2 School characteristics administrative data collection

An administrative data collection was also undertaken using the MySchool website for each participating school (see section 4.2).

The administrative collection of MySchool school characteristics data was performed on a school-by-school basis. The MySchool website provides information on all schools in Australia and is collected annually. Each school was searched by name on the MySchool website (ACARA 2013) and checked against location and available identifying information (e.g. school sector and type). School data was then input into a Microsoft Access database designed specifically for the purpose. The school characteristics data was collected for the 2012 school year, being the first year of data collection for the NCOHS in NSW, SA and the ACT. On the website, the financial information presented with each yearly update is for the previous year (e.g. in the 2012 data, the financial information was for 2011). As such, the financial figures for each school were updated once the 2013 data was released. Data items collected or calculated for use are detailed below.

4.2.1.1.1 School location

School location was listed on the MySchool website as metropolitan, provincial, remote or very remote. For analysis, schools were classified as either metropolitan (metro) or non-metropolitan (non-metro).

4.2.1.1.2 School type

School type was listed on the MySchool website as primary, secondary, combined or special. No special schools were included in the current study. Categorisations were left unaltered for final analysis.

4.2.1.1.3 Index of Community Socio-Educational Advantage

The Index of Community Socio-Education Advantage[14] (ICSEA) was created by the Australian Curriculum, Assessment and Reporting Agency (ACARA). It is an interval scale, designed such that schools fall in a normal distribution with 1000 as the mean. The measure reflects both student- and school-level information, for example parent occupation and education and school location and the proportion of Indigenous students attending the school (ACARA 2013). The ICSEA score was collected and used in analysis as presented on the MySchool website.

4.2.1.1.4 School income

School income was collected and used in analysis as presented on the site. It was presented as the net recurrent income[15] per full time equivalent (FTE) student attending the school.

4.2.1.1.5 School size

School size was recorded as provided on the site, as FTE students attending the school.

4.2.1.1.6 Class size

The number of FTE teachers employed at the school and of FTE students attending the school were collected from the site. Average class size for a school was calculated as the number of FTE teachers divided by the number of FTE students.

4.2.1.1.7 School attendance

A student attendance rate is provided by school for the MySchool website. It is calculated by aggregating the attendance rate across all year levels in the school. It represents "the number of actual student days attended during the period as a percentage of the number of possible student days attended during the period" (ACARA 2013). At the time of collection, there was no standard of definition or method of collection across states and territories. School attendance was collected as presented on the MySchool website.

4.2.1.1.8 Teacher workload

The MySchool website provided information on the number of teachers employed by the schools as well as the number of FTE teaching positions at the school. Teacher workload was calculated as the number of FTE positions divided by the number of actual teachers employed.

4.2.1.1.9 Percent non-English speaking background

The MySchool website presented the percentage of students at a school that came from a non-English speaking background. This was recorded as presented.

4.2.1.1.10 Percent Indigenous at school

The MySchool website presented the percentage of students at a school that came from an Indigenous background. This was recorded as presented.

[14] The Index of Community Socio-Educational Advantage (ICSEA) was created by the Australian Curriculum, Assessment and Reporting Authority (ACARA) specifically to enable meaningful comparisons of National Assessment Program – literacy and numeracy (NAPLAN) test achievement by students in schools across Australia. Key factors in students' family backgrounds (parents' occupation, school education and non-school education) have an influence on students' educational outcomes at school. In addition to these student-level factors, research has shown that school-level factors (a school's geographical location and the proportion of Indigenous students a school caters for) need to be considered when summarising educational advantage or disadvantage at the school level. ICSEA provides a scale that numerically represents the relative magnitude of this influence, and is constructed taking into account both the student- and the school-level factors. (ACARA 2013)

[15] "The amount of income received by a school from the Australian Government and state and territory governments from fees, charges, parent contributions and other private sources available for recurrent purposes." (ACARA 2013)

4.2.1.1.11 School academic performance

Academic performance of a school was deduced from National Assessment Program-Literacy and Numeracy (NAPLAN) information. NAPLAN scores are presented in numbers as the average score for each domain[16] for each eligible year level in a school. Also provided is an indicator of how the school's score compares to other schools in the country ranging on a five-point scale from substantially above to substantially below[17]. It is this comparison indicator that was used to create the variable used in analysis.

Each domain in each year level was given a score from one (substantially below) to five (substantially above). The scores for each domain were summed then divided by the number of participating year levels. The result was an interval variable ranging from five to 25, with low scores indicating a poor performance, and high scores a better performance when compared with other schools in Australia.

4.3 Data methods

This subsection describes the methods adopted for the handling of data. It details the data items collected and data analysis. Where necessary, information is provided separately for various data sources: phase one (P1) initial parent questionnaire data, phase two (P2) second questionnaire data and MySchool school characteristics administrative data. Additional information regarding data management is included in appendix 7.2.1.

4.3.1 Data items

All data items pertaining to schools come from the P2 questionnaire and the school characteristics administrative collection from the MySchool website. Child sociodemographic information was collected as part of the NCOHS P1 questionnaire. Outcome measures were collected as part of the P1 questionnaire and the dental examination of the child. Independent measures are detailed in section 4.3.2.1. The utilisation of outcome measures is discussed below. A full list of variables collected and the source of the data is presented in Table 4-2.

[16] "Test domains are the five learning areas tested in NAPLAN: reading; writing; spelling; grammar and punctuation; and numeracy." (ACARA 2013)

[17] "This comparison is measured using standard deviation. Standard deviation is defined as the average amount by which scores in a test differ from the overall average score; that is, how 'spread out' the results are from the average result.
If the selected school's mean is above/below the comparison school's mean by more than half (>0.5) of one standard deviation, the difference is deemed to be substantial for the purposes of the MySchool website. The terms above and below represent a difference of between one fifth and one half (between 0.2 and 0.5) of a standard deviation in magnitude."(ACARA 2013)

Table 4-2 Data collected

Var. type	Independent			Outcome	
Variable group	Socio-demographic data	Parent perceptions of child's school	School characteristics	Parent-reported child health outcomes	Oral health outcomes
Data source	P1 questionnaire	P2 questionnaire	MySchool website	P1 questionnaire	Clinical examination
Variables	– Child's age, sex, Indigenous status, residential location, health care card status, dental insurance status – Parent's country of birth, Indigenous status, level of education, employment status – Household income	– Provision of health/ support services – Health policies – Parent involvement in health decisions/ general decisions – Community involvement in the school – Quality of buildings and grounds/ teachers – Student morale – Parent involvement in parent and friends group/ volunteering – Number of child sick days – General safety – Experience of teasing/ physical hurt/ bullying – Social problems – Disputes	– School location, school type – Index of Community Socio-Educational Advantage – School income, size attendance rate, academic performance – Class size – Teacher workload – Percent of school population from NESB/ Indigenous background	– Parent-rated child oral health – Parent-rated child health	– Presence of deciduous and permanent caries – Deciduous and permanent decayed, missing and filled surfaces – Deciduous and permanent untreated decayed surfaces

4.3.1.1 *Outcome measures*

Details of the outcome measures assessed are shown in Table 4-3. Of the examination data, measures of decayed, missing and filled surfaces[18] and untreated decayed surfaces were analysed as continuous variables. Presence of caries was a measure of the percentage of children with at least one decayed, missing or filled surface. These measures were calculated for both deciduous and permanent dentition, and were assessed within subsets of the population where the type of dentition is most commonly present. The deciduous subset includes children aged 5–10 years. The permanent subset includes children aged 9–14 years.

Table 4-3 Outcome measures

			Measured in		
Outcome measure	Label	Type	Full sample	Deciduous subset	Permanent subset
Parent-rated child health	*PRH*	Dichotomised	✓	✓	✓
Parent-rated child oral health	*PROH*	Dichotomised	✓	✓	✓
Presence of deciduous caries	*poc*	Dichotomised		✓	
Deciduous decayed, missing, filled surfaces	*dmfs*	Continuous		✓	
Deciduous untreated decayed surfaces	*ud*	Continuous		✓	
Presence of permanent caries	*POC*	Dichotomised			✓
Permanent decayed, missing, filled surfaces	*DMFS*	Continuous			✓
Permanent untreated decayed surfaces	*UD*	Continuous			✓

The questionnaire outcome items of parent rated child health and parent-rated child oral health were collected using modified forms of widely-used self-reported health measures (Harford and Islam 2013, Herman et al. 2014). Parents were asked “How would you rate your child’s health?” and “How would you rate your child’s oral health?” with response options “excellent”, “very good”, “good”, “fair” or “poor”. Responses were dichotomised as per (Herman et al. 2015) as optimal (excellent/very good) or suboptimal (good/fair/poor). These measures were asked of parents of children of all ages and are assessed in the full sample. They are also assessed within the subset populations in recognition of differences there may be between parent-perceived oral health experiences in children with deciduous versus permanent dentition.

4.3.2 Data analysis

Data analyses were conducted using Statistical Analysis Software (SAS) Enterprise Guide 4.2 and SAS 9.3 for Windows. The data analysis process involved a preparation/data cleaning process (see appendix 7.2.2.1), response analysis (see appendix 7.2.2.2), preliminary analysis and final analysis.

4.3.2.1 *Preliminary analysis*

Preliminary analysis involved assessing independent variables descriptively and reducing the number of explanatory and confounding variables. The particular approaches adopted for various data are expounded below.

[18] Decayed, missing and filled surfaces was calculated as per Cappelli and Mobley (2007). See appendix 7.3 for summary.

4.3.2.1.1 Phase one questionnaire

Most sociodemographic data items were used as collected in the P1 questionnaire. The two exceptions were residential location and household income. Residential location was dichotomised as metropolitan (metro) or non-metropolitan (non-metro) based on the postcode of the residential address for the child as provided by the parent. The categorisation was designated according to Australian Statistical Geography Standard (ASGC) (ABS 2013). In the ABS ASGC, some postcodes were split across location groups. When a postcode could be classified both 'metro' and 'non-metro', the residence was categorised as 'metro'.

Household income was re-categorised for analysis to three categories on a conceptual basis. Household income was collected in $20,000 categories up to 'over $180,000'. The Department of Human Services (2014) defines a household with income less than $60,000 and either a couple or single and a dependent child as a low income household when assessing eligibility for a low income supplement and family supplement. This threshold was used to define the low household income group. The high household income group was the approximate highest quartile.

There was likely to be a high level of relationship between some sociodemographic measures. Consequently collinearity was assessed with the view to drop any variables that could be reasonably represented by another variable. A frequency analysis was used to identify any variable categories with very small frequencies. Tetrachoric/polychoric correlations were performed to assess relationships between variables. As there are no standard effect-size conventions for tetrachoric correlations (Faul et al. 2009), guidelines set out by Cohen (1988) were adopted (Table 4-4).

Table 4-4 Effect size for tetrachoric correlations

Small	Medium	Large
0.1	0.3	0.5

4.3.2.1.2 Phase two questionnaire

The P2 questionnaire data came from questions designed to measure different aspects of the same concept, namely the school environment. As such there was likelihood of association and the presence of underlying constructs. Data reduction for this data was aimed to reduce the large number of variables in the dataset to a smaller number while retaining most of the original data.

The P2 questionnaire data was analysed at both the individual and school level. The process was much the same for both individual- and school-level data but some preparatory processes differed.

For child-level data, parent responses were dichotomised for preliminary analysis (see section 5.2.2.1). A frequency analysis was conducted to identify variable categories with very small frequencies.

For school-level data, schools were included in the creation of school-level variables if at least 10 children from the school participated in the P2 questionnaire. Responses from parents of children within a school were amalgamated to create a school score on each item. The resultant variables were continuous in nature. A distribution analysis was performed to explore the created variables.

Data reduction was performed through the application of a principal components analysis (PCA). For child-level items the PCA was performed using a tetrachoric correlation matrix using code adapted from

UCLA: Statistical Consulting Group (2015) and East Carolina University: Department of Psychology (2014). For school-level items a Spearman correlation matrix was used.

The number of components retained was guided initially by the number of eigenvalues greater than one and by reviewing the shape of the scree plot for sharp breaks. A varimax rotation was applied to the initial factor pattern. Other elements were considered when determining the factor pattern to retain. In determining the optimal simple component structure a loading was considered large if its absolute value exceeded 0.40. A lower level of 0.32 was deemed adequate (Tabachnick and Fidell 2001) depending on the outcomes for other elements being considered. The creation of a factor required a minimum loading of four variables. Cross-loading and non-loading items were removed. The final assessment was whether the variables loading on each component were theoretically measuring the same concept. Factor scores were calculated using the SAS SCORE procedure.

Those items that were removed due to cross- or non-loading were retained as standalone variables. All variables were divided into quartiles for final analysis, with the exception of stand-alone items at the child-level which were categorical in nature. These were recategorised to three-level variables (see section 5.2.2.2). Quartiles were created using a ranking procedure in SAS.

4.3.2.1.3 School characteristics collection

The preliminary analysis of school characteristics data items adhered to the same philosophy as the P2 questionnaire items. As variables measured different aspects of school operation, the likelihood of underlying constructs was present and data reduction was applied to reduce the number of variables to a smaller number while retaining most of the original data.

A distribution analysis was used to explore the variables. Spearman correlations were used to assess relationships. A PCA was conducted using the Spearman correlation matrix following the same guidelines detailed above (section 4.3.2.1.2). The resultant factor variable and other variables were divided into quartiles for final analysis, with the exception of teacher workload. This was conceptually categorised into three levels, with 'high' teacher workload indicating schools where the average teacher worked more than one FTE teaching role, and 'low' teacher workload where the average teacher worked less than 0.9 of a FTE teaching role. Quartiles were created using a ranking procedure in SAS.

4.3.2.2 *Final analysis*

The final analysis involved three stages: univariable analysis, bivariable analysis and multivariable analysis. All analysis was performed on unweighted data.

First, an assessment of univariable distributions of independent and outcome variables was performed. Statistical testing was then conducted of bivariable associations of the outcome measures by the independent variables. To constitute the multivariable analysis, adjusted statistical models were produced to assess the effects of school variables when controlling for other independent variables (Table 4-5). The data were structured hierarchically consisting of the individual level and the school level, as per the conceptual model (see section 3.3). Independent variables were grouped together depending on data level and source, resulting in two individual-level and two school-level data groups. The modelling process involved the systematic incorporation of variable-groups into multivariable regression models to reach final fully adjusted multilevel models. The use of multilevel analytical methods ensured that potential correlation of individual-level data within schools was accounted for when considering school-level associations (Merlo et al. 2012). The child- and school-level parent

perceptions of the child's school variables were not incorporated in the same model as they were based on the same collected data. As such, there were two final fully adjusted models (models 7 and 8). The process was performed for each outcome measure (see section 4.3.1.1) resulting in 12 modelling processes.

Table 4-5 Modelling process for adjusted regression models

	Model number								
	0	1	2	3	4	5	6	7	8
Age and sex	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sociodemographic		✓		✓				✓	✓
Parent perceptions of school-child-level			✓	✓				✓	
School characteristics					✓		✓	✓	✓
Parent perceptions of school-school-level						✓	✓		✓

Model 0 = Reference model
Models 1–3 = Child-level models
Models 4–6 = School-level models
Models 7 & 8 = Multilevel models

For dichotomised outcome measures (*PRH*, *PROH*, *poc*, *POC*) PROC GLIMMIX was used to fit generalised logistic mixed models and produce odds ratios (OR) with 95% confidence intervals (CI) for contributing independent variables, corrected using Tukey's adjustment for multiple comparisons. Also produced were median odds ratios (MOR) with CI to assess school-level variance and determine the best model.

For the outcome measures continuous in nature (*dmfs*, *ud*, *DMFS*, *UD*) PROC MIXED was used to fit linear mixed models and produce beta coefficients (β) with 95% CI for contributing independent variables. Other statistics produced were school-level variance (SLV), Intraclass Correlation (ICC) and Akaike's Information Criterion (AIC) to demonstrate the amount of variance at the school level, the percentage of total variance that the school-level variance accounts for and model fit respectively.

The multilevel analyses performed enabled assessment of associations between independent and outcome measures as well as assessment of clustering at a second level (school-level). Within the models, three specific types of effect were important in analysis: specific individual effects, specific contextual effects and general contextual effects. As per (Merlo et al. 2012), specific individual effects refer to associations between individual-level independent variables and child outcome measures, specific general effects refer to associations between school-level independent variables and child outcome measures, and general contextual effects refer to the degree to which the school context affects individual variance in the child outcome measures.

4.3.2.2.1 Post-hoc analyses

The outcome measure of parent-rated child health has been included due to its possible relationship with parent-rated oral health (see section 3.2.2.1.1). A post-hoc analysis of association between *PRH* and *PROH* was performed using a Chi-squared test.

A post-hoc assessment was performed to assess multicollinearity among independent variables in the adjusted models. Variance Inflation Factors (VIF) were produced for both fully adjusted models for parent-rated health (*PRH*) in the total sample.

5 Results

5.1 Response and representativeness

5.1.1 Schools

The total number of schools that participated in the NCOHS in New South Wales (NSW), South Australia (SA) and the Australian Capital Territory (ACT) was 296. The final number used in the current study was 275. This discrepancy was due to the use of a shortened version of the questionnaire for some respondents. A number of schools in NSW and SA consisted of students whose parents had low literacy levels. In such cases the full phase one (P1) questionnaire was too complex and a short simplified version of the questionnaire was used. These records were then not eligible for the phase two (P2) questionnaire. For some of these schools the short P1 questionnaire was used for only a portion of the sample, but for others it was used for the entire sample, which excluded the school from the current study.

The final number of schools in NSW was 154, with 88 schools participating in SA and 33 in ACT. Table 5-1 shows the breakdown of school sample percentages by sector and type for NSW, SA and ACT from the NCOHS. It also provides the percentages from the Australian Bureau of Statistics (ABS) school statistics in 2012 by state/territory, type and sector, excluding special schools, as a comparison (ABS 2013). It is important to note that the selection of the school sample was based on enrolment size, and did not account for the quantity of various types of schools. Very remote schools are also included in the ABS figures. As such, the proportion of school types and sectors in the NCOHS school sample were not expected to precisely mirror that of the ABS figures.

Table 5-1 NCOHS school sample and ABS school population data by type and sector in NSW, SA and ACT

			NCOHS	ABS			NCOHS	ABS
	Type	n	%	%	Sector	n	%	%
NSW	Primary	77	49.0	72.1	Public	116	73.9	70.2
	Secondary	47	29.9	17.6	Catholic	19	12.1	19.7
	Combined	30	19.1	10.3	Independent	22	14.0	10.0
SA	Primary	33	37.5	68.0	Public	55	62.5	73.7
	Secondary	23	26.1	11.9	Catholic	19	21.6	13.9
	Combined	32	36.4	20.0	Independent	14	15.9	12.5
ACT	Primary	19	57.6	63.4	Public	25	75.8	65.0
	Secondary	6	18.2	18.7	Catholic	5	15.2	24.4
	Combined	8	24.2	17.9	Independent	3	9.1	10.6
All	Primary	129	46.4	71.0	Public	196	70.5	70.7
	Secondary	76	27.3	16.5	Catholic	43	15.5	18.7
	Combined	70	25.2	12.5	Independent	39	14.0	10.5
Total n		275	100.0			275	100.0	

Despite some variation between NCOHS and ABS figures across sectors within states/territories, the overall percentages in a combined form are similar. The percentage of independent schools is higher in the NCOHS sample compared to the ABS figures. This may be due to a higher proportion of independent

schools being combined, meaning a likely higher enrolment population and increased chance of selection.

The main differences between the NCOHS sample and ABS figures are the higher percentage of combined schools in NSW, SA and ACT, and the lower percentage of primary schools, which translates into a higher percentage of secondary schools in NSW and SA. This is consistent with sampling methodology, which required approximately equal numbers of primary and secondary schools to ensure the same number of children at each age level.

Table 5-1 demonstrates that an equal sample of primary and secondary schools was not attained. The numbers were closest to the desired outcome in SA, with secondary schools accounting for 41.1% of the non-combined school sample (Table 5-2). The lowest percentage of secondary schools was in the ACT (24.0%). This was in part due to generally lower participation among secondary than primary schools, and in part due to the availability of secondary schools. Availability was particularly an issue in ACT where there was a small number of secondary schools overall. In NSW and SA availability was an issue in a very small number of cases and only in terms of selecting secondary schools appropriate for inclusion based on Index of Community Socio-Educational Advantage (ICSEA) score.

Table 5-2 NCOHS school sample by type in NSW, SA and ACT

	Type[(a)]	n	%
NSW	Primary	77	62.1
	Secondary	47	37.9
SA	Primary	33	58.9
	Secondary	23	41.1
ACT	Primary	19	76.0
	Secondary	6	24.0
All	Primary	129	62.9
	Secondary	76	37.1

[(a)] excludes combined schools

5.1.2 Children

5.1.2.1 *Phase one*

The total number of P1 questionnaires completed in NSW, SA and ACT was 10,604 (Table 5-3). Only 633 respondents did not have an examination (6.0%). The highest percentage of respondents without an examination was in NSW (8.7%) with the lowest in SA (2.9%). For a very small percentage of records (0.4%) an examination was performed but a completed questionnaire was not received.

Table 5-3 Number of children that participated in phase one of the NCOHS in NSW, SA and ACT

	NSW		SA		ACT		Total	
	#	%	#	%	#	%	#	%
P1 questionnaire only	457	8.7	89	2.9	87	3.8	633	6.0
P1 questionnaire and exam	4,714	90.4	2,999	97.0	2,215	96.2	9,928	93.6
Total P1 questionnaires	5,171	99.2	3,088	99.9	2,302	100.0	10,561	99.6
P1 exam only	41	0.8	1	0.1	1	0.0	43	0.4
Total P1	5,212	100.0	3,089	100.0	2,303	100.0	10,604	100.0

Of the total number, some respondents were not eligible for inclusion in the P2 questionnaire. The reasons for ineligibility are provided in Table 5-4. Overall, approximately one in 10 participants (9.9%) was ineligible to participate. The majority of ineligible participants were in the SA sample, in which a quarter could not be included in the P2 questionnaire (24.9% of the SA sample).

Table 5-4 Number of children ineligible to participate in NCOHS phase two questionnaire in NSW, SA and ACT

	NSW		SA		ACT		Total	
	#	%	#	%	#	%	#	%
Child outside age range	80	1.5	58	1.9	19	0.8	157	1.5
Parent completed a short version of P1 questionnaire	114	2.1	502	16.2	-	-	616	5.8
Parent indicated they did not wish to be re-contacted as part of the study	17	0.3	231	7.5	-	-	248	2.3
Parent did not sign the consent form for the P1 questionnaire	18	0.3	2	0.1	-	-	20	0.2
Parent completed the P1 questionnaire in a foreign language	-	-	2	0.1	-	-	2	0.0
Child sampled twice (at different schools)	2	0.0	-	-	-	-	2	0.0
P1 exam only (no questionnaire)	41	0.8	1	0.1	1	0.0	43	0.4
Total not eligible	265	5.0	769	24.9	20	0.9	1,054	9.9
Total eligible	4,947	95.0	2,320	75.1	2,283	99.1	9,550	90.1
Total P1	5,212	100.0	3,089	100.0	2,303	100.0	10,604	100.0

There were two contributing factors to the higher proportion of ineligible participants in SA. One was the relatively high distribution of the short questionnaire within the state (16.2%). The second was due to an ethical requirement by the state government ethics committee to include an 'opt out' tick box on the consent form. This allowed respondents to indicate that they did not wish to be contacted for further involvement in the research. There was no such requirement in NSW or the ACT and it resulted in a much higher likelihood of parental self-exclusion in SA (7.5% compared to 0.3% in NSW and no cases in ACT).

Table 5-5 shows a comparison of the NCOHS sample population with Australian Bureau of Statistics (ABS) population figures (ABS 2013), across groups dichotomised by age group, sex and residential region. As the sample is random, dichotomising the NCOHS sample by age group and sex should approximate the ABS population percentages. As the sampling methodology did not account for residential location, a dichotomy by region was not expected to result in similar NCOHS sample and ABS population percentages.

Table 5-5 NCOHS sample and ABS population data percentages by age group, sex and residential region

%			Total P1	Total eligible	ABS population
NSW	Age grp	5–9 years	49.9[(b)]	49.9	49.7
	Sex	Male	48.2	48.3	51.4
	Region	Metro[(a)]	55.6	56.8	62.3
SA	Age grp	5–9 years	53.6[(b)]	53.0	48.8
	Sex	Male	50.2	51.7	51.3
	Region	Metro[(a)]	57.6	60.1	75.1
ACT	Age grp	5–9 years	60.1[(b)]	60.1	50.4
	Sex	Male	49.9	49.9	51.3
	Region	Metro[(a)]	98.7	98.7	100.0
Total	Age grp	5–9 years	53.2[(b)]	53.1	49.6
	Sex	Male	49.2	49.5	51.4
	Region	Metro[(a)]	65.6	67.6	66.0
n			10,559	9,550	

[(a)] Metro - metropolitan
[(b)] omits children outside of age range, n = 10,402

The largest differences between the respondents to the P1 questionnaire and those eligible for the P2 questionnaire were between population groups by region in SA (2.5 percentage points), sex in SA (1.5 percentage points) and region in NSW (1.1 percentage points). These differences are all small and demonstrate a relatively unbiased loss of participation within the sample due to ineligibility.

Comparing the eligible group percentages to the ABS figures, the largest differences were groups by region in SA (15.0 percentage points), by age group in ACT (9.7 percentage points) and by region in NSW (5.5 percentage points).

As stated, there was no prior expectation for the percentages of the NCOHS sample by region to match those of the ABS population. Despite this not being an aim of the sampling methodology, the outcome is positive in terms of data representativeness. As the majority of the child population aged five to 14 reside in metropolitan areas (62.3% in NSW and 75.1% in SA), sampling the same proportion of both metropolitan and non-metropolitan residing children can negatively affect the representativeness of data for the non-metropolitan sample due to smaller numbers. A higher sample number of the smaller, non-metropolitan group reduces the margin of error and increases reliability of the data for this group.

The higher percentage of children aged five to nine years compared to children aged 10–14 years in the ACT population may represent the impact of the shortfall in secondary school involvement which was present in all three states/territories. In NSW and SA, however, the figures suggest that the shortfall may have been adequately offset by an increased rate of child selection within secondary schools. There was no adjustment to the rate of child sampling per school in the ACT, which may explain the higher percentage of five to nine year-old children in the NCOHS ACT sample. Once the data for NSW, SA and ACT has been combined the difference in percentage by age was almost entirely ameliorated (53.1% compared to 49.6%).

Figure 5-1 shows the percentage of children of each age level in more detail. For most ages the percentage was around 10%. The percentage of children aged 14 years was much lower than other age groups particularly in SA (4.7%) and the ACT (3.9%). In the ACT sample, children aged 12 (7.3%) and 13 (6.2%) years also had a noticeably lower percentage, and higher percentages for the younger ages, particularly ages six (13.1%) and seven years (13.4%). There was a high percentage of 12 year-old children in NSW (15.1%). In the combined data, the percentage of children aged 14 years remained low (5.8%).

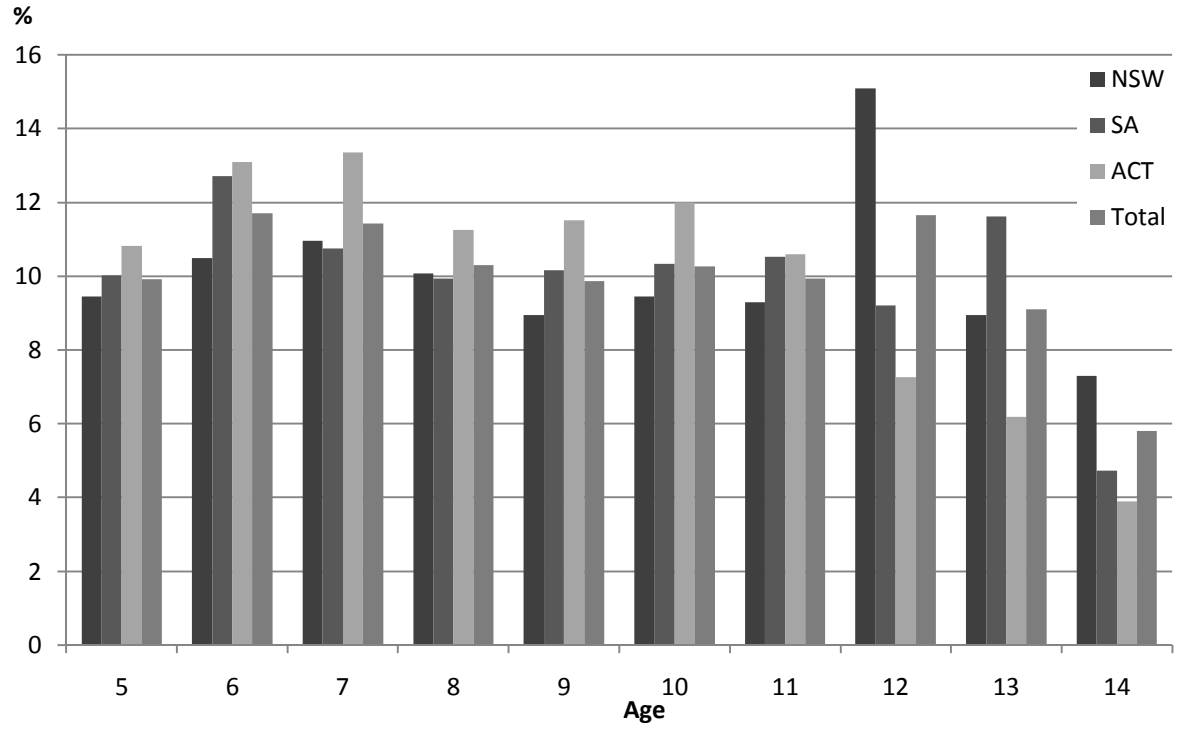


Figure 5-1 Age distribution of NCOHS child sample

5.1.2.2 *Phase two*

The total number of children eligible to participate in the P2 questionnaire was 9,550. The five possible outcomes for a record included in the study were 'received', 'refused', 'uncontactable', 'blocked' or 'non-response' (see appendix 7.2.2.2). It was most common for some form of response to be received, meaning an outcome of either 'received' (59.7%) or 'refused' (9.4%). An outcome of uncontactable was uncommon (0.5%). A very small number of records were coded as 'blocked' (less than 0.1%). The reasons a record was 'blocked' were:

- Injury or sickness of child or parent
- Child no longer with same carer / in same household
- An irate call or other offensive communication from parent
- Same child selected twice for study (from different schools)
- Language difficulty
- Parent completed and returned questionnaire but it was lost in the post

All other records (30.3%) received a final outcome of 'non-response'.

The highest rate of participation in the NCOHS P2 questionnaire was seen in SA (69.5%) (Table 5-6). Refusal was lowest in the ACT (6.0%) and almost equal in NSW (10.4%) and SA (10.7%). Overall, SA respondents responded in some form most frequently, with one in five P1 participants responding to the P2 questionnaire mail out (80.2%). The ACT was the most cooperative state, with nine completed questionnaires for every refusal (90.7%).

Table 5-6 Response, refusal, contact and cooperation rates for NCOHS phase two questionnaire in NSW, SA and ACT

	Response (%)	Refusal (%)	Contact (%)	Cooperation (%)
NSW	56.3	10.4	66.7	84.4
SA	69.5	10.7	80.2	86.7
ACT	58.7	6.0	64.7	90.7
Total	60.1	9.4	69.5	86.5

Response = Received / Total - (Uncontactable + Blocked)
Refusal = Refusal / Total - (Uncontactable + Blocked)
Contact = Received + Refused + Blocked / Total - Uncontactable
Cooperation = Received / Received + Refused

In SA it was an ethical requirement to include a further consent form with the P2 questionnaire. A small number of parents (17) did not sign the consent form. Through follow-up, this was reduced to only two records which are excluded from the final number as they cannot be used in analysis. This resulted in a total of 5,704 records to be included in the current study (Table 5-7). A small percentage of records did not include examination data (5.0%), most of which (212 out of 286) were in NSW.

Table 5-7 Number of children that participated in NCOHS phase two questionnaire in NSW, SA and ACT

	NSW		SA		ACT		Total	
	#	%	#	%	#	%	#	%
Questionnaires only[(a)]	212	7.7	34	2.1	40	3.0	286	5.0
Complete[(b)]	2,549	92.3	1,571	97.9	1,298	97.0	5,418	95.0
Total P2	2,761	100.0	1,605	100.0	1,338	100.0	5,704	100.0

[(a)] P1 and P2 questionnaires, no exam
[(b)] P1 and P2 questionnaires and exam

Compared to the population percentages in the eligible group, the percentages for the final study groups only differed minimally (Table 5-8). The biggest changes were among population groups by sex in the ACT and in NSW. As such, there was a relatively unbiased loss of participation between the eligible stage and completion of the NCOHS.

Table 5-8 NCOHS sample percentages by age group, sex and residential region

%			Total eligible	Total P2	Complete
NSW	Age grp	5–9 years	49.9	49.4	49.8
	Sex	Male	48.3	48.9	49.2
	Region	Metro[(a)]	56.8	56.1	56.4
SA	Age grp	5–9 years	53.0	53.3	53.6
	Sex	Male	51.7	51.6	51.7
	Region	Metro[(a)]	60.1	60.6	60.8
ACT	Age grp	5–9 years	60.1	59.9	59.9
	Sex	Male	49.9	51.4	51.1
	Region	Metro[(a)]	98.7	98.7	98.7
Total	Age grp	5–9 years	53.1	52.9	53.3
	Sex	Male	49.5	50.3	50.4
	Region	Metro[(a)]	67.6	67.3	67.8
n			9,550	5,704	5,418

[(a)] Metro = metropolitan

The response rate for the P1 questionnaire and examination was not available at time of writing to enable a full response assessment. In light of this, Table 5-9 presents various demographic and socioeconomic sample data with corresponding confidence intervals in comparison to Australian Bureau of Statistics (ABS) Census data (obtained from the ABS online Table Builder tool and customised tables from the ABS Information Consultancy Service).

As expected from the population figures, a majority of the sample was of non-Indigenous children, of children with non-Indigenous parents, children with employed parents and children of parents born in Australia. Likewise, a majority of children lived in two-parent households. The same was not true for highest level of parent education and household income. The population percentages were close to reversed for children of parents with and without tertiary education, and for children from households with up to and over $60,000 income.

Amongst the states, SA had the poorest representation of low socioeconomic groups (appendix 7.5). As well as having the most disparate percentage of children of parents without tertiary education and children from households with up to $60,000 income when compared with ABS data, SA also demonstrated inadequate representation of children of unemployed parents and children from one-parent households. This is likely in part due to the higher use of the short version of the P1 questionnaire, excluding a greater proportion of the sample population from involvement in the P2 questionnaire than either NSW or the ACT. The excluded children were highly likely to be of the lowest socioeconomic standing in the sample. A similar effect is evident in NSW but to a smaller degree.

Based on the sampling methodology and resultant sample numbers in conjunction with comparisons between NCOHS and ABS data, the overall representativeness of the data according to age and sex divisions appeared good. The only potential issue was for 14-year-old children, who were less well represented than the younger ages, particularly in the SA and ACT samples. Socioeconomic bias was, however, evident according to measures of household income and parent education. The NCOHS sample better represented children from higher socioeconomic families and households. Literature suggests that children from lower socioeconomic backgrounds have a higher potential for negative

experiences in terms of both oral health outcomes and school involvement and outcomes. As such, these aspects were liable to be under-indicated in the current study. This must be considered when assessing the data.

Table 5-9 ABS population data comparison of demographic characteristics - NSW, SA and ACT combined, Total P2

	Survey estimate		2011 Census
	% of children	(95% CI)	% of children
	Child's demographic characteristics		
Child Indigenous identity			
Non-Indigenous	97.8	(97.3–98.3)	95.3
Indigenous	2.2	(1.7–2.7)	4.7
	Parent/guardian characteristics		
Parent country of birth[(a)]			
Australia	70.0	(67.4–72.5)	62.7
Other	30.0	(27.5–32.6)	37.3
Parent Indigenous identity[(b)]			
Non-Indigenous	98.2	(97.7–98.6)	96.2
Indigenous	1.8	(1.4–2.3)	3.8
Parent highest level of education[(c)]			
Tertiary education	61.0	(58.0–64.0)	32.9
No tertiary education	39.0	(36.0–42.0)	67.1
Parent labour force status[(d)]			
Employed	94.8	(93.9–95.7)	84.5
Unemployed	5.2	(4.3–6.1)	15.5
	Household demographic characteristics		
Type of household			
One parent	12.6	(11.5–13.8)	21.3
Two parent	87.4	(86.2–88.5)	78.7
Household income			
Up to $60,000	20.7	(18.5–22.9)	70.4
Over $60,000	79.3	(77.1–81.5)	29.6

[(a)] Children were classified to the overseas born category if they had at least one parent who was born overseas
[(b)] Children were classified to the Indigenous category if they had at least one parent who was Indigenous
[(c)] Children were classified to the tertiary education category if they had at least one parent with a tertiary education
[(d)] Children were classified to the employed category if they had at least one parent who was employed

5.2 Preliminary analysis and data reduction

This section details the preliminary analysis process applied to all explanatory data items ahead of final analysis. Each data source is treated separately, starting with sociodemographic information from the phase one (P1) initial parent questionnaire. Next follows data from the phase two (P2) second questionnaire, with the first subsection looking at analysis at the child-level and the second at analysis at the school-level. Subsequently the preliminary analysis of the MySchool school characteristics administrative data is detailed. Finally, a summary of all independent variables derived through the process is presented.

5.2.1 Phase one questionnaire

This section presents results of the preliminary data analysis on sociodemographic data collected in the P1 questionnaire. A descriptive analysis and assessment of collinearity are presented. Age, sex and

residential location were not included in the preliminary analysis/data reduction as they are to be retained for final analysis. Descriptive information is therefore included as part of the final analysis (section 5.3.1).

5.2.1.1 *Descriptive analysis*

The coding for most variables resulted in reasonably sized frequencies (Table 5-10). Two variables however had very small frequencies in one of the categories; children with Indigenous status (n = 123, 2.2%) and children of parents with Indigenous status (n = 103, 1.8%). These variables were dropped from the dataset ahead of further analysis.

Table 5-10 Parent responses to sociodemographic questions

Label	Variable	Categories	n	%[(a)]	CI
HCC	Health care card status	Has health care card	1119	20.3	18.8–21.8
		No health care card	4384	79.7	78.2–81.2
		M	*201*	-	-
DentIns	Dental insurance status	Dental insurance	2886	53.8	51.0–56.5
		No dental insurance	2479	46.2	43.5–49.0
		M	*339*	-	-
ChIndig	Child Indigenous status	Non-Indigenous	5496	97.8	97.3–98.3
		Indigenous	123	2.2	1.7–2.7
		M	*85*	-	-
PCOB	Parent country of birth	Australia	3898	70.0	67.5–72.5
		Other	1673	30.0	27.5–32.5
		M	*133*	-	-
PIndig	Parent Indigenous status	Non-Indigenous	5492	98.2	97.7–98.6
		Indigenous	103	1.8	1.4–2.3
		M	*109*	-	-
PEduc	Parent highest level of education	School	742	13.2	11.7–14.8
		Vocational training	899	16.0	14.5–17.5
		Tertiary education	3973	70.8	68.2–73.4
		M	*90*	-	-
PEmpl	Parent employment status	Both at least part-time employed	5131	92.4	91.3–93.4
		Either parent unemployed	425	7.6	6.6–8.7
		M	*148*	-	-
HHI	Household income	Low	1130	20.7	18.5–22.9
		Medium	2854	52.3	50.0–54.6
		High	1472	27.0	23.7–30.2
		M	*248*	-	-
	Total n		5704		

M = missing data

[(a)] frequency calculation does not include records with missing data

5.2.1.2 *Assessment of collinearity*

Table 5-11 shows the tetrachoric/polychoric correlation matrix for sociodemographic variables. Household income (*HHI*) was highly correlated with parent employment status (r* = -0.77) and dental insurance status (r* = 0.52). Dental insurance status and parent employment status were also highly correlated (r* = 0.54). Numerous moderate correlations were evident with all others being small or negligible.

Table 5-11 Tetrachoric/polychoric correlation matrix for sociodemographic variables

r*	*DentIns*	*PCOB*	*PEduc*	*PEmpl*	*HHI*
HCC	-0.21	-0.17	0.17	-0.43	0.45
DentIns	-	0.05	-0.34	0.54	-0.52
PCOB		-	0.23	0.09	0.05
PEduc			-	-0.33	0.47
PEmpl				-	-0.77

r*= tetrachoric/polychoric correlation coefficient

Due to high correlations, household income was retained and parent employment status and dental insurance status were dropped from the final dataset. Therefore four variables were retained for inclusion in addition to age, sex and residential location, resulting in seven variables in total from the P1 questionnaire:

- Age (*Age*)
- Sex (*Sex*)
- Residential location (*ResLoc*)
- Health care card status (*HCC*)
- Parent country of birth (*PCOB*)
- Parent highest level of education (*PEduc*)
- Household income (*HHI*)

5.2.2 Phase two questionnaire - child-level

This section presents results of the preliminary data analysis on data collected in the phase two (P2) second questionnaire regarding parent perception of their child's school. Descriptive analysis and assessment of relationships among variables are presented.

5.2.2.1 *Descriptive analysis*

This subsection includes an initial frequency analysis of parent responses to questions, followed by an explanation of the dichotomisation process for each variable and subsequent descriptive data.

The initial frequency analysis of parent responses revealed very little missing data across questions, with one exception. Question 21 had a very high level of missing data (Table 5-12). Of the four sub-questions, the first had the best response, yet was incompletely answered for 43.8% of parents. This question was dropped from further analysis. The full set of questions and response frequencies is provided in appendix 7.6.

Table 5-12 Parent responses to perception of and involvement in school committees (Q21)

Label	Question		Percent (%)
21a	Does your child's school have…		
	… a governing council?		(n=4,919)
		Yes	72.4
		No	27.6
21aa	In the last 12 months, have you or your spouse or partner belonged to this group?		(n=3,206)
		Yes	12.9
		No	79.4
		Parental involvement not permitted	7.8
		Total n where 21a = 1	3,560
21b	… an education (curriculum/ literacy/numeracy) committee?		(n=4,700)
		Yes	53.1
		No	46.9
21ba	In the last 12 months, have you or your spouse or partner belonged to this group?		(n=2,416)
		Yes	11.6
		No	68.2
		Parental involvement not permitted	20.2
		Total n where 21b = 1	2,496
21c	… a sports committee?		(n=4,573)
		Yes	41.8
		No	58.2
21ca	In the last 12 months, have you or your spouse or partner belonged to this group?		(n=1,574)
		Yes	15.1
		No	70.3
		Parental involvement not permitted	14.6
		Total n where 21c = 1	1,911
21d	… any other group or committee		(n=3,420)
		Yes	45.2
		No	54.8
21da	In the last 12 months, have you or your spouse or partner belonged to this group?		(n=1,459)
		Yes	33.5
		No	61.6
		Parental involvement not permitted	4.9
		Total n where 21d = 1	1,546

The remaining variables were then dichotomised as detailed below (also see table in appendix 7.7). Unless otherwise indicated, missing responses were coded as missing in the dichotomised variable.

- School provision of health services - *HthServ*
    - School provision of health services was coded as 'high' if a parent believed at least two of the three possible services were provided by their child's school. The variable was coded missing if less than two questions were answered.
- School provision of a student support service - *SupServ*
    - The variable categories for provision of support service came straight from the parent responses. If they indicated the school provided the service, the variable was coded as 'support service'.

- School health policies - *HthPol*
    - Parents could indicate their child's school had up to 10 different health policies. Health policies was coded as 'high' if parents indicated at least nine different health policies. The dichotomised variable was coded as missing if less than six policy responses were provided.
- Parent involvement in health decisions at school - *HthDec*
    - Parent involvement in health decisions was coded as 'high' involvement if there was agreement or strong agreement with the statement 'families of children at your child's school are involved in health decisions for the school'.
- Parent involvement in general decisions at school - *GenDec*
    - Parent involvement in general decisions was coded as 'high' involvement if there was agreement or strong agreement with the statement 'parents are encouraged to be involved in decision making at your child's school'.
- Community involvement in school - *ComInv*
    - Community involvement was coded as 'high' involvement if there was agreement or strong agreement with the statement 'local groups participate in school activities at your child's school'.
- Quality of buildings/grounds and classrooms at school - *QualBGC*
    - Quality of buildings/grounds and classrooms was created using the responses to two questions regarding the quality of buildings and grounds and the quality of classrooms and learning spaces at their child's school. If the parent responded 'adequate', 'poor' or 'very poor' to either of the questions quality of buildings/grounds and classrooms was coded as 'low', even if the other response was missing. If both responses were missing or only one response was given but it was not flagged as 'low', the dichotomised variable was coded as missing.
- Quality of teachers at school - *QualTch*
    - Quality of teachers was coded 'low' if parents responded 'adequate', 'poor' or 'very poor' as a rating of the teachers at their child's school.
- Student morale - *Morale*
    - Student morale was coded as 'good' if the parent agreed or strongly agreed with more than half the statements and disagreed or strongly disagreed with no more than one statement. If the parent responded to less than half of the statements the variable was coded as missing.
- Parent involvement in parent and friends group - *PnFGrp*
    - Parents indicated whether they believed there was a parents and friends group at their child's school, whether they were a member of the group and how many of the meetings they had attended. The variable was coded as 'high' involvement if the parents were a member of the group or had attended some meetings. Any missing information meant the variable was coded as missing.
- Parent involvement in volunteering at the school - *Volunt*
    - Parent involvement in volunteering was coded as 'high' participation if the parent had volunteered at least four to eight times in the previous 12 months.

- Child sick leave - *ChSick*
    - Child sick leave was coded to a 'high' number of sick days if the parent indicated their child had at least nine to 15 sick days off school in the previous 12 months.
- General safety at school - *Safety*
    - General safety was created using the responses to two questions: the parent's perception of their own safety and of their child's safety at their child's school. If either response was 'very unsafe, unsafe or neither safe nor unsafe', the variable was coded as 'low' safety, including when one response was missing. If both responses were missing or one response was given but it was not flagged as 'unsafe', the variable was coded as missing.
- Child experience of teasing - *Tease*
    - If parents indicated that their child experienced teasing at least once a month child experience of teasing was coded as 'high' experience of teasing.
- Child experience of physical hurt - *PhysHurt*
    - If parents indicated that their child experienced physical hurt at least once a term, child experience of physical hurt was coded as 'high' experience of physical hurt.
- Child experience of bullying - *Bully*
    - If parents indicated that their child experienced bullying at least once a month, child experience of bullying was coded as 'high' experience of bullying.
- Social problems at school - *SocProb*
    - If the parent's response to a type of social problem was that it was 'fair' or 'big', the response was flagged as 'big'. If a parent indicated at least two 'big' problems or at least four 'small' problems, social problems was coded to a 'high' level of social problems. If the parent responded to less than three out of the seven statements the variable was coded as missing.
- Disputes at school - *Dispute*
    - Disputes was coded as a 'high' level of disputes if a parent indicated that one or more type of dispute occurred at least 'once a term' (repeat dispute) or if more than one type of dispute occurred 'hardly ever'. If none of the dispute questions were answered the variable was coded as missing.

For all variables the resultant categories demonstrated reasonably sized populations (Table 5-13). The lowest frequencies were seen for parent perceptions of low general safety at school (n = 519, 9.2%), high child sick days (n = 535, 9.5%) and high experience of bullying (n = 560, 10.0%).

Table 5-13 Dichotomised parent responses to perceptions of school questions

Variable	Categories	n	%	CI
HlthServ	Low	4364	77.0	75.0–79.0
	High	1305	23.0	21.0–25.0
	M	*35*	-	-
SupServ	No support service	2436	43.1	41.2–44.9
	Support service	3221	56.9	55.1–58.8
	M	*47*	-	-
HthPol	Narrow	4193	73.7	71.8–75.5
	Broad	1499	26.3	24.5–28.2
	M	*12*	-	-
HthDec	Low	3976	71.1	69.4–72.8
	High	1616	28.9	27.2–30.6
	M	*112*	-	-
GenDec	Low	2323	41.2	39.2–43.2
	High	3317	58.8	56.8–60.8
	M	*64*	-	-
ComInv	Low	2987	53.5	51.8–55.3
	High	2591	46.5	44.7–48.2
	M	*126*	-	-
QualBGC	Poor	1130	19.9	17.8–22.0
	Good	4548	80.1	78.0–82.2
	M	*26*	-	-
QualTch	Poor	681	12.0	10.7–13.4
	Good	4991	88.0	86.6–89.4
	M	*32*	-	-
Morale	Poor	1301	23.0	21.6–24.4
	Good	4354	77.0	75.6–78.4
	M	*49*	-	-
Total n		5704		

Variable	Categories	n	%	CI
PnFGrp	Low	4165	74.0	72.1–75.8
	High	1465	26.0	24.2–27.9
	M	*74*	-	-
Volunt	Low	3433	60.6	58.2–63.0
	High	2233	39.4	37.0–41.8
	M	*38*	-	-
ChSick	High	535	9.5	8.5–10.4
	Low	5105	90.5	89.6–91.5
	M	*64*	-	-
Safety	Low	519	9.2	8.1–10.3
	High	5137	90.8	89.7–91.9
	M	*48*	-	-
Tease	High	895	15.9	14.7–17.1
	Low	4731	84.1	82.9–85.3
	M	*78*	-	-
PhysHurt	High	731	13.0	12.0–14.0
	Low	4886	87.0	86.0–88.0
	M	*87*	-	-
Bully	High	560	10.0	9.0–11.0
	Low	5063	90.0	89.0–91.0
	M	*81*	-	-
SocProb	High	1397	24.9	22.4–27.5
	Low	4211	75.1	72.5–77.6
	M	*96*	-	-
Dispute	High	691	12.2	11.1–13.4
	Low	4958	87.8	86.6–88.9
	M	*55*	-	-
Total n		5704		

M = missing data

5.2.2.2 *Relationships among school environment variables*

Principal Components Analysis (PCA) was employed to identify the underlying structure of the data and create new variables based on the principal components, or factors, identified. This enabled a reduction in the number of variables included in the final analysis while retaining all collected information.

The PCA was performed on a tetrachoric correlation matrix due to the binary nature of the variables (Table 5-14). The strongest associations were between variables child experience of teasing and child experience of bullying (r* = 0.93), parent involvement in health decisions and parent involvement in general decisions (r* = 0.75), quality of buildings/grounds and classrooms (*QualBGC*) and quality of teachers (*QualTch*) (r* = 0.65) and child experience of physical hurt and child experience of bullying (r* = 0.63).

Table 5-14 Tetrachoric correlation matrix for sociodemographic variables - child-level

r*	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	0.47	0.18	0.13	0.17	0.17	0.13	0.11	0.05	0.13	0.11	-0.05	0.02	-0.05	-0.01	-0.04	-0.02	-0.01
2	1.00	0.11	0.14	0.20	0.16	0.13	0.16	0.04	0.13	0.16	0.00	0.22	-0.01	0.07	0.05	0.00	0.06
3		1.00	0.35	0.23	0.21	0.27	0.19	0.10	0.02	0.07	0.05	0.14	0.10	0.05	0.07	0.13	0.07
4			1.00	0.75	0.58	0.23	0.25	0.21	0.15	0.17	0.08	0.24	0.12	0.10	0.14	0.13	0.10
5				1.00	0.69	0.26	0.34	0.23	0.13	0.15	0.11	0.26	0.15	0.12	0.18	0.10	0.25
6					1.00	0.19	0.24	0.19	0.08	0.10	0.09	0.20	0.11	0.07	0.12	0.03	0.15
7						1.00	0.65	0.22	-0.05	0.02	0.08	0.42	0.20	0.18	0.21	0.28	0.26
8							1.00	0.39	0.08	0.15	0.11	0.46	0.27	0.21	0.32	0.36	0.42
9								1.00	0.11	0.17	0.25	0.33	0.32	0.24	0.38	0.17	0.25
10									1.00	0.47	0.08	0.06	0.06	0.05	0.14	0.04	-0.09
11										1.00	0.08	0.13	0.00	0.03	0.02	0.16	0.00
12											1.00	0.23	0.29	0.18	0.28	0.13	0.19
13												1.00	0.37	0.37	0.45	0.36	0.39
14													1.00	0.58	0.93	0.21	0.40
15														1.00	0.63	0.19	0.36
16															1.00	0.25	0.45
17																1.00	0.29

r*= tetrachoric/polychoric correlation coefficient

Key:
1 = HthServ *7 = QualBGC* *13 = Safety*
2 = SupServ *8 = QualTch* *14 = Tease*
3 = HthPol *9 = Morale* *15 = PhysHurt*
4 = HthDec *10 = PnFGrp* *16 = Bully*
5 = GenDec *11 = Volunt* *17 = SocProb*
6 = ComInv *12 = ChSick* *18 = Dispute*

The initial statistics of the PCA revealed five factors with eigenvalues greater than 1.0. A five-factor solution had some cross-loading variables and underdetermined factors on which less than four variables loaded. The scree plot also showed a sharp break at three factors (Figure 5-2). The number of factors was reduced and cross-loading or non-loading variables dropped systematically to arrive at a final factor pattern (see appendix 7.8) with at least four variables loading on each factor and that met the criteria of conceptual validity.

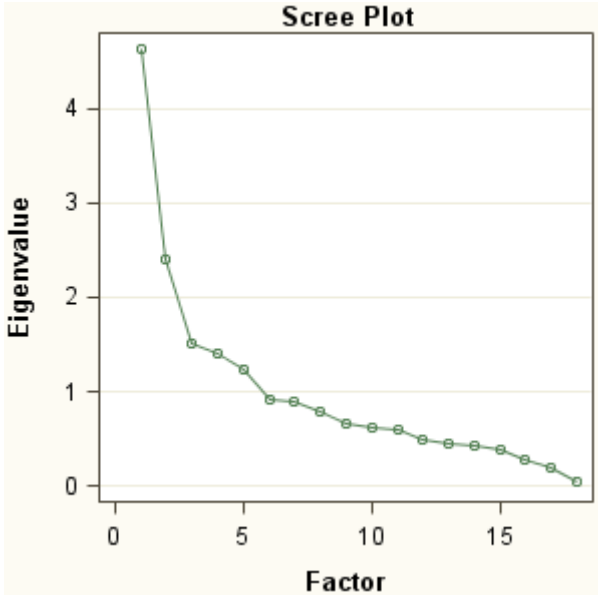


Figure 5-2 Scree plot from Principal Components Analysis for parent perception of child's school variables - child-level

The final factor pattern retained two factors and incorporated 16 of the original 18 variables (Table 5-15). Items which loaded on a factor are indicated in bold. Cronbach alphas are reported as an indicator of internal consistency. The alphas for the subscales are greater than 0.7 indicating good internal consistency. A one-factor solution also demonstrated good internal consistency (α = 0.78) reflecting a general underlying construct but not necessarily unidimensionality of the data.

Table 5-15 Final factor pattern from Principal Components Analysis for parent perception of child's school variables - child-level

Rotated Factor Pattern		
	Factor1	Factor2
Bully	**0.90265**	-0.00522
Tease	**0.86301**	-0.04783
PhysHurt	**0.72858**	-0.03139
Dispute	**0.62347**	0.06863
Safety	**0.62095**	0.24947
Morale	**0.50060**	0.23106
ChSick	**0.42980**	0.04161
SocProb	**0.42398**	0.09279
GenDec	0.21100	**0.80454**
HthDec	0.15890	**0.78973**
ComInv	0.13209	**0.73507**
HthServ	-0.11709	**0.46379**
SupServ	0.00090	**0.45700**
HthPol	0.09509	**0.43421**
Volunt	0.04815	**0.37944**
PnFGrp	0.05289	**0.32851**
Eigenvalue	4.63	2.39
Explained variance	25.1%	14.9%
Cronbach α (subscales)	0.80	0.70
Cronbach α (1 factor)	0.78	

The variables loading on each factor were conceptually related and warranted fitting labels: factor one was labelled social environment (*SocEnv*) and factor two health promoting environment (*HPE*). The use of the SAS SCORE procedure to create factor scores meant that the relative contribution of each variable was reflected in the calculation through weighting mechanisms. The distribution of the factors is shown in Table 5-16. Means closer to the maximum than the minimum indicate more positive perceptions. Social environment was more positive while health promoting environment was more negative.

Table 5-16 Child-level parent perceptions: mean, standard error of the mean and range of created factor scores

Variable	Mean	SEM	Min	Max
SocEnv	1.38	0.00	0.08	1.63
HPE	0.48	0.01	-0.27	1.66

The two variables which were not appropriately loaded onto a factor were retained as stand-alone items. The data reduction process thus resulted in four child-level parent perception variables to be included in final analysis:

- Social environment (*SocEnv*)
- Health promoting environment (*HPE*)
- Quality of buildings/grounds and classrooms (*QualBGC*)
- Quality of teachers (*QualTch*)

The created factor variables were split into quartiles for final analysis. The stand-alone items were re-categorised to three-level variables by splitting the 'high' category of the dichotomised variable.

- Quality of buildings/grounds and classrooms - *QualBGC*
    - The 'high' category was divided: if the response to both questions was 'very good', then the variable was coded as 'high' quality. Otherwise it was coded as 'medium' (Table 5-17).

Table 5-17 Categorisation of quality of buildings/ground and classrooms (*QualBGC*) for final analysis

Buildings/ grounds	Classrooms	Coding
P	P	Poor
P	G	
P	Missing	
G	P	
Missing	P	
G	G	Medium
G	VG	
VG	G	
VG	VG	Good

P = Adequate/poor/ very poor
G = Good
VG = Very good

- Quality of teachers - *QualTch*
    - The 'high' category was divided: the variable was coded 'high' if the response was 'very good' and 'medium' if the response was 'good' (Table 5-18).

Table 5-18 Categorisation of quality of teachers (*QualTch*) for final analysis

Response	Coding
Adequate/poor/ very poor	Poor
Good	Medium
Very good	Good

5.2.3 Phase two questionnaire - school-level

This subsection presents the preliminary analysis on school-level parent perceptions of school. Included is a bias analysis of the loss of data from school excluded from the school-level analysis, a distribution analysis of the school-level data items and an assessment of relationships between variables.

5.2.3.1 *Bias analysis*

Schools with fewer than 10 participating children were excluded from school-level analysis of parent perception items. This resulted in a loss of data for analyses including these data. A bias analysis revealed that the creation of school-level parent perception variables lead to a loss of 57 schools (21.3% of school sample) and 338 children (5.9% of child sample) (Table 5-19).

Table 5-19 Total sample data comparison of demographic characteristics with records lost from the creation of school-level parent perception variables

Variable	Records lost		All records	
	% of children	(95% CI)	% of children	(95% CI)
Age				
5–9 years	18.2	(8.6–27.9)	53.0	(50.0–55.9)
10–14 years	81.8	(72.1–91.4)	47.0	(44.1–50.0)
Sex				
Male	53.1	(47.2–58.9)	50.2	(48.1–52.4)
Females	46.9	(41.1–52.8)	49.8	(47.6–51.9)
Residential location				
Metropolitan	66.0	(52.0–79.9)	67.4	(61.1–73.6)
Non-metropolitan	34.0	(20.1–48.0)	32.6	(26.4–38.9)
ICSEA[(a)]				
Low	33.0	(19.5–46.5)	15.0	(10.9–19.0)
Medium	39.4	(24.6–54.2)	33.3	(26.7–40.0)
High	27.6	(10.4–44.9)	51.7	(44.5–58.9)

[(a)] ICSEA is reported as a proxy for individual SES; incomplete records are missing sociodemographic data but school level data is complete.

There were similar percentages for sex and residential groups among records excluded from the school-level analysis compared to all records. Age groups showed a disproportionate loss of older children, and the ICSEA scores indicated a disproportionate loss of lower socioeconomic status (SES) children. This compounds the under-indication of low SES children already present in the full sample.

5.2.3.2 *Descriptive*

The distribution of school-level parent perception of their child's school variables are displayed in Table 5-20. The mean score indicates the average perception across all schools. Most items demonstrated positive perceptions. Slightly negative perceptions were demonstrated for school provision of health services and of a student support service.

Table 5-20 School-level parent perceptions: mean, standard error of the mean and range of scores

Label	Variable	Mean	SEM	Min	Max
S_HthServ	School provision of health services	0.93	0.02	0.20	1.80
S_SupServ	School provision of a student support service	0.57	0.01	0.15	1.00
S_HthPol	School health policies	6.95	0.05	4.04	8.50
S_HthDec	Parent involvement in school health decisions	3.08	0.02	2.08	4.00
S_GenDec	Parent involvement in school general decisions	3.66	0.03	2.54	4.70
S_ComInv	Community involvement in school	3.42	0.02	2.40	4.25
S_QualBGC	Quality of school buildings/grounds and classrooms	4.28	0.03	3.00	5.00
S_QualTch	Quality of teachers	4.35	0.02	2.86	4.92
S_Morale	Student morale	4.14	0.02	3.21	4.66
S_PnFGrp	Parent involvement in school parent and friends group	1.15	0.01	0.29	1.65
S_Volunt	Parent involvement in volunteering at school	2.52	0.04	1.00	4.00
S_ChSick	Child's number of sick days	3.54	0.02	2.67	4.09
S_Safety	General safety at school	4.63	0.02	3.41	5.00
S_Tease	Child experience of teasing	4.74	0.02	3.65	5.53
S_PhysHurt	Child experience of physical hurt	5.32	0.02	4.53	5.88
S_Bully	Child experience of bullying	5.18	0.03	4.06	6.00
S_SocProb	Social problems at school	3.59	0.01	2.31	3.95
S_Dispute	Disputes at school	5.87	0.01	5.44	6.00

n = 5,366

Note: high scores represent more positive perceptions for all items

5.2.3.3 *Relationships among school environment variables*

The school environment variables were continuous in nature, but due to non-normal distributions, the correlation and consequent PCA was performed based on Spearman's correlations. The strongest associations were between variables school-level child experience of teasing and school-level child experience of bullying (ρ = 0.80), school-level quality of buildings/grounds and classrooms and school-level quality of teachers (ρ = 0.71), school-level parent involvement in health decisions and school-level parent involvement in general decisions (ρ = 0.69) and school-level child experience of physical hurt and school-level child experience of bullying (ρ = 0.59) (Table 5-21).

Table 5-21 Spearman correlation matrix for sociodemographic variables - school-level

ρ	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	0.33***	0.20**	0.10	0.09	0.19**	-0.01	-0.03	-0.03	0.07	0.11	-0.12	-0.01	-0.10	-0.08	-0.07	-0.11	0.01
2	1	0.23**	0.12	0.15*	0.08	0.26**	0.22**	0.07	0.24**	0.28***	0.05	0.31***	0.04	0.15*	0.14*	0.14*	0.12
3		1	0.31***	0.30***	0.10	0.45***	0.44***	0.34***	0.18*	0.34***	0.18**	0.30***	0.00	-0.05	0.12	0.40***	0.02
4			1	0.69***	0.41***	0.22**	0.25**	0.27**	0.27***	0.34***	0.22**	0.29***	0.04	0.00	0.16*	0.31***	0.13
5				1	0.54***	0.21**	0.22**	0.33***	0.36***	0.47***	0.16*	0.26**	0.00	-0.01	0.11	0.20**	0.19**
6					1	0.03	0.00	0.18*	0.19**	0.22**	0.03	0.12	-0.09	-0.10	-0.05	-0.06	0.00
7						1	0.71***	0.36***	0.00	0.23**	0.26**	0.52***	0.13	0.08	0.22**	0.47***	0.26**
8							1	0.46***	0.12	0.26**	0.23**	0.52***	0.25**	0.16*	0.39***	0.60***	0.38***
9								1	0.30***	0.38***	0.28***	0.30***	0.24**	0.10	0.27***	0.47***	0.24**
10									1	0.41***	0.10	0.10	0.04	0.05	0.11	0.15*	-0.02
11										1	0.21**	0.29***	-0.06	-0.11	0.10	0.41***	0.09
12											1	0.29***	0.30***	0.15*	0.26**	0.35***	0.21**
13												1	0.30***	0.32***	0.43***	0.43***	0.38***
14													1	0.63***	0.80***	0.32***	0.41***
15														1	0.59***	0.15*	0.32***
16															1	0.46***	0.41***
17																1	0.32***

*$P < 0.05$; **$P < 0.01$; ***$P < 0.001$.

Key:
1 = S_HthServ
2 = S_SupServ
3 = S_HthPol
4 = S_HthDec
5 = S_GenDec
6 = S_ComInv
7 = S_QualBGC
8 = S_QualTch
9 = S_Morale
10 = S_PnFGrp
11 = S_Volunt
12 = S_ChSick
13 = S_Safety
14 = S_Tease
15 = S_PhysHurt
16 = S_Bully
17 = S_SocProb
18 = S_Dispute

The initial statistics of the PCA revealed five factors with eigenvalues greater than 1.0. A five-factor solution had some cross-loading and non-loading variables as well as underdetermined factors on which less than four variables loaded. The scree plot showed a break at three factors (Figure 5-3). The number of factors was reduced and cross-loading or non-loading variables dropped systematically to arrive at a final factor pattern (see appendix 7.9) with at least four variables loading on each factor and that met the criteria of conceptual validity.

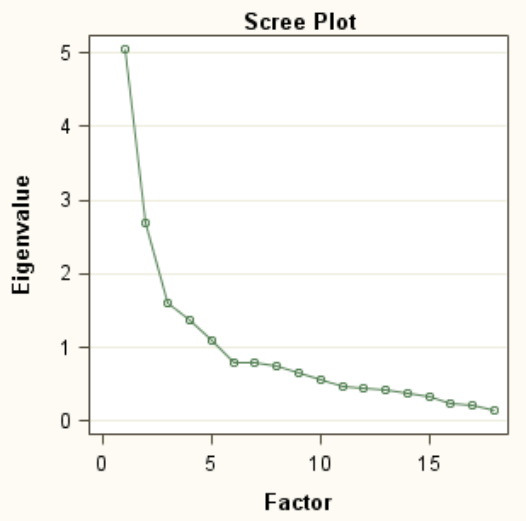


Figure 5-3 Scree plot from Principal Components Analysis for parent perception of child's school variables - school-level

The final factor pattern retained three factors and incorporated 14 of the original 18 variables (Table 5-22). Items which loaded on a factor are indicated in bold. The Cronbach alphas for the subscales are greater than 0.7 indicating good internal consistency. A one-factor solution also demonstrated good internal consistency (α = 0.87) reflecting a general underlying construct.

Table 5-22 Final factor pattern from Principal Components Analysis for parent perception of child's school variables - school-level

Rotated Factor Pattern			
	Factor1	Factor2	Factor3
S_QualTch	**0.84578**	0.22340	0.03969
S_QualBGC	**0.84166**	0.05063	-0.00880
S_SocProb	**0.71258**	0.29590	0.08132
S_HthPol	**0.67737**	-0.14857	0.21324
S_GenSafe	**0.58155**	0.38547	0.16692
S_Morale	**0.52717**	0.19403	0.33310
S_Tease	0.08659	**0.89336**	-0.02651
S_Bully	0.24400	**0.85545**	0.06520
S_PhysHurt	-0.03081	**0.81769**	-0.02587
S_Dispute	0.29585	**0.54934**	0.05278
S_GenDec	0.21823	0.01548	**0.85436**
S_ComInv	-0.06176	-0.09809	**0.75744**
S_HthDec	0.27855	0.03715	**0.75496**
S_PnFGrp	0.05014	0.08120	**0.55512**
Eigenvalue	4.54	2.42	1.59
Explained variance	32.4%	17.3%	11.3%
Cronbach α (subscales)	0.91	0.90	0.87
Cronbach α (1 factor)		0.87	

The variables loading on each factor were conceptually related and appropriate labels were applied: factor one was labelled school quality (*S_SchQual*), factor two was labelled relations (*S_Relat*) and factor three integration (*S_Integ*). The use of the SAS SCORE procedure to create factor scores meant that the relative contribution of each variable was reflected in the calculation through weighting mechanisms. The distribution of the factors is shown in Table 5-23. Means closer to the maximum than the minimum indicate more positive perceptions. School quality was largely positive, school relations was slightly positive and school integration was balanced.

Table 5-23 School-level parent perceptions: mean, standard error of the mean and range of created factor scores

Variable	Mean	SEM	Min	Max
S_SchQual	0.17	0.06	-4.12	1.87
S_Relat	-0.03	0.07	-3.28	2.54
S_Integ	0.04	0.07	-3.20	3.26

The four variables which were not appropriately loaded onto a factor were retained as stand-alone items. The data reduction process thus resulted in seven school-level parent perception variables to be included in final analysis:

- School quality (*S_SchQual*)
- Relations (*S_Relat*)
- Integration (*S_Integ*)
- School provision of health services (*S_HthServ*)
- School provision of a student support service (*S_SupServ*)
- Parent involvement in volunteering at the school (*S_Volunt*)
- Child sick leave (*S_ChSick*)

The created factor variables were split into quartiles for final analysis.

5.2.4 School characteristics collection

This section presents results of the preliminary data analysis on items from the school characteristics administrative data collection. A descriptive analysis and an assessment of relationships between variables are presented. School type was not assessed as part of preliminary analysis/data reduction as it is a basic classification variable to be retained for final analysis. Descriptive information is, however, provided in section 5.2.4.1 for school numbers. Later statistics display child numbers only.

5.2.4.1 *Descriptive*

Table 5-24 shows the descriptive statistics for all variables collected in the school characteristics administrative collection. The numbers refer to the sample of schools rather than the sample of students. Most schools in the sample are located in metropolitan areas (62.9%). The sample average index of community socio-educational advantage (ICSEA) score (1016) indicates that the sample is above average in socioeconomic advantage. Average school income per full-time equivalent (FTE) student was just under $13,000, with 580 FTE students per school, 14.74 students per teacher and a school attendance rate of 92.12%. Each teacher was working approximately one FTE teaching position (0.98). The average school student population was less than one fifth from a non-English speaking background

(17.45%) and one in twenty from an Indigenous Australian background (5.21%). The average academic score (14.12) indicates that academic performance within the school sample was slightly below average.

Table 5-24 School characteristics data

Label	Variable	Categories	n	%	CI
S_SchLoc	School location	Metro	173	62.9	57.2–68.7
S_SchType		Non-metro	102	37.1	31.3–42.8
	School type	Primary	129	46.9	41.0–52.8
		Secondary	76	27.6	22.3–33.0
		Combined	70	25.5	20.3–30.6
	Total n		275		
	Variable	n	Mean	SEM	CI
S_ICSEA	ICSEA	275	1016	5	1007–1025
S_Income	School income	275	12996	230	12544–13449
S_SchSize	School size	275	580	21	539–622
S_ClsSize	Class size	275	14.74	0.19	14.36–15.11
S_Attend	School attendance rate	275	92.12	0.20	91.73–92.52
S_TchWkld	Teacher workload	275	0.98	0.01	0.96–1.00
S_NESB	Percent non-English speaking background	275	17.45	1.32	14.84–20.05
S_Indig	Percent Indigenous at school	275	5.21	0.47	4.28–6.13
S_Acad	School academic performance	273	14.12	0.31	13.51–14.73

Metro = metropolitan, Non-metro = non-metropolitan, ICSEA = Index of community socio-educational advantage

5.2.4.2 *Relationships among school characteristic variables*

The ICSEA score is a composite variable incorporating school location (*S_SchLoc*) and the percentage of Indigenous students enrolled (*S_Indig*) in its calculation. School location was also redundant alongside the measure of residential location (*ResLoc*) with a high degree of correlation between the variables (Cramer's V = 0.97). As such, the variables school location and percent Indigenous at school were dropped ahead of further analysis.

Due to non-normal distributions a Spearman's rank correlation was performed for school characteristic variables. The largest correlations were seen between ICSEA and academic performance (0.848) and between school income and class size (-0.858) (Table 5-25).

Table 5-25 Spearman correlation matrix for school characteristic variables

ρ	Income	SchSize	ClsSize	Attend	TchWkld	NESB	Acad
ICSEA	-0.158**	0.269***	0.140*	0.532***	-0.386***	0.257***	0.848***
Income	-	0.035	-0.858***	-0.443***	-0.051	-0.066	-0.223**
SchSize		-	-0.089	-0.011	-0.018	0.273***	0.353***
ClsSize			-	0.396***	-0.016	-0.065	0.187**
Attend				-	-0.176**	0.102	0.626***
TchWkld					-	0.069	-0.227**
NESB						-	0.207**

*P < 0.05; **P < 0.01; ***P < 0.001.

ρ = Spearman's rank correlation coefficient/Spearman's rho

The PCA revealed three factors with eigenvalues greater than 1.0 in the initial statistics. The three-factor solution had a cross-loading variable and two underdetermined factors with less than four loading variables. There was no obvious break in the scree plot (Figure 5-4). The number of factors was reduced and cross-loading or non-loading variables dropped systematically to arrive at a final factor pattern (see appendix 7.10).

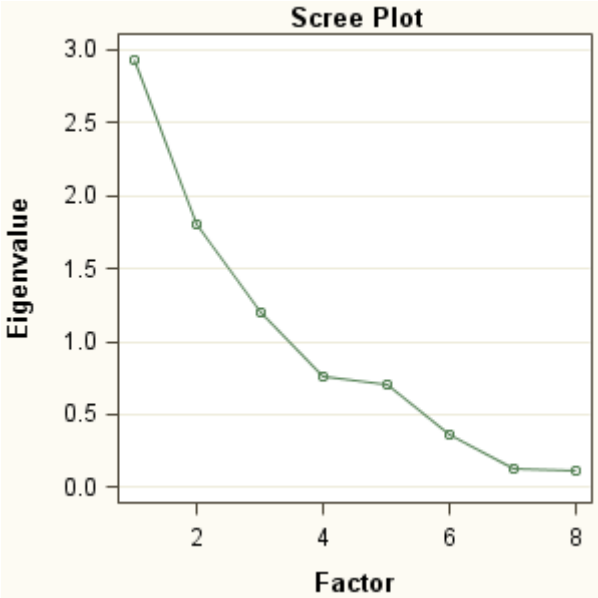


Figure 5-4 Scree plot from Principal Components Analysis for school characteristic variables

The final factor pattern retained one factor, incorporating 5 of the original 8 variables (Table 5-26). Good internal validity was indicated ($\alpha = 0.77$).

Table 5-26 Final factor pattern from Principal Components Analysis for school characteristic variables

Factor Pattern	
	Factor1
S_Attend	**0.82290**
S_Acad	**0.79941**
S_ICSEA	**0.74138**
*S_Income**	**0.68998**
S_ClsSize	**0.65925**
Eigenvalue	2.78
Explained variance	55.5%
Alpha (1 factor)	0.77

*direction reversed

The variables loading on the factor were conceptually related and the factor was labelled school SES (*S_SchSES*) accordingly. The distribution of the created factor score is shown in Table 5-27. The mean is closer to the maximum than the minimum indicated on average schools had higher school SES.

Table 5-27 School characteristics: mean, standard error of the mean and range of created factor score

Variable	Mean	SEM	Min	Max
S_SchSES	0.334	0.012	-3.795	2.110

The three variables which were not appropriately loaded onto a factor were retained as stand-alone items. The data reduction process thus resulted in four variables, in addition to school type (*S_SchType*), meaning a total of six variables were included in final analysis:

- School type (*S_SchType*)
- School socio-economic status (*S_SchSES*)
- School size (*S_SchSize*)
- Teacher workload (*S_TchWkld*)
- Percent non-English speaking background (*S_NESB*)

All variables were split into quartiles for final analysis, with the exceptions of school type (categorical) and teacher workload, for which the conceptually-driven categorisation (see section 4.3.2.1.3) was retained.

5.2.5 Summary

The final set of independent variables derived through the preliminary data analysis process is shown in Table 5-28.

Table 5-28 Independent data items for final analysis

Group	Variable	Label	Type
Child socioeconomic characteristics	Age	*Age*	Continuous
	Sex	*Sex*	Categorical
	Residential location	*ResLoc*	Categorical
	Health care card status	*HCC*	Categorical
	Parent country of birth	*PCOB*	Categorical
	Parent highest level of education	*PEduc*	Categorical
	Household income	*HHI*	Categorical
Parent perceptions of school - child-level	School social environment	*SocEnv*	Quartiles
	School health promoting environment	*HPE*	Quartiles
	Quality of buildings/grounds and classrooms	*QualBGC*	Categorical
	Quality of teachers	*QualTch*	Categorical
Parent perceptions of school - school-level	School quality	*S_SchQual*	Quartiles
	School relations	*S_Relat*	Quartiles
	School integration	*S_Integ*	Quartiles
	Provision of health services	*S_HthServ*	Quartiles
	Provision of support service	*S_SupServ*	Quartiles
	Parent involvement in volunteering at school	*S_Volunt*	Quartiles
	Child sick leave from school	*S_ChSick*	Quartiles
School characteristics	School type	*S_SchType*	Categorical
	School SES	*S_SchSES*	Quartiles
	School size	*S_SchSize*	Quartiles
	Teacher workload	*S_TchWkld*	Categorical
	Percent non-English speaking background	*S_NESB*	Quartiles

5.3 Final analysis

5.3.1 Univariable analysis

This section details the output of the final analysis which includes univariable analyses, analysis of bivariable associations between variables and multivariable analysis to assess the associations between variables in adjusted models.

Table 5-29, Table 5-30, Table 5-31 and Table 5-32 displays the univariable data for the total sample, deciduous subset and permanent subset study populations across independent variable categories. Percentages reported in the text are for the total sample as variation between study populations was minimal.

The percentage of children in each age group is approximately equal with the exception of children aged 14 years (6.2% in the total sample). Sex was roughly evenly distributed with 50.2% males and 49.8% females. Most children resided in a metropolitan location (67.4%) rather than non-metropolitan (*ResLoc*), did not have a parent born outside of Australia (70.0%) rather than having a parent born outside Australia (*PCOB*), were not covered by a health care card (79.7%) rather than covered by a health care card (*HCC*) and had at least one parent with a tertiary education (70.8%) rather than a parent with vocational training (16.0%) or both parents with school-only (13.2%) education (*PEduc*). Half of the sample (52.3%) had medium household income (*HHI*). A larger percent of parents perceived good quality of buildings/grounds and classrooms (40.2%) than medium (39.9%) or poor (19.9%) quality of buildings/grounds and classrooms (*QualBGC*). Likewise, good quality of teachers (47.0%) was perceived more frequently than medium (41.0%) or poor (12.0%) quality of teachers (*QualTch*). Half of schools (51.4%) were primary, compared to 36.3% combined and 12.3% secondary schools (*S_SchType*). A higher percentage of children attended schools with low teacher workload (39.4%) than medium (33.0%) or high (27.6%) teacher workload (*S_TchWkld*). All other variables were in quartiles.

Table 5-29 Univariable statistics for independent variables: total sample, deciduous subset and permanent subset, part 1

Variables	Total sample n	Total sample %[(a)]	Deciduous subset n	Deciduous subset %[(a)]	Permanent subset n	Permanent subset %[(a)]
Child-level sociodemographic variables						
Age						
5	559	9.8	533	15.3	-	-
6	676	11.9	652	18.8	-	-
7	668	11.7	635	18.3	-	-
8	579	10.2	554	15.9	-	-
9	539	9.4	515	14.8	515	16.9
10	606	10.6	588	16.9	588	19.3
11	550	9.6	-	-	526	17.3
12	644	11.3	-	-	602	19.8
13	531	9.3	-	-	496	16.3
14	352	6.2	-	-	317	10.4
Missing	*0*		*0*		*0*	
Sex						
Male	2866	50.2	1740	50.0	1532	50.3
Female	2838	49.8	1737	50.0	1512	49.7
Missing	*0*		*0*		*0*	
ResLoc						
Metropolitan	3842	67.4	2415	69.5	2036	66.9
Non-metropolitan	1862	32.6	1062	30.5	1008	33.1
Missing	*0*		*0*		*0*	
PCOB						
Australia	3898	70.0	2393	70.4	2053	69.2
Other	1673	30.0	1007	29.6	914	30.8
Missing	*133*		*77*		*77*	
HCC						
Has HCC	1119	20.3	640	19.0	637	21.8
No HCC	4384	79.7	2729	81.0	2291	78.2
Missing	*201*		*108*		*116*	
PEduc						
School	742	13.2	406	11.8	433	14.5
Vocational training	899	16.0	518	15.1	480	16.1
Tertiary education	3973	70.8	2505	73.1	2077	69.5
Missing	*90*		*48*		*54*	
HHI						
Low	1130	20.7	643	19.2	632	21.8
Medium	2854	52.3	1780	53.2	1485	51.3
High	1472	27.0	925	27.6	779	26.9
Missing	*248*		*129*		*148*	
Total	*5704*		*3477*		*3044*	

Table 5-30 Univariable statistics for independent variables: total sample, deciduous subset and permanent subset, part 2

	Total sample		Deciduous subset		Permanent subset	
Variables	n	%[(a)]	n	%[(a)]	n	%[(a)]
Child-level parent perceptions of school variables						
SocEnv						
Poor	1408	25.0	854	24.8	782	26.0
Medium-poor	1409	25.0	820	23.8	754	25.1
Medium-good	1433	25.4	922	26.8	719	23.9
Good	1389	24.6	846	24.6	751	25.0
Missing	*65*		*35*		*38*	
HPE						
Poor	1426	25.1	731	21.1	879	29.0
Medium-poor	1409	24.8	841	24.3	763	25.1
Medium-good	1427	25.1	915	26.5	725	23.9
Good	1419	25.0	973	28.1	669	22.0
Missing	*23*		*17*		*8*	
QualBGC						
Poor	1130	19.9	616	17.8	631	20.8
Medium	2267	39.9	1414	40.9	1229	40.5
Good	2281	40.2	1426	41.3	1174	38.7
Missing	*26*		*21*		*10*	
QualTch						
Poor	681	12.0	334	9.7	442	14.6
Medium	2326	41.0	1374	39.8	1307	43.1
Good	2665	47.0	1746	50.6	1282	42.3
Missing	*32*		*23*		*13*	
Total	*5704*		*3477*		*3044*	

Table 5-31 Univariable statistics for independent variables: total sample, deciduous subset and permanent subset, part 3

Variables	Total sample		Deciduous subset		Permanent subset	
	n	%[(a)]	n	%[(a)]	n	%[(a)]
School-level parent perceptions of school variables						
S_SchQual						
Poor	1348	25.1	697	20.4	812	29.3
Medium-poor	1357	25.3	959	28.1	601	21.6
Medium-good	1297	24.2	881	25.8	633	22.8
Good	1364	25.4	880	25.8	730	26.3
Missing	*338*		*60*		*268*	
S_Relat						
Poor	1340	25.0	890	26.0	702	25.3
Medium-poor	1347	25.1	968	28.3	609	21.9
Medium-good	1329	24.8	916	26.8	629	22.7
Good	1350	25.2	643	18.8	836	30.1
Missing	*338*		*60*		*268*	
S_Integ						
Poor	1340	25.0	737	21.6	791	28.5
Medium-poor	1350	25.2	872	25.5	716	25.8
Medium-good	1347	25.1	892	26.1	663	23.9
Good	1329	24.8	916	26.8	606	21.8
Missing	*338*		*60*		*268*	
S_HthServ						
Poor	1337	24.9	822	24.1	726	26.2
Medium-poor	1318	24.6	853	25.0	689	24.8
Medium-good	1373	25.6	814	23.8	732	26.4
Good	1338	24.9	928	27.2	629	22.7
Missing	*338*		*60*		*268*	
S_SupServ						
Poor	1342	25.0	850	24.9	649	23.4
Medium-poor	1301	24.2	862	25.2	677	24.4
Medium-good	1273	23.7	800	23.4	695	25.0
Good	1450	27.0	905	26.5	755	27.2
Missing	*338*		*60*		*268*	
S_Volunt						
Poor	1332	24.8	603	17.6	851	30.7
Medium-poor	1320	24.6	852	24.9	690	24.9
Medium-good	1349	25.1	964	28.2	646	23.3
Good	1365	25.4	998	29.2	589	21.2
Missing	*338*		*60*		*268*	
S_ChSick						
Poor	1291	24.1	761	22.3	704	25.4
Medium-poor	1384	25.8	950	27.8	687	24.7
Medium-good	1351	25.2	904	26.5	661	23.8
Good	1340	25.0	802	23.5	724	26.1
Missing	*338*		*60*		*268*	
Total	*5704*		*3477*		*3044*	

Table 5-32 Univariable statistics for independent variables: total sample, deciduous subset and permanent subset, part 4

Variables	Total sample		Deciduous subset		Permanent subset	
	n	%[(a)]	n	%[(a)]	n	%[(a)]
School-level school characteristic variables						
S_SchType						
Combined	2071	36.3	1206	34.7	1183	38.9
Primary	2933	51.4	2271	65.3	1217	40.0
Secondary	700	12.3	0	0.0	644	21.2
Missing	*0*		*0*		*0*	
S_SchSES						
Low	1431	25.1	764	22.0	823	27.0
Medium-low	1427	25.0	904	26.0	727	23.9
Medium-high	1427	25.0	938	27.0	735	24.2
High	1419	24.9	871	25.1	759	24.9
Missing	*0*		*0*		*0*	
S_SchSize						
Small	1419	24.9	1044	30.0	638	21.0
Medium-small	1444	25.3	991	28.5	663	21.8
Medium-large	1419	24.9	807	23.2	799	26.3
Large	1422	24.9	635	18.3	944	31.0
Missing	*0*		*0*		*0*	
S_TchWkld						
Low	2248	39.4	1485	42.7	1162	38.2
Medium	1884	33.0	1088	31.3	1059	34.8
High	1572	27.6	904	26.0	823	27.0
Missing	*0*		*0*		*0*	
S_NESB						
Low	1338	23.5	797	22.9	688	22.6
Medium-low	1428	25.0	802	23.4	821	27.0
Medium-high	1542	27.0	979	28.2	824	27.1
High	1396	24.5	889	25.6	711	23.4
Missing	*0*		*0*		*0*	
Total	5704		3477		3044	

Table 5-33 shows univariable statistics for outcome measures applicable to the total sample, and the deciduous and permanent subsets. Both parent-rated health (*PRH*) and parent-rated oral health (*PROH*) suboptimal measures are most frequent in the permanent subset (10.8% and 35.7% respectively) and lowest in the deciduous subset (9.6% and 34.0% respectively). Suboptimal *PROH* is over three times as frequent as suboptimal *PRH* in each population. Both deciduous and permanent caries is present in approximately a third of children, but a slightly higher percentage has presence of deciduous caries (*poc*) in the deciduous subset (34.9%) than has presence of permanent caries (*POC*) in the permanent subset (31.0%). Likewise average decayed, missing and filled deciduous surfaces (*dmfs*) in the deciduous subset (2.29) is more than double average decayed, missing and filled permanent surfaces (*DMFS*) in the permanent subset (1.10). Average untreated deciduous decay (*ud*) in the deciduous subset (0.85) is higher than untreated permanent decay (*UD*) in the permanent subset (0.65), but the difference is smaller than the difference between *dmfs* and *DMFS*.

Table 5-33 Univariable statistics for outcome measures: total sample, deciduous subset and permanent subset

	Total sample		Deciduous subset		Permanent subset	
	n	%	n	%	n	%
PRH (suboptimal)	566	10.0	334	9.6	327	10.8
PROH (suboptimal)	1867	33.7	1150	34.0	1054	35.7
poc	-	-	1213	34.9	-	-
POC	-	-	-	-	943	31.0
				Mean		Mean
dmfs		-		2.29		-
ud		-		0.85		-
DMFS		-		-		1.10
UD		-		-		0.65

5.3.2 Bivariable analysis

The bivariable analysis first covers the outcome measures relevant to the total sample, followed by the outcome measures relevant to the deciduous subset and finally the permanent subset. Table percentages or means are presented within the text while confidence intervals are referred to but are only presented in the tables.

5.3.2.1 *Total sample*

5.3.2.1.1 Parent-rated child health

Table 5-34 shows bivariable statistics for suboptimal parent-rated health (*PRH*) in the total sample. Children with a health care card (*HCC*) were more likely to have been reported with suboptimal *PRH* (15.9%) than children without a health care card (8.2%), as were children with a parent born outside of Australia (12.4%) than those with both parents born in Australia (8.8%) (*PCOB*). Almost double the percentage of children of parents with school-only education (*PEduc*) had suboptimal *PRH* (16.1%) than children of parents with tertiary education (8.5%), with a significantly lower percentage also seen for children of parents with vocational training (10.7%). Children from low-income households (*HHI*) were almost three times as likely to have suboptimal *PRH* (17.7%) than children from high-income households (5.9%). The percentage of children from medium-income households with suboptimal *PRH* (8.6%) was significantly lower than low-income households and significantly higher than high-income households.

A higher percentage of children in primary-type schools (*S_SchType*) had suboptimal *PRH* (11.0%) than children in combined-type schools (7.4%), as did children in secondary schools (13.4%). Children attending schools with low school socioeconomic status (SES) had more frequent suboptimal *PRH* (15.2%) than those attending schools with medium-low (8.2%), medium-high (8.0%) and high (8.6%) school SES (*S_SchSES*). Schools where teacher workload (*S_TchWkld*) was low saw a lower percentage of suboptimal *PRH* (7.7%) than schools with high teacher workload (13.2%). School with high percent non-English speaking background (NESB) children (*S_NESB*) had a significantly higher percentage (15.2%) than schools with low (8.7%), medium-low (7.6%) and medium-high (8.5%) percent NESB children.

All child-level parent perceptions of school items showed significant association with the percentage of suboptimal *PRH* with better perceptions being associated with a lower percentage of suboptimal *PRH*. The only variation was seen for good social environment (7.5%), which had a higher percentage than medium-good social environment (6.0%) but was still significantly lower than the percentage for medium-poor (11.0%) social environment (*SocEnv*).

Among school-level parent perception variables, good and medium-good school quality (*S_SchQual*) had lower percentages (7.2% and 8.1% respectively) of children with suboptimal *PRH* than poor school quality (12.4%). Good school quality was also significantly lower than medium-poor school quality (11.1%). Children from schools with good and medium-good school-level parent involvement in volunteering (*S_Volunt*) at their school had a significantly lower percentage (7.6% and 7.4% respectively) of suboptimal *PRH* than children from schools with poor school-level parent involvement in volunteering (13.4%).

Table 5-34 Bivariable statistics: suboptimal parent-rated child health (*PRH*), total sample

Variables	n	%	CI
Child-level sociodemographic			
Age			
5	42	7.5	5.5–10.3
6	55	8.2	6.2–10.7
7	61	9.2	7.2–11.6
8	60	10.4	8.0–13.4
9	58	10.8	8.3–14.1
10	71	11.8	9.3–14.8
11	54	9.9	7.6–12.7
12	65	10.2	7.9–13.1
13	65	12.3	9.5–15.7
14	35	10.1	7.4–13.5
Sex			
Male	319	11.2	9.9–12.7
Female	247	8.8	7.7–10.0
ResLoc			
Metropolitan	410	10.7	9.5–12.1
Non-metropolitan	156	8.4	7.2–9.9
PCOB			
Australia	342	8.8	7.9–9.9*
Other	206	12.4	10.5–14.6
HCC			
Has HCC	177	15.9	13.6–18.5*
No HCC	360	8.2	7.3–9.3
PEduc			
School	119	16.1	13.4–19.3*
Vocational training	96	10.7	8.7–13.2
Tertiary education	338	8.5	7.6–9.6
HHI			
Low	199	17.7	15.2–20.5*
Medium	243	8.6	7.5–9.7
High	86	5.9	4.7–7.3
School characteristics			
S_SchType			
Combined	153	7.4	6.4–8.6*
Primary	320	11.0	9.6–12.6
Secondary	93	13.4	10.6–16.9
S_SchSES			
Low	216	15.2	12.8–18.1*
Medium-low	116	8.2	7.0–9.5
Medium-high	113	8.0	6.6–9.6
High	121	8.6	6.9–10.6
S_SchSize			
Small	161	11.4	9.5–13.7
Medium-small	121	8.4	6.9–10.2
Medium-large	144	10.2	8.5–12.2
Large	140	9.9	7.9–12.4
S_TchWkld			
Low	172	7.7	6.5–9.1*
Medium	188	10.0	8.6–11.6
High	206	13.2	11.0–15.7
S_NESB			
Low	116	8.7	7.2–10.5*
Medium-low	108	7.6	6.4–9.1
Medium-high	131	8.5	7.1–10.2
High	211	15.2	12.5–18.4
Total	566	10.0	9.0–11.0

Variables	n	%	CI
Child-level parent perceptions of school			
SocEnv			
Poor	218	15.6	13.6–17.8*
Medium-poor	154	11.0	9.3–13.0
Medium-good	86	6.0	4.8–7.5
Good	104	7.5	6.3–8.9
HPE			
Poor	175	12.4	10.6–14.3*
Medium-poor	138	9.8	8.3–11.7
Medium-good	125	8.8	7.4–10.5
Good	123	8.7	7.2–10.5
QualBGC			
Poor	150	13.4	11.3–15.8*
Medium	246	10.9	9.5–12.5
Good	166	7.3	6.2–8.5
QualTch			
Poor	115	17.0	14.0–20.5*
Medium	239	10.3	9.0–11.8
Good	207	7.8	6.8–9.0
School-level parent perceptions of school			
S_SchQual			
Poor	166	12.4	10.1–15.1*
Medium-poor	150	11.1	9.3–13.2
Medium-good	104	8.1	6.6–9.8
Good	98	7.2	5.9–8.8
S_Relat			
Poor	160	12.0	10.0–14.4
Medium-poor	133	9.9	7.9–12.5
Medium-good	114	8.6	7.2–10.3
Good	111	8.3	6.7–10.1
S_Integ			
Poor	124	9.9	8.2–11.9
Medium-poor	143	10.6	8.7–12.9
Medium-good	120	9.0	7.3–11.0
Good	117	8.9	7.1–11.1
S_HthServ			
Poor	133	10.0	8.2–12.2
Medium-poor	113	8.6	7.1–10.4
Medium-good	136	9.9	8.3–11.9
Good	136	10.2	8.1–12.9
S_SupServ			
Poor	165	12.4	10.3–14.8
Medium-poor	117	9.0	7.4–11.0
Medium-good	112	8.8	7.0–11.0
Good	124	8.6	7.0–10.6
S_Volunt			
Poor	177	13.4	11.0–16.1*
Medium-poor	138	10.5	8.9–12.4
Medium-good	99	7.4	6.1–9.0
Good	104	7.6	6.2–9.4
S_ChSick			
Poor	154	12.0	10.0–14.3
Medium-poor	131	9.5	7.6–11.8
Medium-good	111	8.3	6.5–10.4
Good	122	9.1	7.5–11.0
Total	566	10.0	9.0–11.0

* indicates a statistically significant difference between at least two variable categories

5.3.2.1.2 Parent-rated child oral health

Table 5-35 shows a number of significant differences in ratings of suboptimal parent-rated child oral health (*PROH*) across age groups, with children aged 10 years having the highest percentage (41.5%). Males had a significantly higher percentage (36.4%) than females (31.0%). Health care card-holder children (*HCC*) were more likely to have a suboptimal *PROH* (42.0%) than non-health care card-holder children (31.2%). Children of parents with tertiary education (*PEduc*) were less likely to have received a suboptimal rating (30.5%) than children of parents with vocational training (36.5%) or school-only education (46.3%). The difference between children of parents with vocational training and school-only education was significant also. A higher percentage of children from low-income households (46.9%) received a suboptimal rating on *PROH* than children from medium- (31.7%) or high-income (27.5%) households (*HHI*).

Primary schools (*S_SchType*) had a higher percentage of children with suboptimal *PROH* (36.4%) than combined schools (29.9%). A higher percentage of children with suboptimal *PROH* was seen in schools with low (41.0%) socioeconomic status (SES) than medium-low (33.3%), medium-high (30.8%) and high (29.8%) SES (*S_SchSES*). Schools with low teacher workload (*S_TchWkld*) had a lower percentage of suboptimal *PROH* (30.6%) than schools with high teacher workload (39.8%), as did schools with medium-low non-English speaking background (NESB) children (29.6%) compared to high (37.6%) NESB children (*S_NESB*).

Significant differences were seen across categories of school social environment (*SocEnv*) for *PROH* but as with child health, the percentage of children with suboptimal *PROH* was higher for perceptions of good social environment (30.5%) than medium-good social environment (26.8%). The other variables showed significant differences with lower percentages of suboptimal *PROH* associated with better perceptions among parents.

Schools with poor and medium-poor school quality (*S_SchQual*) had significantly higher percentages (37.2% and 37.0% respectively) of suboptimal *PROH* than good quality (29.1%). The percentage of children with suboptimal *PROH* was 38.4% at schools with poor school relations (*S_Relat*) and 35.4% at schools with medium-poor relations, both significantly higher than at schools with good relations (28.8%). Schools with medium-good relations also had a significantly lower percentage (32.1%) than those with poor relations. Schools with poor school-level parent involvement in volunteering (*S_Volunt*) had a significantly higher percentage of suboptimal-*PROH* children (38.1%) than schools with medium-good school-level parent involvement in volunteering (30.2%).

Table 5-35 Bivariable statistics: suboptimal parent-rated child oral health (*PROH*), total sample

Variables	n	%	CI
Child-level sociodemographic			
Age			
5	119	21.9	18.7–25.5*
6	198	29.9	26.4–33.7
7	207	31.9	28.3–35.7
8	225	39.8	35.7–44.1
9	201	38.9	34.2–43.8
10	246	41.5	37.6–45.5
11	216	40.4	35.9–45.0
12	218	35.0	30.9–39.3
13	146	28.4	24.2–33.1
14	91	27.2	22.9–32.0
Sex			
Male	1011	36.4	34.4–38.5*
Female	856	31.0	29.0–33.1
ResLoc			
Metropolitan	1284	34.4	32.4–36.3
Non-metropolitan	583	32.4	29.7–35.2
PCOB			
Australia	1243	32.8	31.0–34.6
Other	570	35.2	32.6–37.9
HCC			
Has HCC	452	42.0	38.6–45.4*
No HCC	1334	31.2	29.6–32.9
PEduc			
School	331	46.3	42.1–50.5*
Vocational training	319	36.5	32.8–40.4
Tertiary education	1181	30.5	28.9–32.3
HHI			
Low	512	46.9	43.6–50.2*
Medium	879	31.7	29.7–33.6
High	393	27.5	25.0–30.2
School characteristics			
S_SchType			
Combined	600	29.9	27.5–32.4*
Primary	1040	36.4	34.2–38.7
Secondary	227	33.7	29.6–38.0
S_SchSES			
Low	566	41.0	37.5–44.6*
Medium-low	464	33.3	30.9–35.7
Medium-high	429	30.8	28.2–33.6
High	408	29.8	26.6–33.2
S_SchSize			
Small	485	35.1	31.6–38.9
Medium-small	472	33.7	31.1–36.4
Medium-large	478	34.6	31.7–37.7
Large	432	31.4	28.3–34.8
S_TchWkld			
Low	671	30.6	28.2–33.1*
Medium	591	32.5	29.9–35.1
High	605	39.8	36.8–42.8
S_NESB			
Low	445	34.2	31.4–37.2*
Medium-low	409	29.6	26.8–32.5
Medium-high	505	33.6	30.7–36.7
High	508	37.6	33.9–41.4
Total	1867	33.7	32.1–35.3

Variables	n	%	CI
Child-level parent perceptions of school			
SocEnv			
Poor	566	41.9	39.1–44.8*
Medium-poor	491	36.0	33.4–38.8
Medium-good	377	26.8	24.2–29.5
Good	413	30.5	28.1–32.9
HPE			
Poor	539	39.0	36.3–41.7*
Medium-poor	482	35.1	32.6–37.8
Medium-good	416	30.1	27.5–32.9
Good	416	30.2	27.4–33.1
QualBGC			
Poor	437	39.8	36.8–42.9*
Medium	782	35.4	33.2–37.6
Good	636	28.8	26.7–31.0
QualTch			
Poor	306	46.6	42.5–50.8*
Medium	770	34.0	31.8–36.2
Good	777	30.0	28.0–32.2
School-level parent perceptions of school			
S_SchQual			
Poor	483	37.2	33.9–40.5*
Medium-poor	490	37.0	33.9–40.2
Medium-good	395	31.3	28.4–34.4
Good	385	29.1	26.1–32.3
S_Relat			
Poor	501	38.4	35.1–41.7*
Medium-poor	464	35.4	31.9–39.1
Medium-good	409	32.1	29.2–35.0
Good	379	28.8	26.2–31.5
S_Integ			
Poor	412	33.8	30.8–36.9
Medium-poor	450	34.0	31.0–37.2
Medium-good	444	34.2	30.8–37.9
Good	420	32.5	29.2–36.1
S_HthServ			
Poor	437	33.7	31.1–36.5
Medium-poor	408	31.9	28.8–35.1
Medium-good	438	32.8	29.4–36.4
Good	470	36.2	32.7–40.0
S_SupServ			
Poor	474	36.3	33.5–39.3
Medium-poor	427	33.9	30.6–37.4
Medium-good	405	32.6	29.2–36.3
Good	447	31.9	28.8–35.2
S_Volunt			
Poor	489	38.1	34.5–41.8*
Medium-poor	440	34.5	31.4–37.6
Medium-good	396	30.2	26.9–33.6
Good	428	32.1	29.5–34.8
S_ChSick			
Poor	457	36.4	32.7–40.4
Medium-poor	461	34.2	30.8–37.8
Medium-good	432	33.1	30.5–35.9
Good	403	31.0	28.1–33.9
Total	1867	33.7	32.1–35.3

* indicates a statistically significant difference between at least two variable categories

5.3.2.2 ***Deciduous subset***

5.3.2.2.1 Parent-rated child health

Table 5-36 shows that children with at least one parent born overseas (*PCOB*) had a significantly higher percentage (12.9%) of children with suboptimal parent-rated health (*PRH*) than children with Australian-born parents (8.2%). Children without a health care card (*HCC*) had a significantly lower percentage with suboptimal *PRH* (8.4%) than children with a health care card (14.4%). A significantly lower proportion of children of tertiary-educated parents (*PEduc*) had suboptimal *PRH* (8.7%) than school-only educated parents (14.4%). Children from medium- and high-income households (*HHI*) had lower percentages of suboptimal *PRH* (8.2% and 6.0% respectively) than children from low-income households (17.1%).

Primary schools (*S_SchType*) had a significantly higher percentage of children with suboptimal *PRH* (11.0%) than combined schools (7.2%). Low school socioeconomic status (SES) was associated with a significantly higher percentage of suboptimal *PRH* (15.8%) compared to medium-low (7.8%), medium-high (7.3%) and high (8.8%) school SES (*S_SchSES*). A significantly higher percentage of suboptimal *PRH* was seen in schools with high teacher workload (*S_TchWkld*) (12.9%) compared to low (7.4%) teacher workload (*S_TchWkld*) and with a high percent of non-English speaking background (NESB) children (14.6%) than a medium-low percent (6.7%) NESB children (*S_NESB*).

Medium-good and good parent perceptions of social environment (*SocEnv*) were associated with significantly lower percentages (6.7% and 6.9% respectively) of suboptimal *PRH* than poor social environment (14.4%). The perception of poor health promoting environment (*HPE*) at school was associated with significantly higher suboptimal *PRH* (12.9%) than medium-good health promoting environment (8.3%). A lower percentage of children of parents that perceived good quality of buildings/grounds and classrooms (*QualBGC*) were rated with suboptimal *PRH* (7.4%) than medium (10.9%) and poor perceptions (11.8%). A significant difference was also seen between good perceptions of quality of teachers (7.7%) and poor (14.7%) quality of teachers (*QualTch*).

A significantly lower percentage of children at schools with good school quality (*S_SchQual*) had suboptimal *PRH* (6.7%) than schools with medium-poor quality (11.3%). Poor school-level parent involvement in volunteering (*S_Volunt*) was associated with a significantly higher percentage of suboptimal *PRH* (13.7%) than good (7.4%) and medium-good (7.7%) school-level parent involvement in volunteering.

Table 5-36 Bivariable statistics: suboptimal parent-rated child health (*PRH*), deciduous subset

Variables	n	%	CI
Child-level sociodemographic			
Age			
5	41	7.7	5.6–10.5
6	51	7.9	5.9–10.3
7	60	9.5	7.5–12.0
8	56	10.1	7.8–13.1
9	57	11.1	8.5–14.5
10	69	11.8	9.3–14.8
11	-	-	-
12	-	-	-
13	-	-	-
14	-	-	-
Sex			
Male	184	10.6	9.0–12.5
Female	150	8.7	7.3–10.3
ResLoc			
Metropolitan	243	10.1	8.5–11.9
Non-metropolitan	91	8.6	7.0–10.5
PCOB			
Australia	195	8.2	7.0–9.5*
Other	129	12.9	10.4–15.9
HCC			
Has HCC	92	14.4	11.5–17.9*
No HCC	228	8.4	7.2–9.7
PEduc			
School	58	14.4	10.7–19.0*
Vocational training	52	10.1	7.5–13.5
Tertiary education	217	8.7	7.4–10.1
HHI			
Low	110	17.1	13.8–21.1*
Medium	145	8.2	6.8–9.9
High	55	6.0	4.6–7.8
School characteristics			
S_SchType			
Combined	86	7.2	5.7–9.0*
Primary	248	11.0	9.3–12.9
Secondary	-	-	-
S_SchSES			
Low	120	15.8	12.4–20.0*
Medium-low	70	7.8	6.2–9.6
Medium-high	68	7.3	5.8–9.1
High	76	8.8	6.5–11.7
S_SchSize			
Small	122	11.8	9.5–14.5
Medium-small	82	8.3	6.5–10.5
Medium-large	64	8.0	6.1–10.3
Large	66	10.4	7.0–15.4
S_TchWkld			
Low	110	7.4	5.9–9.3*
Medium	108	10.0	8.1–12.2
High	116	12.9	10.1–16.3
S_NESB			
Low	72	9.0	7.0–11.5*
Medium-low	54	6.7	5.1–8.6
Medium-high	79	8.1	6.3–10.4
High	129	14.6	11.4–18.4
Total	334	9.6	8.4–11.0

Variables	n	%	CI
Child-level parent perceptions of school			
SocEnv			
Poor	122	14.4	11.8–17.3*
Medium-poor	89	10.9	8.7–13.7
Medium-good	62	6.7	5.2–8.8
Good	58	6.9	5.4–8.7
HPE			
Poor	94	12.9	10.4–16.0*
Medium-poor	76	9.1	7.2–11.4
Medium-good	76	8.3	6.7–10.3
Good	84	8.7	6.8–11.1
QualBGC			
Poor	72	11.8	9.2–14.9*
Medium	154	10.9	9.2–12.9
Good	105	7.4	6.0–9.1
QualTch			
Poor	49	14.7	11.0–19.4*
Medium	148	10.8	9.0–12.9
Good	133	7.7	6.3–9.2
School-level parent perceptions of school			
S_SchQual			
Poor	83	11.9	8.8–15.9*
Medium-poor	108	11.3	9.3–13.7
Medium-good	72	8.2	6.3–10.6
Good	59	6.7	4.9–9.2
S_Relat			
Poor	105	11.8	9.7–14.4
Medium-poor	94	9.8	7.1–13.2
Medium-good	77	8.4	6.7–10.5
Good	46	7.2	5.1–10.0
S_Integ			
Poor	65	9.4	7.3–11.9
Medium-poor	90	10.3	7.7–13.7
Medium-good	83	9.3	7.3–11.9
Good	80	8.8	6.6–11.7
S_HthServ			
Poor	81	9.9	7.8–12.5
Medium-poor	69	8.1	6.2–10.6
Medium-good	75	9.2	7.3–11.6
Good	97	10.5	7.7–14.1
S_SupServ			
Poor	99	11.7	9.5–14.4
Medium-poor	76	8.8	6.9–11.4
Medium-good	67	8.4	5.9–11.7
Good	80	8.9	6.6–11.8
S_Volunt			
Poor	82	13.7	10.1–18.3*
Medium-poor	92	10.8	8.8–13.2
Medium-good	74	7.7	6.0–9.9
Good	74	7.4	5.6–9.8
S_ChSick			
Poor	84	11.1	8.7–14.1
Medium-poor	88	9.3	7.3–11.8
Medium-good	78	8.7	6.3–11.9
Good	72	9.0	6.8–11.8
Total	334	9.6	8.4–11.0

* indicates a statistically significant difference between at least two variable categories

5.3.2.2.2 Parent-rated child oral health

There were numerous significant differences in the percentage of suboptimal parent-rated oral health (*PROH*) across age groups (Table 5-37). The percentage increased across age groups from 22.4% among children aged five years to 41.4% among 10-year-olds. Children of parents with school-only education (45.2%) or vocational training (39.1%) had a significantly higher percentage of suboptimal *PROH* than children of tertiary-educated parents at 31.0% (*PEduc*). A higher percentage of children in low-income households (47.2%) had a higher percentage of suboptimal *PROH* than children in medium- (32.1%) or high- (27.7%) income households (*HHI*).

Significantly higher percentages of children with suboptimal *PROH* were seen at schools with high (29.9%), medium-high (31.3%) and medium-low (34.0%) school socioeconomic status (SES) than at schools with low (42.1%) school SES (*S_SchSES*). Schools with a high teacher workload (*S_TchWkld*) also saw a significantly higher percentage (38.6%) than those with a low teacher workload (31.5%).

Children of parents who perceived a good or medium-good social environment (*SocEnv*) at the child's school had a significantly lower percentage of suboptimal *PROH* (30.1% and 29.0% respectively) than children whose parents perceived a medium-poor (36.3%) or poor (41.4%) social environment. Good and medium-good perceptions of school health promoting environment (*HPE*) were associated with significantly lower ratings of suboptimal *PROH* (31.0% and 30.3% respectively) than poor perceptions (40.8%). A lower percentage of children with suboptimal *PROH* was seen among children of parents perceiving good quality of buildings/grounds and classrooms (29.3%) than medium (36.0%) or poor (39.7%) quality of buildings/grounds and classrooms (*QualBGC*), and good or medium quality of teachers (30.4% and 35.3% respectively) compared to poor (46.5%) quality of teachers (*QualTch*).

Schools with good school quality (*S_SchQual*) had a significantly lower percentage of children with suboptimal *PROH* (29.2%) than schools with medium-poor quality (37.8 %).

Table 5-37 Bivariable statistics: suboptimal parent-rated child oral health (*PROH*), deciduous subset

Variables	n	%	CI
Child-level sociodemographic			
Age			
5	116	22.4	19.1–26.1*
6	189	29.6	26.1–33.4
7	201	32.6	28.9–36.5
8	214	39.6	35.4–44.0
9	192	38.9	34.2–43.8
10	238	41.4	37.6–45.3
11	-	-	-
12	-	-	-
13	-	-	-
14	-	-	-
Sex			
Male	603	35.8	33.3–38.3
Female	547	32.2	29.8–34.8
ResLoc			
Metropolitan	802	34.1	31.9–36.3
Non-metropolitan	348	33.9	30.5–37.5
PCOB			
Australia	763	32.8	30.7–34.9
Other	355	36.3	33.2–39.6
HCC			
Has HCC	259	41.8	31.9–36.3
No HCC	850	32.0	30.5–37.5
PEduc			
School	178	45.2	40.1–50.3*
Vocational training	196	39.1	34.1–44.3
Tertiary education	756	31.0	28.9–33.1
HHI			
Low	295	47.2	43.1–51.4*
Medium	555	32.1	29.5–34.7
High	249	27.7	25.0–30.5
School characteristics			
S_SchType			
Combined	367	31.3	28.3–34.4
Primary	783	35.5	33.1–37.8
Secondary	-	-	-
S_SchSES			
Low	310	42.1	37.6–46.8*
Medium-low	301	34.0	30.9–37.3
Medium-high	286	31.3	28.3–34.4
High	253	29.9	26.7–33.3
S_SchSize			
Small	354	35.0	31.0–39.3
Medium-small	320	33.4	30.4–36.5
Medium-large	276	34.8	31.9–37.9
Large	200	32.3	27.8–37.0
S_TchWkld			
Low	456	31.5	28.8–34.2*
Medium	356	33.7	30.3–37.2
High	338	38.6	35.0–42.3
S_NESB			
Low	277	35.8	31.8–40.0
Medium-low	239	30.2	26.9–33.7
Medium-high	322	33.8	30.3–37.4
High	312	36.2	32.4–40.1
Total	1150	34.0	32.2–35.9

Variables	n	%	CI
Child-level parent perceptions of school			
SocEnv			
Poor	339	41.4	37.9–45.0*
Medium-poor	289	36.3	32.7–40.1
Medium-good	263	29.0	25.9–32.4
Good	249	30.1	27.3–33.0
HPE			
Poor	290	40.8	37.0–44.7*
Medium-poor	288	35.1	32.2–38.2
Medium-good	270	30.3	27.2–33.6
Good	293	31.0	27.6–34.7
QualBGC			
Poor	238	39.7	35.8–43.7*
Medium	500	36.0	33.4–38.8
Good	404	29.3	26.8–32.0
QualTch			
Poor	152	46.5	41.0–52.1*
Medium	474	35.3	32.5–38.2
Good	515	30.4	28.0–33.0
School-level parent perceptions of school			
S_SchQual			
Poor	242	36.0	31.6–40.6*
Medium-poor	353	37.8	34.4–41.3
Medium-good	275	31.9	28.4–35.7
Good	250	29.2	26.2–32.4
S_Relat			
Poor	321	36.8	33.2–40.6
Medium-poor	326	34.7	30.9–38.7
Medium-good	289	32.7	29.8–35.7
Good	184	29.3	25.6–33.2
S_Integ			
Poor	225	33.1	30.1–36.2
Medium-poor	287	33.6	29.9–37.4
Medium-good	301	35.0	31.0–39.1
Good	295	33.2	29.5–37.1
S_HthServ			
Poor	254	31.7	28.5–35.0
Medium-poor	270	32.5	29.3–35.9
Medium-good	262	33.0	29.1–37.2
Good	334	37.2	33.2–41.3
S_SupServ			
Poor	289	34.7	31.8–37.7
Medium-poor	279	33.4	29.5–37.4
Medium-good	250	32.0	28.1–36.2
Good	302	34.6	30.7–38.6
S_Volunt			
Poor	226	38.4	33.9–43.2
Medium-poor	294	35.7	32.3–39.3
Medium-good	282	30.1	26.5–34.0
Good	318	32.6	29.7–35.7
S_ChSick			
Poor	267	36.0	31.4–40.8
Medium-poor	310	33.5	29.9–37.2
Medium-good	303	34.7	31.4–38.1
Good	240	30.7	27.6–34.0
Total	1150	34.0	32.2–35.9

* indicates a statistically significant difference between at least two variable categories

5.3.2.2.3 Presence of caries

The percentage of children with presence of deciduous caries (*poc*) was higher for each age between ages five and eight years and lower for ages nine and 10 years (Table 5-38). Significant differences were evident comparing age five years (27.8%) with ages eight (41.0%) and nine years (40.0%). Children residing in non-metropolitan areas (*ResLoc*) had a higher percentage of *poc* (41.6%) than in metropolitan areas (31.9%). A significantly lower percentage of children of parents with tertiary education (*PEduc*) had *poc* (32.5%) than children of parents with school-level education (41.4%) or vocational training (40.7%). There were significant differences between all three levels of household income (*HHI*), with a gradient in the percentage of children with *poc* from a low of 28.2% among high-income households, to a high of 44.5% for low-income households.

There were no significant differences for any parent perceptions of school variables at either the individual or school level. The percentage of children with *poc* was significantly lower in schools with high (28.6%) and medium-high (31.7%) school socioeconomic status (SES) than in schools with medium-low (40.3%) or low (39.7%) SES (*S_SchSES*).

Table 5-38 Bivariable statistics: presence of caries (*poc*), deciduous subset

Variables	n	%	CI
Child-level sociodemographic			
Age			
5	148	27.8	23.9–32.0*
6	215	33.0	29.2–36.9
7	212	33.4	29.6–37.3
8	227	41.0	36.9–45.1
9	206	40.0	35.8–44.4
10	205	34.9	30.8–39.2
11	-	-	-
12	-	-	-
13	-	-	-
14	-	-	-
Sex			
Male	647	37.2	34.5–40.0
Female	566	32.6	30.1–35.2
ResLoc			
Metropolitan	771	31.9	29.8–34.1*
Non-metropolitan	442	41.6	38.2–45.1
PCOB			
Australia	823	34.4	32.0–36.8
Other	362	35.9	32.9–39.1
HCC			
Has HCC	249	38.9	35.0–43.0
No HCC	919	33.7	31.6–35.8
PEduc			
School	168	41.4	37.0–45.9*
Vocational training	211	40.7	36.4–45.2
Tertiary education	813	32.5	30.3–34.7
HHI			
Low	286	44.5	40.5–48.6*
Medium	626	35.2	32.7–37.7
High	261	28.2	25.3–31.4
School characteristics			
S_SchType			
Combined	423	35.1	32.0–38.2
Primary	790	34.8	32.3–37.4
Secondary	-	-	-
S_SchSES			
Low	303	39.7	36.2–43.3*
Medium-low	364	40.3	36.0–44.6
Medium-high	297	31.7	28.3–35.2
High	249	28.6	25.3–32.2
S_SchSize			
Small	395	37.8	34.5–41.3
Medium-small	329	33.2	29.2–37.5
Medium-large	280	34.7	30.9–38.7
Large	209	32.9	28.9–37.2
S_TchWkld			
Low	486	32.7	29.9–35.6
Medium	373	34.3	30.7–38.1
High	354	39.2	35.4–43.0
S_NESB			
Low	300	37.6	33.5–42.0
Medium-low	286	35.2	31.2–39.4
Medium-high	331	33.8	30.2–37.6
High	296	33.3	29.7–37.0
Total	1213	34.9	32.9–36.9

Variables	n	%	CI
Child-level parent perceptions of school			
SocEnv			
Poor	318	37.2	33.9–40.7
Medium-poor	301	36.7	33.4–40.1
Medium-good	299	32.4	28.9–36.1
Good	284	33.6	30.2–37.1
HPE			
Poor	261	35.7	32.0–39.6
Medium-poor	293	34.8	31.5–38.3
Medium-good	310	33.9	30.9–37.0
Good	343	35.3	32.0–38.7
QualBGC			
Poor	208	33.8	29.9–37.9
Medium	494	34.9	32.2–37.8
Good	502	35.2	32.3–38.2
QualTch			
Poor	120	35.9	30.9–41.3
Medium	481	35.0	32.3–37.8
Good	601	34.4	31.9–37.0
School-level parent perceptions of school			
S_SchQual			
Poor	247	35.4	31.1–40.0
Medium-poor	350	36.5	32.6–40.5
Medium-good	283	32.1	28.7–35.7
Good	295	33.5	29.8–37.4
S_Relat			
Poor	339	38.1	34.7–41.6
Medium-poor	337	34.8	31.2–38.6
Medium-good	296	32.3	28.6–36.3
Good	203	31.6	27.4–36.1
S_Integ			
Poor	231	33.1	29.1–37.3
Medium-poor	314	36.0	32.3–39.9
Medium-good	285	32.0	28.0–36.2
Good	335	36.6	33.1–40.2
S_HthServ			
Poor	252	30.7	27.8–33.6
Medium-poor	280	32.8	28.8–37.1
Medium-good	299	36.7	32.6–41.1
Good	344	37.1	33.1–41.3
S_SupServ			
Poor	284	33.4	29.9–37.2
Medium-poor	287	33.3	29.7–37.1
Medium-good	289	36.1	32.2–40.2
Good	315	34.8	30.7–39.1
S_Volunt			
Poor	207	34.3	29.8–39.2
Medium-poor	327	38.4	34.3–42.6
Medium-good	297	30.8	27.5–34.3
Good	344	34.5	31.0–38.1
S_ChSick			
Poor	254	33.4	30.0–37.0
Medium-poor	351	36.9	33.0–41.1
Medium-good	316	35.0	31.1–39.0
Good	254	31.7	28.0–35.6
Total	1213	34.9	32.9–36.9

* indicates a statistically significant difference between at least two variable categories

5.3.2.2.4 Decayed, missing and filled surfaces

Table 5-39 showed some significant differences across age groups in average decayed, missing and filled deciduous surfaces (*dmfs*), with a lower average among five- (1.69), six- (1.84) and 10-year-olds (1.87) than eight- (2.88) and nine-year-olds (3.07). Males had significantly higher *dmfs* (2.62) than females (1.96). Average *dmfs* was higher among children residing in non-metropolitan (2.90) than in metropolitan (2.02) areas (*ResLoc*), and among children covered by a health care card (2.89) compared to those not covered (2.13) by a health care card (*HCC*). Children of parents with school only education (*PEduc*) had significantly higher *dmfs* (3.31) than children of parents with tertiary education (2.07). Average *dmfs* was significantly higher among children from low-income households (3.17) than medium- (2.20) and high- (1.76) income households (*HHI*).

There were no significant differences for any parent perceptions of school variables at either the individual or school level. There were a number of significant differences between average *dmfs* in schools by school socioeconomic status (SES). Average *dmfs* for low school SES (2.70) was significantly higher than medium-high (1.85) and high school SES (1.91), as was *dmfs* in medium-low school SES (2.76) compared to medium-high school SES (*S_SchSES*).

Table 5-39 Bivariable statistics: decayed, missing and filled surfaces (*dmfs*), deciduous subset

Variables	mean	CI
Child-level sociodemographic		
Age		
5	1.69	1.25–2.13*
6	1.84	1.50–2.18
7	2.47	1.96–2.99
8	2.88	2.32–3.44
9	3.07	2.59–3.55
10	1.87	1.51–2.24
11	-	-
12	-	-
13	-	-
14	-	-
Sex		
Male	2.62	2.33–2.90*
Female	1.96	1.69–2.23
ResLoc		
Metropolitan	2.02	1.79–2.24*
Non-metropolitan	2.90	2.47–3.32
PCOB		
Australia	2.21	1.96–2.47
Other	2.47	2.09–2.85
HCC		
Has HCC	2.89	2.36–3.42*
No HCC	2.13	1.91–2.34
PEduc		
School	3.31	2.57–4.04*
Vocational training	2.52	2.08–2.96
Tertiary education	2.07	1.85–2.29
HHI		
Low	3.17	2.64–3.70*
Medium	2.20	1.94–2.46
High	1.76	1.47–2.04
School characteristics		
S_SchType		
Combined	2.30	1.95–2.65
Primary	2.28	2.01–2.55
Secondary	-	-
S_SchSES		
Low	2.70	2.34–3.07*
Medium-low	2.76	2.23–3.28
Medium-high	1.85	1.55–2.15
High	1.91	1.50–2.31
S_SchSize		
Small	2.38	2.03–2.74
Medium-small	2.28	1.84–2.73
Medium-large	2.34	1.90–2.79
Large	2.06	1.60–2.53
S_TchWkld		
Low	2.43	2.08–2.78
Medium	1.98	1.66–2.30
High	2.42	2.02–2.83
S_NESB		
Low	2.54	2.08–3.00
Medium-low	2.04	1.64–2.45
Medium-high	2.22	1.85–2.58
High	2.36	1.90–2.82
Total	2.29	2.07–2.50

Variables	mean	CI
Child-level parent perceptions of school		
SocEnv		
Poor	2.33	1.94–2.72
Medium-poor	2.41	2.01–2.81
Medium-good	2.23	1.85–2.61
Good	2.20	1.83–2.58
HPE		
Poor	2.35	1.96–2.74
Medium-poor	2.21	1.88–2.53
Medium-good	2.23	1.88–2.59
Good	2.37	1.98–2.77
QualBGC		
Poor	2.04	1.65–2.43
Medium	2.27	1.97–2.57
Good	2.42	2.10–2.73
QualTch		
Poor	2.24	1.77–2.70
Medium	2.35	2.05–2.66
Good	2.24	1.95–2.52
School-level parent perceptions of school		
S_SchQual		
Poor	2.21	1.77–2.65
Medium-poor	2.53	2.09–2.98
Medium-good	1.98	1.62–2.34
Good	2.25	1.81–2.68
S_Relat		
Poor	2.36	2.04–2.69
Medium-poor	2.47	1.99–2.95
Medium-good	2.05	1.66–2.44
Good	2.05	1.57–2.52
S_Integ		
Poor	1.93	1.59–2.27
Medium-poor	2.40	1.98–2.81
Medium-good	2.14	1.71–2.58
Good	2.50	2.04–2.96
S_HthServ		
Poor	2.14	1.73–2.55
Medium-poor	2.04	1.64–2.44
Medium-good	2.40	1.91–2.89
Good	2.41	2.01–2.81
S_SupServ		
Poor	2.31	1.91–2.72
Medium-poor	2.25	1.83–2.67
Medium-good	2.25	1.84–2.66
Good	2.19	1.72–2.65
S_Volunt		
Poor	1.93	1.55–2.31
Medium-poor	2.59	2.16–3.02
Medium-good	1.92	1.57–2.27
Good	2.47	2.01–2.92
S_ChSick		
Poor	2.30	1.88–2.72
Medium-poor	2.37	1.89–2.85
Medium-good	2.29	1.91–2.66
Good	2.02	1.60–2.44
Total	2.29	2.07–2.50

* indicates a statistically significant difference between at least two variable categories

5.3.2.2.5 Untreated decayed surfaces

In Table 5-40, showing bivariable statistics for the average number of deciduous surfaces with untreated decay (*ud*), *ud* was significantly higher in males (1.00) than females (0.70). There was a significant difference between average *ud* among children of parents with school-only education (1.33) and children of parents with tertiary (0.74) education (*PEduc*). There were significant differences between all levels of household income (*HHI*), with the lowest average *ud* among children of high-income households (0.51), followed by medium-income (0.82) and low-income households (1.38).

Children from schools with low school SES (*S_SchSES*) had significantly higher *ud* (1.22) than schools with medium-high (0.68) and high SES (0.62). High teacher workload (*S_TchWkld*) in schools was associated with a higher *ud* (1.22) than schools with low teacher workload (0.63). Across schools by percent non-English speaking background (NESB) children (*S_NESB*), medium-high percent NESB had the lowest *ud* (0.63), which differed significantly from high percent NESB children schools (1.05).

There were no significant differences among child-level parent perceptions of school variables. Schools where school-level parent perception of health services (*S_HthServ*) was poor had a significantly lower average *ud* (0.47) than schools with medium-poor (0.86), medium-good (0.95) or good perceptions (1.04).

Table 5-40 Bivariable statistics: untreated decayed surfaces (*ud*), deciduous subset

Variables	mean	CI
Child-level sociodemographic		
Age		
5	0.87	0.66–1.09
6	0.88	0.68–1.09
7	0.76	0.56–0.97
8	1.03	0.81–1.24
9	0.90	0.71–1.10
10	0.67	0.49–0.85
11	-	-
12	-	-
13	-	-
14	-	-
Sex		
Male	1.00	0.85–1.16*
Female	0.70	0.59–0.80
ResLoc		
Metropolitan	0.81	0.69–0.94
Non-metropolitan	0.93	0.73–1.13
PCOB		
Australia	0.78	0.66–0.90
Other	1.02	0.84–1.19
HCC		
Has HCC	1.09	0.87–1.31
No HCC	0.78	0.68–0.88
PEduc		
School	1.33	0.96–1.71*
Vocational training	0.98	0.79–1.18
Tertiary education	0.74	0.63–0.85
HHI		
Low	1.38	1.09–1.67*
Medium	0.82	0.71–0.94
High	0.51	0.40–0.62
School characteristics		
S_SchType		
Combined	0.68	0.55–0.81
Primary	0.94	0.79–1.08
Secondary	-	-
S_SchSES		
Low	1.22	0.97–1.47*
Medium-low	0.93	0.70–1.17
Medium-high	0.68	0.51–0.84
High	0.62	0.47–0.77
S_SchSize		
Small	1.02	0.80–1.24
Medium-small	0.77	0.60–0.95
Medium-large	0.86	0.63–1.08
Large	0.68	0.49–0.86
S_TchWkld		
Low	0.63	0.46–0.79*
Medium	0.84	0.68–1.00
High	1.22	1.00–1.44
S_NESB		
Low	0.93	0.71–1.16*
Medium-low	0.81	0.59–1.03
Medium-high	0.63	0.48–0.79
High	1.05	0.82–1.28
Total	0.85	0.74–0.95

Variables	mean	CI
Child-level parent perceptions of school		
SocEnv		
Poor	0.93	0.76–1.09
Medium-poor	0.93	0.73–1.13
Medium-good	0.78	0.62–0.94
Good	0.76	0.59–0.94
HPE		
Poor	0.91	0.72–1.10
Medium-poor	0.78	0.62–0.94
Medium-good	0.77	0.61–0.93
Good	0.94	0.75–1.13
QualBGC		
Poor	0.79	0.64–0.93
Medium	0.85	0.71–0.99
Good	0.88	0.71–1.04
QualTch		
Poor	0.85	0.60–1.10
Medium	0.83	0.69–0.97
Good	0.86	0.72–1.00
School-level parent perceptions of school		
S_SchQual		
Poor	0.88	0.70–1.07
Medium-poor	1.00	0.75–1.24
Medium-good	0.73	0.55–0.90
Good	0.74	0.53–0.94
S_Relat		
Poor	1.00	0.80–1.20
Medium-poor	0.96	0.72–1.20
Medium-good	0.66	0.51–0.81
Good	0.67	0.47–0.87
S_Integ		
Poor	0.81	0.62–1.00
Medium-poor	0.76	0.59–0.93
Medium-good	0.83	0.63–1.03
Good	0.97	0.70–1.23
S_HthServ		
Poor	0.47	0.33–0.60*
Medium-poor	0.86	0.62–1.10
Medium-good	0.95	0.76–1.15
Good	1.04	0.82–1.25
S_SupServ		
Poor	0.94	0.70–1.18
Medium-poor	0.80	0.60–1.01
Medium-good	0.80	0.57–1.02
Good	0.81	0.63–0.98
S_Volunt		
Poor	0.96	0.73–1.18
Medium-poor	0.91	0.68–1.14
Medium-good	0.66	0.51–0.82
Good	0.87	0.65–1.09
S_ChSick		
Poor	0.91	0.66–1.16
Medium-poor	0.92	0.68–1.16
Medium-good	0.82	0.65–0.99
Good	0.68	0.52–0.84
Total	0.85	0.74–0.95

* indicates a statistically significant difference between at least two variable categories

5.3.2.3 ***Permanent subset***

5.3.2.3.1 Parent-rated health

Table 5-41 showed that children covered by a health care card (*HCC*) had a significantly higher percentage (16.4%) of suboptimal parent-rated health (*PRH*) than children without a health care card (8.9%). A significantly higher percentage of children of parents with school-only education (*PEduc*) had suboptimal *PRH* (17.6%) than children of parents with tertiary education (8.8%). Low household income (*HHI*) was associated with a higher percentage of children with suboptimal *PRH* (19.1%) compared to medium- (9.3%) and high-income households (6.6%).

Combined schools (*S_SchType*) had a lower percentage of children with suboptimal *PRH* (7.8%) than both secondary (13.6%) and primary schools (12.2%). A higher percentage of children in schools with low school socioeconomic status (SES) had suboptimal *PRH* (15.5%) than in medium-low (9.7%), medium-high (9.5%) and high (8.2%) school SES (*S_SchSES*). Low teacher workload (*S_TchWkld*) in schools was associated with a significantly lower percentage (7.7%) of suboptimal *PRH* than schools with medium (11.7%) and high workload (14.1%). Schools with a high proportion of percent non-English speaking background (NESB) children (*S_NESB*) had a higher percentage of children with suboptimal *PRH* (17.0%) than medium-high (9.0%), medium-low (9.0%) and low percent NESB children schools (8.8%).

Good social environment (*SocEnv*) was associated with a significantly lower percentage of suboptimal *PRH* (8.5%) than poor social environment (16.9%), while medium-good perceptions of school environment were associated with a lower percentage (5.9%) than both poor and medium-poor perceptions (11.9%). A significantly lower percentage had suboptimal *PRH* among children of parents who perceived good quality of buildings/grounds and classrooms (7.5%) than medium (11.6%) and poor (15.4%) quality of buildings/grounds and classrooms (*QualBGC*). Children of parents that perceived poor quality of teachers (*QualTch*) had a higher percentage of suboptimal *PRH* (18.5%) than children of parents who perceived medium (10.6%) and good (8.5%) quality of teachers.

Schools with medium-good school quality (*S_SchQual*) had a lower percentage of children with suboptimal *PRH* (7.7%) than poor (12.9%) or medium-poor school quality (13.4%). Poor school-level parent involvement in volunteering (*S_Volunt*) was associated with a higher percentage of children with suboptimal *PRH* (13.7%) than medium-good (8.3%) and good school-level parent involvement in volunteering (8.2%). Medium-good school-level child sick leave (*S_ChSick*) was associated with a significantly lower percentage of children with suboptimal *PRH* (8.1%) than poor school-level child sick leave (13.9%).

Table 5-41 Bivariable statistics: suboptimal parent-rated child health (*PRH*), permanent subset

Variables	n	%	CI
Child-level sociodemographic			
Age			
5	-	-	-
6	-	-	-
7	-	-	-
8	-	-	-
9	57	11.1	8.5–14.5
10	69	11.8	9.3–14.8
11	50	9.6	7.4–12.3
12	59	9.9	7.5–13.0
13	62	12.6	9.7–16.1
14	30	9.6	6.8–13.3
Sex			
Male	186	12.2	10.3–14.4
Female	141	9.4	7.9–11.1
ResLoc			
Metropolitan	237	11.7	10.1–13.5
Non-metropolitan	90	9.0	7.2–11.2
PCOB			
Australia	199	9.7	8.4–11.3
Other	116	12.8	10.5–15.5
HCC			
Has HCC	104	16.4	13.6–19.7*
No HCC	203	8.9	7.6–10.3
PEduc			
School	76	17.6	14.2–21.6*
Vocational training	59	12.4	9.6–15.9
Tertiary education	183	8.8	7.6–10.3
HHI			
Low	120	19.1	15.9–22.8*
Medium	137	9.3	7.9–10.8
High	51	6.6	4.9–8.7
School characteristics			
S_SchType			
Combined	92	7.8	6.4–9.5*
Primary	148	12.2	10.2–14.6
Secondary	87	13.6	10.7–17.3
S_SchSES			
Low	126	15.5	12.6–18.9*
Medium-low	70	9.7	8.1–11.6
Medium-high	69	9.5	7.2–12.3
High	62	8.2	6.1–11.0
S_SchSize			
Small	86	13.6	10.9–16.9
Medium-small	58	8.8	6.6–11.7
Medium-large	100	12.5	10.0–15.6
Large	83	8.9	7.0–11.2
S_TchWkld			
Low	89	7.7	6.2–9.5*
Medium	123	11.7	9.9–13.8
High	115	14.1	11.3–17.6
S_NESB			
Low	60	8.8	6.7–11.4*
Medium-low	73	9.0	7.2–11.2
Medium-high	74	9.0	7.0–11.5
High	120	17.0	13.5–21.2
Total	327	10.8	9.6–12.2

Variables	n	%	CI
Child-level parent perceptions of school			
SocEnv			
Poor	131	16.9	14.2–20.1*
Medium-poor	89	11.9	9.7–14.6
Medium-good	42	5.9	4.3–8.0
Good	64	8.5	6.8–10.7
HPE			
Poor	109	12.5	10.3–15.1
Medium-poor	82	10.8	8.7–13.2
Medium-good	69	9.6	7.6–12.1
Good	66	9.9	7.7–12.6
QualBGC			
Poor	96	15.4	12.5–18.7*
Medium	142	11.6	9.8–13.7
Good	88	7.5	6.2–9.2
QualTch			
Poor	81	18.5	14.9–22.7*
Medium	137	10.6	8.9–12.5
Good	108	8.5	7.0–10.2
School-level parent perceptions of school			
S_SchQual			
Poor	104	12.9	10.2–16.1*
Medium-poor	80	13.4	10.5–16.8
Medium-good	48	7.7	5.9–9.9
Good	59	8.1	6.3–10.5
S_Relat			
Poor	91	13.1	10.2–16.6
Medium-poor	70	11.6	9.1–14.8
Medium-good	57	9.1	6.9–11.9
Good	73	8.8	6.8–11.2
S_Integ			
Poor	79	10.8	8.4–13.7
Medium-poor	80	11.2	9.0–14.0
Medium-good	66	10.0	7.6–13.1
Good	56	9.3	7.0–12.2
S_HthServ			
Poor	72	10.0	7.4–13.5
Medium-poor	62	9.1	7.1–11.5
Medium-good	82	11.2	8.9–14.1
Good	75	12.0	9.3–15.4
S_SupServ			
Poor	92	14.3	11.1–18.3
Medium-poor	66	9.8	7.6–12.5
Medium-good	65	9.4	7.4–11.8
Good	68	9.1	7.0–11.7
S_Volunt			
Poor	116	13.7	11.1–16.9*
Medium-poor	74	10.8	8.5–13.6
Medium-good	53	8.3	6.3–10.8
Good	48	8.2	6.1–10.9
S_ChSick			
Poor	97	13.9	11.2–17.1*
Medium-poor	71	10.4	7.7–13.9
Medium-good	53	8.1	6.2–10.5
Good	70	9.7	7.5–12.4
Total	327	10.8	9.6–12.2

* indicates a statistically significant difference between at least two variable categories

5.3.2.3.2 Parent-rated oral health

A number of significant differences in the percentage of children with suboptimal parent-rated oral health (*PROH*) were seen across age groups (Table 5-42). Children aged 13 and 14 years had lower percentages (28.1% and 26.4% respectively) than children aged nine (38.9%), 10 (41.4%) and 11 years (40.4%). The percentage of children with suboptimal *PROH* was significantly higher among children with a health care card (44.5%) than children without (32.6%) a health care card (*HCC*). A higher percentage of children of school-educated parents (*PEduc*) had suboptimal *PROH* (48.7%) than children of parents with vocational training (37.1%) or tertiary education (32.3%). Low-income households (*HHI*) had a higher percentage of children with suboptimal *PROH* (48.6%) than medium- (33.4%) or high-income households (29.4%).

A higher percentage of children at primary schools (*S_SchType*) had suboptimal *PROH* (41.6%) than at secondary (33.2%) or combined schools (31.1%). Schools with low school socioeconomic status (SES) had a significantly higher frequency of suboptimal *PROH* (43.4%) than medium-low (32.9%), medium-high (34.2%) or high (31.6%) school SES (*S_SchSES*). High teacher workload (*S_TchWkld*) in a school was associated with a significantly higher percentage of children with suboptimal *PROH* (42.0%) than medium (33.2%) or low teacher workload (33.6%).

Parent perception of a poor social environment (*SocEnv*) was associated with a significantly higher percentage of children with suboptimal *PROH* (45.2%) than medium-poor (37.3%), medium-good (26.6%) and good perceptions (33.4%). A significant difference was also seen between medium-poor and medium-good perceptions. A higher percentage of children of parents who perceived a poor health promoting environment (*HPE*) had suboptimal *PROH* (40.3%) than children of parents who perceived a medium-good (32.6%) or good health promoting environment (30.8%). Children of parents who perceived poor quality of buildings/grounds and classrooms (*QualBGC*) were more frequently rated with suboptimal *PROH* (44.3%) than children of parents whose perceptions were medium (35.6%) or good (30.8%). The perception of poor quality of teachers (*QualTch*) was associated with a higher percentage of suboptimal *PROH* (49.1%) than a medium (34.3%) or good perception (32.3%).

Schools with poor school relations (*S_Relat*) had a significantly higher percentage of children with suboptimal *PROH* (44.3%) than medium-good (34.6%) or good relations (29.2%). The percentage at schools with medium-poor relations (37.5%) was also significantly higher than at schools with good relations.

Table 5-42 Bivariable statistics: suboptimal parent-rated child oral health (*PROH*), permanent subset

Variables	n	%	CI
Child-level sociodemographic			
Age			
5	-	-	-
6	-	-	-
7	-	-	-
8	-	-	-
9	192	38.9	34.2–43.8*
10	238	41.4	37.6–45.3
11	207	40.4	35.8–45.0
12	202	34.6	30.4–39.0
13	135	28.1	23.6–33.0
14	80	26.4	22.1–31.2
Sex			
Male	572	38.6	35.7–41.5
Female	482	32.9	30.2–35.7
ResLoc			
Metropolitan	721	36.5	33.7–39.3
Non-metropolitan	333	34.2	30.8–37.8
PCOB			
Australia	689	34.5	32.1–37.0
Other	331	37.5	33.9–41.2
HCC			
Has HCC	272	44.5	40.3–48.8*
No HCC	729	32.6	30.2–35.1
PEduc			
School	204	48.7	43.6–53.8*
Vocational training	173	37.1	32.4–42.1
Tertiary education	652	32.3	30.0–34.7
HHI			
Low	296	48.6	44.3–53.0*
Medium	483	33.4	30.9–36.1
High	223	29.4	25.7–33.4
School characteristics			
S_SchType			
Combined	355	31.1	27.7–34.6*
Primary	492	41.6	38.3–44.9
Secondary	207	33.2	29.0–37.8
S_SchSES			
Low	346	43.4	39.1–47.8*
Medium-low	232	32.9	29.8–36.2
Medium-high	245	34.2	30.3–38.4
High	231	31.6	26.7–36.8
S_SchSize			
Small	242	38.9	34.2–43.9
Medium-small	239	37.1	33.5–40.9
Medium-large	289	37.3	32.7–42.2
Large	284	31.2	27.3–35.4
S_TchWkld			
Low	380	33.6	30.1–37.3*
Medium	340	33.2	29.7–37.0
High	334	42.0	37.9–46.1
S_NESB			
Low	239	35.8	32.0–39.8
Medium-low	252	31.8	28.0–35.9
Medium-high	282	35.4	31.2–39.8
High	281	40.5	35.3–45.9
Total	1054	35.7	33.5–38.0

Variables	n	%	CI
Child-level parent perceptions of school			
SocEnv			
Poor	338	45.2	41.5–49.1*
Medium-poor	271	37.3	33.8–40.9
Medium-good	188	26.6	23.4–30.1
Good	245	33.4	29.9–37.1
HPE			
Poor	344	40.3	36.8–43.9*
Medium-poor	277	37.4	33.7–41.2
Medium-good	228	32.6	29.1–36.3
Good	199	30.8	26.9–34.9
QualBGC			
Poor	272	44.3	40.3–48.4*
Medium	425	35.6	32.6–38.6
Good	349	30.8	27.7–34.2
QualTch			
Poor	209	49.1	44.1–54.1*
Medium	437	34.3	31.5–37.2
Good	400	32.3	29.1–35.7
School-level parent perceptions of school			
S_SchQual			
Poor	309	39.4	35.4–43.5
Medium-poor	233	39.6	34.8–44.6
Medium-good	195	31.9	27.8–36.2
Good	231	32.9	28.2–37.9
S_Relat			
Poor	301	44.3	39.4–49.3*
Medium-poor	221	37.5	32.4–42.8
Medium-good	208	34.6	30.1–39.3
Good	238	29.2	26.4–32.1
S_Integ			
Poor	258	36.3	31.6–41.2
Medium-poor	254	36.3	31.8–41.2
Medium-good	238	37.3	32.7–42.2
Good	198	33.5	29.4–37.9
S_HthServ			
Poor	263	37.7	34.3–41.2
Medium-poor	216	32.4	27.9–37.4
Medium-good	259	36.1	31.4–41.1
Good	230	37.9	32.7–43.4
S_SupServ			
Poor	250	39.7	35.4–44.2
Medium-poor	246	37.8	33.0–42.9
Medium-good	223	32.8	28.4–37.6
Good	249	34.2	29.9–38.7
S_Volunt			
Poor	328	40.1	35.8–44.7
Medium-poor	235	35.2	30.7–39.9
Medium-good	207	32.9	28.4–37.7
Good	198	34.6	30.1–39.3
S_ChSick			
Poor	268	39.3	34.4–44.4
Medium-poor	253	37.9	33.0–43.0
Medium-good	209	32.8	28.7–37.1
Good	238	34.0	29.7–38.4
Total	1054	35.7	33.5–38.0

* indicates a statistically significant difference between at least two variable categories

5.3.2.3.3 Presence of caries

Table 5-43 showed the percentage of children with presence of permanent caries (*POC*) was higher at older ages, with a significantly lower percentage at ages nine and 10 years (18.8% and 23.3% respectively) than at ages 11 (32.3%), 12 (36.0%), 13 (37.3%) and 14 years (43.2%). Children residing in non-metropolitan areas (*ResLoc*) had a significantly higher percentage with *POC* (36.9%) than children in metropolitan areas (28.0%). Low household income (*HHI*) was associated with a higher percentage of children with *POC* (39.4%) than medium (31.1%) or high household income (24.6%).

Secondary schools (*S_SchType*) had a higher percentage of children with *POC* (40.4%) than primary (28.7%) or combined schools (28.2%). High teacher workload (*S_TchWkld*) was associated with a significantly higher frequency of *POC* (40.1%) than medium (29.3%) or low teacher workload (26.1%).

Children of parents who perceived a poor health promoting environment (*HPE*) had a higher percentage of *POC* (34.2%) than children whose parents perceived a medium-good health promoting environment (26.2%). No school-level parent perception variables demonstrated a significant association.

Table 5-43 Bivariable statistics: presence of caries (*POC*), permanent subset

Variables	n	%	CI
Child-level sociodemographic			
Age			
5	-	-	-
6	-	-	-
7	-	-	-
8	-	-	-
9	97	18.8	15.7–22.5*
10	137	23.3	19.6–27.4
11	170	32.3	27.8–37.2
12	217	36.0	31.9–40.4
13	185	37.3	32.3–42.5
14	137	43.2	36.8–49.9
Sex			
Male	453	29.6	26.5–32.8
Female	490	32.4	29.5–35.5
ResLoc			
Metropolitan	571	28.0	25.2–31.0*
Non-metropolitan	372	36.9	32.7–41.4
PCOB			
Australia	637	31.0	28.3–33.9
Other	286	31.3	28.0–34.8
HCC			
Has HCC	222	34.9	30.9–39.0
No HCC	687	30.0	27.4–32.7
PEduc			
School	157	36.3	31.7–41.1
Vocational training	167	34.8	30.4–39.4
Tertiary education	600	28.9	26.1–31.8
HHI			
Low	249	39.4	35.2–43.8*
Medium	462	31.1	28.4–34.0
High	192	24.6	20.5–29.3
School characteristics			
S_SchType			
Combined	334	28.2	24.3–32.5*
Primary	349	28.7	25.5–32.1
Secondary	260	40.4	34.6–46.4
S_SchSES			
Low	297	36.1	32.1–40.3
Medium-low	214	29.4	25.0–34.3
Medium-high	227	30.9	25.2–37.2
High	205	27.0	22.4–32.2
S_SchSize			
Small	203	31.8	28.0–35.9
Medium-small	186	28.1	23.3–33.4
Medium-large	257	32.2	27.0–37.8
Large	297	31.5	26.8–36.5
S_TchWkld			
Low	303	26.1	22.8–29.7*
Medium	310	29.3	25.1–33.8
High	330	40.1	35.4–45.0
S_NESB			
Low	254	36.9	31.9–42.2
Medium-low	243	29.6	24.6–35.2
Medium-high	234	28.4	24.6–32.6
High	212	29.8	25.1–35.0
Total	943	31.0	28.5–33.5

Variables	n	%	CI
Child-level parent perceptions of school			
SocEnv			
Poor	264	33.8	30.5–37.2
Medium-poor	254	33.7	29.9–37.6
Medium-good	200	27.8	23.7–32.3
Good	215	28.6	25.2–32.3
HPE			
Poor	301	34.2	30.4–38.3*
Medium-poor	241	31.6	28.1–35.3
Medium-good	190	26.2	22.9–29.7
Good	209	31.2	27.2–35.5
QualBGC			
Poor	224	35.5	31.3–40.0
Medium	385	31.3	28.1–34.8
Good	333	28.4	25.2–31.8
QualTch			
Poor	152	34.4	29.9–39.2
Medium	407	31.1	28.2–34.2
Good	381	29.7	26.3–33.3
School-level parent perceptions of school			
S_SchQual			
Poor	263	32.4	27.7–37.5
Medium-poor	200	33.3	28.6–38.3
Medium-good	154	24.3	19.7–29.6
Good	214	29.3	24.2–35.0
S_Relat			
Poor	243	34.6	30.0–39.6
Medium-poor	163	26.8	22.8–31.1
Medium-good	175	27.8	23.3–32.8
Good	250	29.9	24.3–36.1
S_Integ			
Poor	215	29.2	24.8–34.0
Medium-poor	214	29.9	24.0–36.5
Medium-good	199	30.0	25.7–34.7
Good	185	30.5	25.4–36.2
S_HthServ			
Poor	194	26.7	22.6–31.3
Medium-poor	196	28.4	23.2–34.4
Medium-good	243	33.2	27.8–39.1
Good	198	31.5	26.7–36.6
S_SupServ			
Poor	213	32.8	27.4–38.7
Medium-poor	202	29.8	25.5–34.6
Medium-good	180	25.9	21.2–31.3
Good	236	31.3	26.3–36.6
S_Volunt			
Poor	299	35.1	30.5–40.0
Medium-poor	207	30.0	24.8–35.8
Medium-good	170	26.3	21.5–31.7
Good	155	26.3	21.7–31.5
S_ChSick			
Poor	229	32.5	27.7–37.8
Medium-poor	215	31.3	26.4–36.7
Medium-good	173	26.2	21.7–31.2
Good	214	29.6	24.3–35.4
Total	943	31.0	28.5–33.5

* indicates a statistically significant difference between at least two variable categories

5.3.2.3.4 Decayed, missing and filled surfaces

Average decayed, missing and filled permanent surfaces (*DMFS*) was significantly higher across older age groups, with children aged 14 years having *DMFS* over four times higher (2.09) than children aged nine (0.50) years (Table 5-44). Average *DMFS* among 14-year-old children was significantly higher than among nine-, 10- (0.70) and 11-year-olds (0.94). Children aged 12 and 13 years also had a higher *DMFS* (1.32 and 1.45 respectively) than nine- and 10-year-olds. Children from low income households (*HHI*) had significantly higher average *DMFS* (1.58) than children of medium- (1.05) and high-income households (0.87).

At secondary schools (*S_SchType*), children had higher average *DMFS* (1.79) than at primary (0.89) or combined schools (0.93). Children at schools with high teacher workload (*S_TchWkld*) had higher *DMFS* (1.55) than at schools with low teacher workload (0.77).

Children of parents who perceived good quality of buildings/grounds and classrooms (*QualBGC*) had significantly lower *DMFS* (0.89) than children of parents who perceived poor quality (1.38).

Medium-good school quality (*S_SchQual*) was associated with a significantly lower *DMFS* (0.70) than medium-poor (1.21) or poor quality (1.35). Schools with poor school-level parent involvement in volunteering (*S_Volunt*) had significantly higher DMFS (1.41) than schools with medium-good (0.76) or good school-level parent involvement in volunteering (0.77).

Table 5-44 Bivariable statistics: decayed, missing and filled surfaces (*DMFS*), permanent subset

Variables	mean	CI
Child-level sociodemographic		
Age		
5	-	-
6	-	-
7	-	-
8	-	-
9	0.50	0.38–0.62*
10	0.70	0.49–0.92
11	0.94	0.75–1.14
12	1.32	1.05–1.58
13	1.45	1.12–1.78
14	2.09	1.51–2.67
Sex		
Male	1.12	0.93–1.31
Female	1.08	0.92–1.23
ResLoc		
Metropolitan	0.99	0.83–1.16
Non-metropolitan	1.31	1.08–1.54
PCOB		
Australia	1.07	0.93–1.22
Other	1.17	0.93–1.41
HCC		
Has HCC	1.29	1.06–1.51
No HCC	1.04	0.89–1.20
PEduc		
School	1.34	1.07–1.61
Vocational training	1.18	0.95–1.41
Tertiary education	1.02	0.86–1.18
HHI		
Low	1.58	1.31–1.85*
Medium	1.05	0.87–1.22
High	0.87	0.66–1.08
School characteristics		
S_SchType		
Combined	0.93	0.72–1.14*
Primary	0.89	0.74–1.05
Secondary	1.79	1.41–2.17
S_SchSES		
Low	1.37	1.08–1.65
Medium-low	1.12	0.86–1.37
Medium-high	1.00	0.72–1.29
High	0.88	0.61–1.14
S_SchSize		
Small	1.02	0.83–1.20
Medium-small	0.96	0.66–1.25
Medium-large	1.16	0.87–1.45
Large	1.20	0.92–1.48
S_TchWkld		
Low	0.77	0.60–0.94*
Medium	1.11	0.87–1.35
High	1.55	1.26–1.84
S_NESB		
Low	1.15	0.89–1.40
Medium-low	1.06	0.79–1.32
Medium-high	1.03	0.79–1.28
High	1.17	0.85–1.49
Total	1.10	0.96–1.24

Variables	mean	CI
Child-level parent perceptions of school		
SocEnv		
Poor	1.35	1.10–1.60
Medium-poor	1.14	0.94–1.33
Medium-good	0.96	0.70–1.21
Good	0.94	0.76–1.11
HPE		
Poor	1.31	1.06–1.55
Medium-poor	1.09	0.89–1.29
Medium-good	0.98	0.73–1.22
Good	0.95	0.78–1.11
QualBGC		
Poor	1.38	1.08–1.68*
Medium	1.16	0.96–1.35
Good	0.89	0.74–1.04
QualTch		
Poor	1.38	1.04–1.72
Medium	1.10	0.92–1.27
Good	1.01	0.83–1.18
School-level parent perceptions of school		
S_SchQual		
Poor	1.35	1.03–1.67*
Medium-poor	1.21	0.92–1.50
Medium-good	0.70	0.51–0.88
Good	0.92	0.67–1.16
S_Relat		
Poor	1.32	1.01–1.63
Medium-poor	0.88	0.69–1.07
Medium-good	0.89	0.63–1.16
Good	1.09	0.78–1.41
S_Integ		
Poor	1.20	0.88–1.52
Medium-poor	0.92	0.67–1.18
Medium-good	1.11	0.81–1.40
Good	0.94	0.73–1.14
S_HthServ		
Poor	1.08	0.75–1.40
Medium-poor	0.92	0.66–1.18
Medium-good	1.23	0.92–1.55
Good	0.98	0.79–1.17
S_SupServ		
Poor	1.27	0.93–1.62
Medium-poor	1.26	0.96–1.56
Medium-good	0.80	0.55–1.04
Good	0.93	0.71–1.15
S_Volunt		
Poor	1.41	1.10–1.72*
Medium-poor	1.14	0.83–1.46
Medium-good	0.76	0.57–0.95
Good	0.77	0.57–0.97
S_ChSick		
Poor	1.40	1.08–1.73
Medium-poor	1.05	0.75–1.35
Medium-good	0.91	0.65–1.18
Good	0.86	0.63–1.09
Total	1.10	0.96–1.24

* indicates a statistically significant difference between at least two variable categories

5.3.2.3.5 Untreated decayed surfaces

Average untreated decayed permanent surfaces (*UD*) was higher across older age groups with a number of significant differences (Table 5-45). Average *UD* among 14-year-olds (1.32) was over 4.5 times higher than among nine-year-olds (0.28). Children of low-income households (*HHI*) had double the frequency of *UD* (0.97) than children of high-income households (0.49).

Children at secondary schools (*S_SchType*) had higher average *UD* (1.10) than children at primary (0.53) or combined schools (0.53). Significantly higher *UD* was seen among children at low socioeconomic status (SES) schools (0.89) compared to high (0.42) SES schools (*S_SchSES*). High teacher workload (*S_TchWkld*) was associated with more than double the average *UD* (1.00) than low teacher workload (0.37.)

There were no significant associations between *UD* and child-level parent perceptions of school. Children at schools with poor school-level parent involvement in volunteering (*S_Volunt*) had significantly higher *UD* (0.90) than at schools with medium-good (0.38) or good school-level parent involvement in volunteering (0.44).

Table 5-45 Bivariable statistics untreated decayed surfaces (*UD*), permanent subset

Variables	mean	CI
Child-level sociodemographic		
Age		
5	-	-
6	-	-
7	-	-
8	-	-
9	0.28	0.19–0.37*
10	0.40	0.23–0.57
11	0.54	0.40–0.68
12	0.79	0.58–0.99
13	0.87	0.58–1.16
14	1.32	0.77–1.87
Sex		
Male	0.74	0.57–0.91
Female	0.56	0.44–0.68
ResLoc		
Metropolitan	0.60	0.46–0.74
Non-metropolitan	0.76	0.57–0.94
PCOB		
Australia	0.61	0.50–0.73
Other	0.75	0.56–0.95
HCC		
Has HCC	0.71	0.55–0.87
No HCC	0.64	0.51–0.77
PEduc		
School	0.85	0.63–1.08
Vocational training	0.74	0.54–0.93
Tertiary education	0.59	0.46–0.72
HHI		
Low	0.97	0.76–1.19*
Medium	0.62	0.47–0.77
High	0.49	0.33–0.65
School characteristics		
S_SchType		
Combined	0.53	0.36–0.70*
Primary	0.53	0.41–0.65
Secondary	1.10	0.76–1.44
S_SchSES		
Low	0.89	0.64–1.13*
Medium-low	0.67	0.45–0.89
Medium-high	0.61	0.37–0.85
High	0.42	0.24–0.61
S_SchSize		
Small	0.58	0.43–0.74
Medium-small	0.61	0.34–0.87
Medium-large	0.69	0.47–0.91
Large	0.70	0.47–0.92
S_TchWkld		
Low	0.37	0.24–0.49*
Medium	0.70	0.49–0.91
High	1.00	0.77–1.23
S_NESB		
Low	0.76	0.54–0.98
Medium-low	0.56	0.36–0.76
Medium-high	0.58	0.37–0.79
High	0.74	0.49–1.00
Total	0.65	0.54–0.76

Variables	mean	CI
Child-level parent perceptions of school		
SocEnv		
Poor	0.85	0.64–1.06
Medium-poor	0.66	0.50–0.82
Medium-good	0.58	0.35–0.80
Good	0.51	0.38–0.64
HPE		
Poor	0.81	0.60–1.01
Medium-poor	0.56	0.42–0.71
Medium-good	0.66	0.43–0.89
Good	0.53	0.40–0.66
QualBGC		
Poor	0.81	0.57–1.04
Medium	0.74	0.57–0.90
Good	0.49	0.37–0.60
QualTch		
Poor	0.93	0.63–1.24
Medium	0.67	0.52–0.82
Good	0.54	0.41–0.66
School-level parent perceptions of school		
S_SchQual		
Poor	0.89	0.62–1.15
Medium-poor	0.77	0.53–1.02
Medium-good	0.40	0.24–0.56
Good	0.45	0.28–0.63
S_Relat		
Poor	0.88	0.64–1.12
Medium-poor	0.47	0.30–0.64
Medium-good	0.49	0.27–0.72
Good	0.67	0.41–0.93
S_Integ		
Poor	0.82	0.55–1.09
Medium-poor	0.50	0.32–0.68
Medium-good	0.67	0.43–0.91
Good	0.49	0.32–0.66
S_HthServ		
Poor	0.60	0.32–0.89
Medium-poor	0.52	0.34–0.69
Medium-good	0.81	0.57–1.06
Good	0.61	0.44–0.78
S_SupServ		
Poor	0.75	0.49–1.01
Medium-poor	0.77	0.51–1.02
Medium-good	0.48	0.28–0.69
Good	0.57	0.36–0.77
S_Volunt		
Poor	0.90	0.64–1.16*
Medium-poor	0.72	0.46–0.97
Medium-good	0.38	0.24–0.52
Good	0.44	0.27–0.62
S_ChSick		
Poor	0.90	0.63–1.18
Medium-poor	0.66	0.43–0.89
Medium-good	0.50	0.27–0.73
Good	0.48	0.31–0.66
Total	0.65	0.54–0.76

* indicates a statistically significant difference between at least two variable categories

5.3.3 Multivariable analysis

This section presents adjusted models as outlined in the methods (see section 4.3.2.2). The first subsection includes models performed using the total sample. The subsequent subsections include models for the deciduous and permanent subsets. For each model, specific effects both individual and contextual in nature are presented followed by general contextual effects. Associations between outcome measures and age and sex are commented upon only for the reference model. There is minimal change in these associations across models. Table odds ratios or beta coefficients are presented within the text. Confidence intervals are referred to but are only presented in the tables.

5.3.3.1 *Total sample*

5.3.3.1.1 Parent-rated child health

The reference model (Model 0) presented in Table 5-46 indicates significant differences exist across schools (MOR 1.38) in suboptimal parent-rated health (*PRH*). There were large differences across ages between the reference group (children aged five years) and children aged 10 years (OR 1.66) and 13 years (OR 1.80) but they did not reach statistical significance. Females had significantly lower odds of suboptimal *PRH* when compared with males (OR 0.77).

Table 5-46 Adjusted models: Parent-rated child health (*PRH*), total sample, reference model (Model 0)

Variable	Category	Adj. OR	95% CI
Age	5	Ref	
	6	1.07	0.54–2.12
	7	1.20	0.62–2.36
	8	1.33	0.68–2.63
	9	1.42	0.72–2.82
	10	1.66	0.57–2.00
	11	1.32	0.66–2.64
	12	1.40	0.71–2.76
	13	1.80	0.91–3.60
	14	1.32	0.60–2.92
Sex	Male	Ref	
	Female	0.77**	0.64–0.92
MOR		1.38	1.18–1.60

Model is for suboptimal parent ratings of child health
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 1 all sociodemographic variables demonstrated significant associations with suboptimal *PRH* (Table 5-47). Children in non-metropolitan areas (*ResLoc*) had lower odds compared to those in metropolitan areas of receiving a suboptimal rating (OR 0.71) as did children without a health care card (OR 0.71) compared to those with a health care card (*HCC*). Children of parents born outside of Australia (*PCOB*) had higher odds of suboptimal *PRH* (OR 1.34) compared to children of Australian-born parents. Higher parent education (*PEduc*) was associated with lower odds of suboptimal *PRH*, but significance was only demonstrated for children of parents with tertiary education (OR 0.63) compared to school-only education. Compared to low household income (*HHI*), lower odds of suboptimal *PRH* was significantly associated with medium (OR 0.46) and high household income (OR 0.28). Variation across schools was lower compared to Model 0 but remained significant (MOR 1.18).

In Model 2 children of parents who perceived social environment (*SocEnv*) more highly had significantly lower odds of suboptimal *PRH*. This was true for medium-poor (OR 0.71), medium-good (OR 0.42), and good social environment (OR 0.48) compared to poor. Medium quality of teachers (*QualTch*) was associated with significantly lower odds of suboptimal *PRH* (OR 0.71) compared to poor quality of teachers. Variation across schools was lower than in Model 0 and remained significant (MOR 1.30).

The full child-level model (Model 3) saw all associated variables retain significance from Models 1 and 2 except for medium-poor social environment and medium quality of teachers. The inclusion of child-level parent perceptions of school saw the effects of household income attenuate from Model 1 for both medium- (OR 0.60) and high-income households (OR 0.42) while attenuation, where evident, was minimal for other associated variables from Models 1 and 2. Variation across schools approached but did not reach non-significance (MOR 1.14).

Table 5-47 Adjusted models: Parent-rated child health (*PRH*), total sample, child-level models (Models 1–3)

		Model no.					
		1		2		3	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc	Metropolitan	Ref				Ref	
	Non-metropolitan	0.71**	0.55–0.91			0.69**	0.54–0.89
PCOB	Australia	Ref				Ref	
	Other	1.34**	1.08–1.65			1.40**	1.13–1.73
HCC	Has HCC	Ref				Ref	
	No HCC	0.71**	0.57–0.90			0.74*	0.59–0.93
PEduc	School	Ref				Ref	
	Vocational	0.77	0.53–1.12			0.81	0.55–1.18
	Tertiary	0.63**	0.46–0.86			0.65**	0.47–0.90
HHI	Low	Ref				Ref	
	Medium	0.46***	0.44–0.77			0.60**	0.45–0.80
	High	0.28***	0.26–0.55			0.42***	0.29–0.62
SocEnv	Poor			Ref		Ref	
	Medium-poor			0.71*	0.53–0.96	0.80	0.58–1.10
	Medium-good			0.42***	0.29–0.61	0.48***	0.33–0.71
	Good			0.48***	0.34–0.68	0.53**	0.37–0.78
HPE	Poor			Ref		Ref	
	Medium-poor			0.82	0.59–1.14	0.84	0.59–1.19
	Medium-good			0.80	0.57–1.13	0.85	0.59–1.23
	Good			0.81	0.56–1.17	0.86	0.58–1.27
QualBGC	Poor			Ref		Ref	
	Medium			1.04	0.78–1.40	1.02	0.74–1.39
	Good			0.77	0.54–1.09	0.79	0.55–1.15
QualTch	Poor			Ref		Ref	
	Medium			0.71*	0.52–0.99	0.71	0.50–1.01
	Good			0.70	0.48–1.02	0.69	0.46–1.04
MOR		1.18	1.04–1.34	1.30	1.13–1.50	1.14	1.01–1.30

Models are for suboptimal parent ratings of child health; Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 4 children in primary schools (*S_SchType*) had significantly higher odds of suboptimal *PRH* (OR 1.49) when compared with combined schools (Table 5-48). Compared to schools with low school socioeconomic status (SES), significantly lower odds of suboptimal *PRH* was associated with medium-low (OR 0.52), medium-high (OR 0.50) and high (OR 0.46) school SES (*S_SchSES*). High percent non-English speaking background (NESB) children (*S_NESB*) was associated with double the odds of suboptimal *PRH* (OR 2.07) compared to low percent NESB children. Variation across schools was lower than in Model 0 and reached non- significance (MOR 1.07).

In Model 5 children at schools with good school quality (*S_SchQual*) had significantly lower odds of suboptimal *PRH* (OR 0.60) compared to children at schools with poor school quality. Compared to poor school-level parent involvement in volunteering (*S_Volunt*), lower odds of suboptimal *PRH* was associated with medium-good (OR 0.64) and good school-level parent involvement in volunteering (OR 0.62) but significance was not reached. Variation across schools was lower than in Model 0 but remained significant (MOR 1.20).

The full school-level model (Model 6) saw significant results for school type and school quality disappear compared to Model 4. The effects across school SES and for high percent NESB children were attenuated from Model 4 but significance was retained. Variation across schools was lower than in Model 0, and marginally lower than Model 4, and reached non-significance (MOR 1.05).

Table 5-48 Adjusted models: Parent-rated child health (*PRH*), total sample, school-level models (Models 4–6)

		Model no.					
		4		5		6	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
S_SchType	Combined	Ref				Ref	
	Primary	1.49*	1.05–2.11			1.32	0.89–1.95
	Secondary	1.20	0.76–1.90			1.20	0.66–2.18
S_SchSES	Low	Ref				Ref	
	Medium-low	0.52***	0.37–0.75			0.60**	0.40–0.91
	Medium-high	0.50***	0.35–0.73			0.60*	0.38–0.95
	High	0.46***	0.31–0.68			0.55*	0.33–0.92
S_SchSize	Small	Ref				Ref	
	Medium-small	0.81	0.56–1.19			0.83	0.55–1.26
	Medium-large	0.95	0.65–1.41			0.87	0.55–1.37
	Large	1.02	0.64–1.62			1.05	0.61–1.82
S_TchWkld	Low	Ref				Ref	
	Medium	1.08	0.80–1.46			1.21	0.85–1.72
	High	1.23	0.89–1.69			1.42	0.97–2.07
S_NESB	Low	Ref				Ref	
	Medium-low	1.00	0.67–1.50			0.92	0.58–1.45
	Medium-high	1.06	0.72–1.57			1.00	0.65–1.56
	High	2.07***	1.41–3.04			1.95**	1.23–3.11
S_SchQual	Poor			Ref		Ref	
	Medium-poor			0.80	0.52–1.23	0.95	0.62–1.44
	Medium-good			0.64	0.40–1.02	0.77	0.49–1.22
	Good			0.60*	0.37–0.97	1.07	0.63–1.80
S_Relat	Poor			Ref		Ref	
	Medium-poor			0.98	0.64–1.50	0.94	0.63–1.40
	Medium-good			0.81	0.51–1.28	0.90	0.57–1.41
	Good			0.71	0.45–1.12	0.79	0.49–1.28
S_Integ	Poor			Ref		Ref	
	Medium-poor			1.34	0.87–2.07	1.39	0.92–2.09
	Medium-good			1.07	0.67–1.70	0.81	0.72–1.78
	Good			1.15	0.71–1.84	0.79	0.70–1.79
S_HthServ	Poor			Ref		Ref	
	Medium-poor			0.98	0.63–1.53	0.95	0.63–1.45
	Medium-good			1.01	0.65–1.57	0.86	0.56–1.32
	Good			1.07	0.67–1.70	0.89	0.57–1.38
S_SupServ	Poor			Ref		Ref	
	Medium-poor			0.69	0.44–1.08	0.79	0.52–1.20
	Medium-good			0.74	0.47–1.18	0.90	0.58–1.40
	Good			0.84	0.53–1.32	0.96	0.63–1.48
S_Volunt	Poor			Ref		Ref	
	Medium-poor			0.95	0.61–1.49	1.21	0.76–1.93
	Medium-good			0.64	0.40–1.02	0.82	0.51–1.31
	Good			0.62	0.39–1.01	0.92	0.55–1.52
S_ChSick	Poor			Ref		Ref	
	Medium-poor			0.90	0.58–1.37	0.75	0.50–1.12
	Medium-good			0.74	0.46–1.17	0.67	0.43–1.05
	Good			0.89	0.56–1.41	0.80	0.51–1.25
MOR		1.07	0.96–1.18	1.20	1.05–1.36	1.05	0.95–1.17

Models are for suboptimal parent ratings of child health; Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In fully adjusted Model 7 residential location (*ResLoc*) did not show a significant association (Table 5-49). The effects were attenuated across parent highest level of education (*PEduc*) and household income (*HHI*) from Models 1 and 3 but remained significant. Attenuation was also evident for the effects of school SES (*S_SchSES*) and percent NESB children (*S_NESB*) from Models 4 and 6 and significance was lost for high school SES.

In fully adjusted Model 8 significance was lost for residential location and parent highest level of education. The odds of suboptimal *PRH* were significant for children with a parent born outside of Australia (1.34) compared to children of parent born in Australia (*PCOB*) and children with no health care card (0.78) compared to children with a health care card (*HCC*). The odds for medium and high household income remained significant and at the same level as in Model 3 (OR 0.59 and 0.42 respectively). Medium-low, medium-high and high school SES each had an odds ratio of 0.65 but significance was only reached for medium-low school SES. High percent NESB children was significantly associated with double the odds of suboptimal *PRH* (OR 1.97) compared to low percent NESB children.

The MOR for Model 8 (1.05) was lower than in Model 7 (1.06) and both were non-significant. The MOR was the same for the full school-level model (Model 6) which constitutes Model 8 with the addition of sociodemographic items (Model 1). The block of variables that explained the most school-level variance in suboptimal *PRH* was school characteristics (Model 4, MOR 1.07) followed by sociodemographic characteristics (Model 1, MOR 1.18) and school-level parent perceptions of school (Model 5, MOR 1.20).

Table 5-49 Adjusted models: Parent-rated child health (*PRH*), total sample, multilevel models (Models 7–8)

	Model no.			
	7		8	
Category	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc				
Metro	Ref		Ref	
Non-metro	0.88	0.63–1.22	0.95	0.67–1.34
PCOB				
Australia	Ref		Ref	
Other	1.35**	1.08–1.68	1.34*	1.07–1.68
HCC				
Has HCC	Ref		Ref	
No HCC	0.75*	0.60–0.95	0.78*	0.61–1.00
PEduc				
School	Ref		Ref	
Vocational	0.84	0.57–1.22	0.86	0.58–1.29
Tertiary	0.70*	0.51–0.97	0.72	0.51–1.02
HHI				
Low	Ref		Ref	
Medium	0.65**	0.49–0.87	0.59**	0.43–0.80
High	0.49***	0.33–0.73	0.42***	0.28–0.64
S_SchType				
Combined	Ref		Ref	
Primary	1.30	0.88–1.91	1.14	0.75–1.74
Secondary	1.09	0.67–1.80	1.30	0.69–2.45
S_SchSES				
Low	Ref		Ref	
Medium-low	0.66*	0.45–0.97	0.65*	0.42–0.99
Medium-high	0.63*	0.42–0.95	0.65	0.40–1.05
High	0.65	0.41–1.02	0.65	0.37–1.13
S_SchSize				
Small	Ref		Ref	
Medium-small	0.82	0.55–1.23	0.82	0.53–1.27
Medium-large	0.94	0.62–1.44	0.84	0.52–1.35
Large	0.86	0.51–1.45	0.91	0.51–1.63
S_TchWkld				
Low	Ref		Ref	
Medium	1.08	0.78–1.49	1.28	0.88–1.86
High	1.04	0.73–1.48	1.21	0.81–1.81
S_NESB				
Low	Ref		Ref	
Medium-low	1.02	0.66–1.57	0.90	0.55–1.46
Medium-high	1.11	0.70–1.78	1.12	0.67–1.86
High	1.81*	1.11–2.95	1.97*	1.13–3.45
MOR	1.06	0.95–1.19	1.05	0.93–1.18

	Model no.			
	7		8	
Category	Adj. OR	95% CI	Adj. OR	95% CI
SocEnv				
Poor	Ref			
Medium-poor	0.81	0.58–1.12		
Medium-good	0.49***	0.33–0.72		
Good	0.55**	0.37–0.80		
HPE				
Poor	Ref			
Medium-poor	0.83	0.59–1.19		
Medium-good	0.84	0.58–1.21		
Good	0.85	0.57–1.26		
QualBGC				
Poor	Ref			
Medium	1.03	0.75–1.42		
Good	0.86	0.59–1.26		
QualTch				
Poor	Ref			
Medium	0.74	0.52–1.06		
Good	0.75	0.50–1.12		
S_SchQual				
Poor			Ref	
Medium-poor			0.98	0.63–1.51
Medium-good			0.73	0.45–1.18
Good			1.00	0.57–1.75
S_Relat				
Poor			Ref	
Medium-poor			1.00	0.66–1.53
Medium-good			1.09	0.67–1.76
Good			0.85	0.51–1.42
S_Integ				
Poor			Ref	
Medium-poor			1.52	0.98–2.36
Medium-good			1.16	0.72–1.86
Good			1.04	0.64–1.71
S_HthServ				
Poor			Ref	
Medium-poor			1.01	0.64–1.57
Medium-good			0.84	0.53–1.33
Good			0.95	0.60–1.50
S_SupServ				
Poor			Ref	
Medium-poor			0.84	0.54–1.29
Medium-good			0.94	0.59–1.50
Good			0.98	0.62–1.54
S_Volunt				
Poor			Ref	
Medium-poor			1.43	0.88–2.33
Medium-good			0.97	0.59–1.60
Good			1.15	0.67–1.96
S_ChSick				
Poor			Ref	
Medium-poor			0.76	0.50–1.16
Medium-good			0.64	0.40–1.02
Good			0.73	0.45–1.17
MOR	1.06	0.95–1.19	1.05	0.93–1.18

Models are for suboptimal parent ratings of child health; Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

MOR = Median odds ratio

5.3.3.1.2 Parent-rated child oral health

There were significant differences in suboptimal parent-rated oral health (*PROH*) between age groups in Model 0 (Table 5-50). Children aged seven through 12 years had significantly higher odds of suboptimal *PROH* compared to children aged five years, with the highest odds at age 10 years (OR 2.56). Females had significantly lower odds of suboptimal *PROH* (OR 0.78) compared with males. The MOR (1.12) demonstrated significant variation existed across schools.

Table 5-50 Adjusted models: Parent-rated child oral health (*PR0H*), total sample, reference model (Model 0)

Variable	Category	Adj. OR	95% CI
Age	5	Ref	
	6	1.51	0.98–2.32
	7	1.65**	1.08–2.54
	8	2.32***	1.51–3.58
	9	2.26***	1.46–3.52
	10	2.56***	1.67–3.93
	11	2.41***	1.55–3.73
	12	1.91**	1.24–2.95
	13	1.45	0.91–2.32
	14	1.31	0.77–2.21
Sex	Male	Ref	
	Female	0.78***	0.70–0.88
MOR		1.12	1.05–1.19

Model is for suboptimal parent ratings of child oral health
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 1 (Table 5-51), the odds of suboptimal *PROH* were significantly lower in children living in non-metropolitan areas (OR 0.83) compared to metropolitan (*ResLoc*). The odds were significantly higher for children of parents with tertiary education (OR 0.61) compared to children of parents with school-only education (*PEduc*), and among children from medium- (OR 0.61) and high-income households (OR 0.51) compared to low-income households (*HHI*). Odds of suboptimal *PROH* were close to significant among children without a health care card (OR 0.86) compared to children with a health care card (*HCC*), and for children of parents with vocational training (OR 0.78) compared to children of parents with school-only education. Variation across schools was lower than in the reference model but remained significant (MOR 1.09).

In Model 2, significant differences were evident among all variables. Significantly lower odds of suboptimal *PROH* were seen for medium-good and good categories of social environment (OR 0.63 and 0.64 respectively) compared to poor social environment (*SocEnv*), and medium-good and good health promoting environment (OR 0.71 for both) compared to poor (*HPE*). Children of parents who perceived good quality of buildings/grounds and classrooms (*QualBGC*) had significantly lower odds of suboptimal *PROH* (OR 0.78) compared to poor perceptions, as did children of parents with medium and good perceptions of quality of teachers (OR 0.67 and 0.71 respectively) compared to poor (*QualTch*). Variation across schools was significant (MOR 1.10).

The full child-level model (Model 3) saw most significant associations remain. Significance was lost from Model 2 for parent perceptions of medium-good health promoting environment (OR 0.80) but only marginally. All odds ratios were attenuated from Models 1 and 2 to some degree with the exception of good quality of buildings/grounds and classrooms, with a slightly amplified odds ratio of 0.76. Variation across schools was significant (MOR 1.08).

Table 5-51 Adjusted models: Parent-rated child oral health (*PR0H*), total sample, child-level models (Models 1–3)

		Model no.					
		1		2		3	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc	Metropolitan	Ref				Ref	
	Non-metropolitan	0.83*	0.70–0.97			0.82*	0.69–0.97
PCOB	Australia	Ref				Ref	
	Other	1.09	0.95–1.26			1.11	0.97–1.28
HCC	Has HCC	Ref				Ref	
	No HCC	0.86	0.73–1.01			0.88	0.75–1.04
PEduc	School	Ref				Ref	
	Vocational	0.78	0.60–1.01			0.81	0.62–1.05
	Tertiary	0.61***	0.49–0.77			0.64***	0.51–0.80
HHI	Low	Ref				Ref	
	Medium	0.61***	0.50–0.74			0.64***	0.52–0.78
	High	0.51***	0.40–0.64			0.56***	0.44–0.71
SocEnv	Poor			Ref		Ref	
	Medium-poor			0.84	0.68–1.04	0.91	0.72–1.14
	Medium-good			0.63***	0.51–0.79	0.70**	0.55–0.89
	Good			0.64***	0.51–0.80	0.74**	0.58–0.94
HPE	Poor			Ref		Ref	
	Medium-poor			0.85	0.69–1.06	0.91	0.72–1.14
	Medium-good			0.71**	0.57–0.89	0.80	0.63–1.01
	Good			0.71**	0.56–0.90	0.77*	0.60–1.00
QualBGC	Poor			Ref		Ref	
	Medium			0.99	0.81–1.20	0.95	0.77–1.18
	Good			0.78*	0.62–0.98	0.76**	0.60–0.97
QualTch	Poor			Ref		Ref	
	Medium			0.67**	0.53–0.85	0.70**	0.54–0.90
	Good			0.71**	0.55–0.92	0.75*	0.57–0.98
MOR		1.09	1.03–1.15	1.10	1.04–1.16	1.08	1.02–1.15

Models are for suboptimal parent ratings of child oral health; Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 4 controlling for school characteristic variables, primary-only schools (*S_SchType*) saw a higher odds of suboptimal *PROH* among children (OR 1.28) compared with combined schools (Table 5-52). Compared to low school socioeconomic status (SES) schools (*S_SchSES*), a significantly lower odds of suboptimal *PROH* was seen among children at medium-low (OR 0.71), medium-high (OR 0.61) and high school SES schools (OR 0.55). Odds of suboptimal *PROH* were significantly greater among children at schools with high teacher workload (OR 1.26) compared to low teacher workload (*S_TchWkld*). Variation across schools bordered on non-significance (MOR 1.05).

In Model 5, significantly lower odds of suboptimal *PROH* were seen for children at schools with good school quality (OR 0.68) compared to poor school quality (*S_SchQual*), and medium-good and good school-level parent involvement in volunteering (OR 0.73 for both) compared to poor school-level parent involvement in volunteering (*S_Volunt*). Good school relations (*S_Relat*) was associated with lower odds of suboptimal *PROH* (OR 0.75) than poor relations but significance was not reached. Variation across schools was lower than in the reference model but remained significant (MOR 1.08).

When Models 4 and 5 were combined in Model 6, most significant results did not remain. The effects of primary-only schools compared to combined schools attenuated slightly from Model 4 but just lost significance (OR 1.26). Likewise, high teacher workload compared to poor attenuated from Model 4 and lost significance (OR 1.20). Significance was retained from Model 4 for high school SES with lower odds of suboptimal *PROH* (0.65) compared to poor school SES, although medium-low (OR 0.76) and medium-high (OR 0.73) categories marginally lost significance. The MOR was higher than in Model 4 (MOR 1.06).

Table 5-52 Adjusted models: Parent-rated child oral health (*PR0H*), total sample, school-level models (Models 4–6)

		Model no.					
		4		5		6	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
S_SchType	Combined	Ref				Ref	
	Primary	1.28*	1.02–1.61			1.26	0.97–1.64
	Secondary	1.11	0.81–1.61			1.22	0.80–1.87
S_SchSES	Low	Ref				Ref	
	Medium-low	0.71**	0.56–0.90			0.76	0.57–1.01
	Medium-high	0.61***	0.47–0.79			0.73	0.53–1.01
	High	0.55***	0.42–0.73			0.65*	0.45–0.93
S_SchSize	Small	Ref				Ref	
	Medium-small	1.09	0.85–1.40			1.15	0.86–1.52
	Medium-large	1.16	0.89–1.51			1.25	0.91–1.72
	Large	1.22	0.89–1.68			1.40	0.95–2.07
S_TchWkld	Low	Ref				Ref	
	Medium	1.02	0.84–1.24			1.02	0.81–1.29
	High	1.26*	1.02–1.56			1.20	0.92–1.56
S_NESB	Low	Ref				Ref	
	Medium-low	0.86	0.67–1.10			0.82	0.61–1.11
	Medium-high	1.00	0.78–1.28			0.98	0.73–1.30
	High	1.20	0.92–1.57			1.17	0.85–1.62
S_SchQual	Poor			Ref		Ref	
	Medium-poor			0.91	0.69–1.21	0.97	0.72–1.30
	Medium-good			0.76	0.56–1.02	0.85	0.63–1.17
	Good			0.68**	0.50–0.93	0.92	0.65–1.31
S_Relat	Poor			Ref		Ref	
	Medium-poor			1.00	0.76–1.33	0.99	0.75–1.32
	Medium-good			0.85	0.63–1.14	0.83	0.61–1.14
	Good			0.75	0.56–1.01	0.77	0.56–1.07
S_Integ	Poor			Ref		Ref	
	Medium-poor			1.11	0.83–1.48	1.09	0.81–1.46
	Medium-good			1.08	0.80–1.46	1.10	0.80–1.49
	Good			1.07	0.79–1.45	1.11	0.80–1.53
S_HthServ	Poor			Ref		Ref	
	Medium-poor			0.96	0.73–1.28	0.98	0.74–1.31
	Medium-good			0.95	0.71–1.26	0.94	0.70–1.27
	Good			1.02	0.75–1.38	1.03	0.76–1.39
S_SupServ	Poor			Ref		Ref	
	Medium-poor			0.89	0.67–1.20	0.93	0.69–1.24
	Medium-good			0.92	0.68–1.25	0.95	0.70–1.29
	Good			0.98	0.73–1.33	1.01	0.75–1.37
S_Volunt	Poor			Ref		Ref	
	Medium-poor			0.83	0.62–1.12	0.98	0.70–1.36
	Medium-good			0.73*	0.54–0.98	0.87	0.63–1.20
	Good			0.73*	0.53–0.99	0.90	0.64–1.28
S_ChSick	Poor			Ref		Ref	
	Medium-poor			1.00	0.75–1.33	0.95	0.72–1.27
	Medium-good			0.96	0.71–1.30	0.94	0.69–1.28
	Good			0.91	0.67–1.23	0.93	0.68–1.26
MOR		1.05	1.00–1.09	1.08	1.02–1.15	1.06	1.04–1.11

Models are for suboptimal parent ratings of child oral health; Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In the fully adjusted Model 7 (Table 5-53), significant effects seen in Model 3 for sociodemographic variables residential location (*ResLoc*), parent highest level of education (*PEduc*) and household income (*HHI*) remained significant, as did effects for child-level parent perceptions of school variables social environment (*SocEnv*) and health promoting environment (*HPE*). The odds of suboptimal *PROH* associated with medium-good health promoting environment were non-significant by a very small margin (OR 0.79). The effect of high quality of teachers (*QualTch*) did not retain significance from Model 5 and 6 by a small margin (OR 0.78) while medium quality of teachers did (OR 0.71). Good quality of buildings/grounds and classrooms (*QualBGC*) did not remain significant although significance was also lost by a small margin (OR 0.79).

In Model 8, the effects of sociodemographic variables were significant. From the full school-level model (Model 6) no significant associations remained.

Variation across schools was at a similar level for Model 7 (MOR 1.08) and Model 8 (MOR 1.09) and significance was demonstrated. Less school-level variation was explained by either multilevel model than was explained by Models 4 (MOR 1.05) and 6 (MOR 1.06). The block of variables that produced the lowest MOR was school characteristics (Model 4, MOR 1.05), followed by school-level parent perceptions of school (Model 5, MOR 1.08) and sociodemographic variables (Model 1, MOR 1.09).

Table 5-53 Adjusted models: Parent-rated child oral health (*PR0H*), total sample, multilevel models (Models 7–8)

	Model no.			
	7		8	
Category	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc				
Metro	Ref		Ref	
Non-metro	0.80*	0.64–0.99	0.78*	0.62–0.98
PCOB				
Australia	Ref		Ref	
Other	1.11	0.96–1.28	1.09	0.94–1.26
HCC				
Has HCC	Ref		Ref	
No HCC	0.88	0.75–1.03	0.86	0.72–1.01
PEduc				
School	Ref		Ref	
Vocational	0.83	0.63–1.08	0.80	0.60–1.05
Tertiary	0.67**	0.53–0.84	0.64***	0.51–0.82
HHI				
Low	Ref		Ref	
Medium	0.67***	0.54–0.82	0.63***	0.51–0.78
High	0.61***	0.48–0.79	0.56***	0.43–0.72
S_SchType				
Combined	Ref		Ref	
Primary	1.16	0.89–1.52	1.15	0.86–1.55
Secondary	0.99	0.69–1.40	1.21	0.76–1.91
S_SchSES				
Low	Ref		Ref	
Medium-low	0.84	0.64–1.10	0.83	0.60–1.14
Medium-high	0.75	0.56–1.00	0.83	0.58–1.18
High	0.71*	0.51–0.98	0.77	0.51–1.16
S_SchSize				
Small	Ref		Ref	
Medium-small	1.10	0.83–1.45	1.15	0.84–1.56
Medium-large	1.09	0.81–1.46	1.18	0.83–1.68
Large	1.12	0.78–1.63	1.28	0.83–1.97
S_TchWkld				
Low	Ref		Ref	
Medium	0.97	0.77–1.21	0.99	0.77–1.28
High	1.14	0.89–1.45	1.09	0.81–1.45
S_NESB				
Low	Ref		Ref	
Medium-low	0.86	0.64–1.14	0.80	0.57–1.11
Medium-high	0.95	0.70–1.29	0.91	0.64–1.28
High	0.97	0.69–1.36	1.00	0.68–1.49
MOR	1.08	1.02–1.14	1.09	1.02–1.16

	Model no.			
	7		8	
Category	Adj. OR	95% CI	Adj. OR	95% CI
SocEnv				
Poor	Ref			
Medium-poor	0.90	0.72–1.13		
Medium-good	0.70**	0.55–0.89		
Good	0.74**	0.58–0.94		
HPE				
Poor	Ref			
Medium-poor	0.91	0.73–1.15		
Medium-good	0.79	0.62–1.01		
Good	0.77*	0.59–0.99		
QualBGC				
Poor	Ref			
Medium	0.97	0.79–1.20		
Good	0.79	0.62–1.01		
QualTch				
Poor	Ref			
Medium	0.71**	0.56–0.92		
Good	0.78	0.59–1.03		
S_SchQual				
Poor			Ref	
Medium-poor			0.95	0.69–1.30
Medium-good			0.79	0.56–1.12
Good			0.86	0.58–1.26
S_Relat				
Poor			Ref	
Medium-poor			1.07	0.78–1.46
Medium-good			0.90	0.64–1.28
Good			0.79	0.55–1.13
S_Integ				
Poor			Ref	
Medium-poor			1.14	0.83–1.57
Medium-good			1.08	0.77–1.52
Good			1.15	0.80–1.64
S_HthServ				
Poor			Ref	
Medium-poor			1.01	0.74–1.38
Medium-good			0.92	0.67–1.28
Good			1.04	0.75–1.45
S_SupServ				
Poor			Ref	
Medium-poor			0.97	0.70–1.33
Medium-good			1.03	0.74–1.44
Good			1.05	0.75–1.47
S_Volunt				
Poor			Ref	
Medium-poor			1.01	0.70–1.44
Medium-good			0.90	0.63–1.28
Good			0.91	0.62–1.33
S_ChSick				
Poor			Ref	
Medium-poor			0.99	0.73–1.35
Medium-good			0.90	0.65–1.27
Good			0.92	0.66–1.29
MOR	1.08	1.02–1.14	1.09	1.02–1.16

Models are for suboptimal parent ratings of child oral health; Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

MOR = Median odds ratio

5.3.3.2 *Deciduous dentition subset*

5.3.3.2.1 Parent-rated child health

The reference model for suboptimal parent-rated health *(PRH*) in the deciduous subset saw no significant associations with age or sex (Table 5-54). Significant variation was evident across schools (MOR 1.50).

Table 5-54 Adjusted models: Parent-rated child health (*PRH*), deciduous subset, reference model (Model 0)

Variable	Category	Adj. OR	95% CI
Age	5	Ref	
	6	1.01	0.53–1.89
	7	1.20	0.65–2.22
	8	1.26	0.67–2.35
	9	1.40	0.75–2.62
	10	1.61	0.88–2.95
Sex	Male	Ref	
	Female	0.81	0.64–1.03
MOR		1.50	1.22–1.86

Model is for suboptimal parent ratings of child health
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 1, higher odds of suboptimal *PRH* were seen for children of parents born outside of Australia (*PCOB*) (OR 1.57) compared to Australian-born parents (Table 5-55). Lower odds of suboptimal *PRH* were seen among children from medium (OR 0.51) and high household income (OR 0.35) compared to low (*HHI*). Variation across schools was lower than in the reference model but retained significance (MOR 1.39).

In Model 2 controlling for child-level parent perceptions of school, significantly lower odds of suboptimal *PRH* was associated with parent perceptions of medium-good (OR 0.52) and good social environment (OR 0.45) compared to poor social environment (*SocEnv*). Medium-poor, medium-good and good health promoting environment (*HPE*) were each associated with a lower odds of suboptimal *PRH* but did not reach significance (OR 0.69, 0.67 and 0.68 respectively). Variation across schools was slightly lower than in the reference model but retained significance (MOR 1.47).

In the full child-level model (Model 3) the significant odds of suboptimal *PRH* were marginally attenuated from Models 1 and 2 but retained significance. School-level variation was lower than in the reference model (MOR 1.38) but only very slightly lower than in Model 1.

Table 5-55 Adjusted models: Parent-rated child health (*PRH*), deciduous subset, child-level models (Models 1–3)

		Model no.					
		1		2		3	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc	Metropolitan	Ref				Ref	
	Non-metropolitan	0.80	0.56–1.15			0.80	0.55–1.15
PCOB	Australia	Ref				Ref	
	Other	1.57**	1.20–2.07			1.59**	1.20–2.10
HCC	Has HCC	Ref				Ref	
	No HCC	0.88	0.65–1.21			0.89	0.65–1.21
PEduc	School	Ref				Ref	
	Vocational	0.92	0.54–1.56			0.96	0.56–1.64
	Tertiary	0.78	0.50–1.21			0.81	0.51–1.27
HHI	Low	Ref				Ref	
	Medium	0.51**	0.35–0.75			0.52**	0.35–0.76
	High	0.35***	0.21–0.57			0.38***	0.23–0.62
SocEnv	Poor			Ref		Ref	
	Medium-poor			0.77	0.52–1.16	0.86	0.55–1.32
	Medium-good			0.52**	0.33–0.81	0.55**	0.34–0.90
	Good			0.45***	0.28–0.72	0.51**	0.31–0.85
HPE	Poor			Ref		Ref	
	Medium-poor			0.69	0.44–1.07	0.71	0.44–1.15
	Medium-good			0.67	0.42–1.05	0.76	0.47–1.24
	Good			0.68	0.42–1.09	0.79	0.48–1.31
QualBGC	Poor			Ref		Ref	
	Medium			1.12	0.75–1.68	1.11	0.72–1.70
	Good			0.89	0.56–1.43	0.90	0.55–1.49
QualTch	Poor			Ref		Ref	
	Medium			0.92	0.58–1.47	0.91	0.55–1.51
	Good			0.79	0.47–1.32	0.76	0.43–1.34
MOR		1.39	1.13–1.72	1.47	1.19–1.81	1.38	1.11–1.71

Models are for suboptimal parent ratings of child health; Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 4 controlling for school characteristics, children attending a primary-only school (*S_SchType*) had significantly higher odds of suboptimal *PRH* (OR 1.62) compared to those attending a combined school (Table 5-56). Significantly lower odds were seen among children attending a medium-low (OR 0.49), medium-high (OR 0.46) or high school socioeconomic status (SES) school (OR 0.45) compared to low school SES (*S_SchSES*). Children at a school with high percent non-English speaking background (NESB) children (*S_NESB*) had significantly higher odds of suboptimal *PRH* (OR 1.70) compared with children at low NESB children schools. The variation across schools was non-significant (MOR 1.12).

In Model 5, children at schools with good school-level parent involvement in volunteering (*S_Volunt*) had significantly lower odds of suboptimal *PRH* (OR 0.52) when compared to schools with poor school-level parent involvement in volunteering. Good school quality (*S_SchQual*) was associated with lower odds of suboptimal *PRH* (OR 0.54) but significance was not reached. School-level variation was lower than in the reference model but remained significant (MOR 1.35).

In the full school-level model (Model 6) a significant association remained from Model 4 with medium-low school SES demonstrating lower odds of suboptimal *PRH* (OR 0.55). All other significant associations disappeared once Models 4 and 5 were combined. Medium-high school SES schools marginally lost significance (OR 0.57) from Model 4. Variation across schools was non-significant (MOR 1.14), being slightly higher than the level seen in Model 4.

Table 5-56 Adjusted models: Parent-rated child health (*PRH*), deciduous subset, school-level models (Models 4–6)

		Model no.					
		4		5		6	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
S_SchType	Combined	Ref				Ref	
	Primary	1.62*	1.10–2.38			1.34	0.87–2.06
	Secondary						
S_SchSES	Low	Ref				Ref	
	Medium-low	0.49**	0.31–0.79			0.55*	0.32–0.97
	Medium-high	0.46**	0.28–0.75			0.57	0.30–1.05
	High	0.45**	0.27–0.76			0.58	0.29–1.14
S_SchSize	Small	Ref				Ref	
	Medium-small	0.80	0.49–1.29			0.79	0.47–1.35
	Medium-large	0.78	0.46–1.32			0.72	0.38–1.35
	Large	1.29	0.68–2.44			1.31	0.63–2.73
S_TchWkld	Low	Ref				Ref	
	Medium	1.16	0.78–1.73			1.23	0.77–1.98
	High	1.33	0.88–2.00			1.53	0.93–2.52
S_NESB	Low	Ref				Ref	
	Medium-low	0.84	0.48–1.46			0.76	0.40–1.43
	Medium-high	0.93	0.55–1.57			0.88	0.49–1.60
	High	1.70*	1.00–2.87			1.64	0.86–3.11
S_SchQual	Poor			Ref		Ref	
	Medium-poor			0.86	0.48–1.54	0.97	0.55–1.71
	Medium-good			0.66	0.36–1.22	0.71	0.39–1.28
	Good			0.54	0.28–1.02	0.94	0.47–1.88
S_Relat	Poor			Ref		Ref	
	Medium-poor			0.94	0.54–1.63	0.89	0.52–1.52
	Medium-good			0.82	0.45–1.49	0.96	0.51–1.81
	Good			0.79	0.41–1.53	0.85	0.44–1.64
S_Integ	Poor			Ref		Ref	
	Medium-poor			1.32	0.71–2.43	1.44	0.79–2.64
	Medium-good			1.14	0.60–2.17	1.30	0.69–2.45
	Good			1.15	0.61–2.18	1.11	0.59–2.10
S_HthServ	Poor			Ref		Ref	
	Medium-poor			0.85	0.47–1.55	0.81	0.46–1.44
	Medium-good			0.94	0.51–1.73	0.69	0.37–1.30
	Good			1.07	0.57–1.99	0.84	0.46–1.53
S_SupServ	Poor			Ref		Ref	
	Medium-poor			0.72	0.40–1.32	0.81	0.46–1.45
	Medium-good			0.72	0.38–1.37	0.89	0.47–1.66
	Good			0.95	0.51–1.79	1.05	0.57–1.93
S_Volunt	Poor			Ref		Ref	
	Medium-poor			0.87	0.48–1.57	1.18	0.63–2.20
	Medium-good			0.62	0.34–1.13	0.87	0.47–1.61
	Good			0.52*	0.28–0.98	0.82	0.42–1.59
S_ChSick	Poor			Ref		Ref	
	Medium-poor			0.98	0.54–1.79	0.81	0.46–1.46
	Medium-good			0.81	0.44–1.52	0.66	0.36–1.21
	Good			0.93	0.48–1.78	0.74	0.39–1.41
MOR		1.12	0.96–1.32	1.35	1.11–1.66	1.14	0.95–1.36

Models are for suboptimal parent ratings of child health; Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 7 (Table 5-57), significance was retained from Models 1 and 3 in odds ratios for categories under parent country of birth (*PCOB*), household income (*HHI*) and social environment (*SocEnv*). Medium-high school SES (*S_SchSES*) was associated with significantly lower odds of suboptimal *PRH* (OR 0.55) when compared to low school SES. Significance was not evident for medium-low (OR 0.59) and high (OR 0.66) school SES, while medium-low school SES lost significance from Models 4 and 6 by a small margin (OR 0.59).

In Model 8, significance was retained only for categories under sociodemographic variables parent country of birth and household income from Model 1, though significance was lost from Models 4 and 6 by a small margin for medium-low school SES (OR 0.56).

School-level variation in suboptimal *PRH* was lower than in the reference model and was of equal variation in Models 7 and 8 (MOR 1.21 for both). Both reached non-significance. The block of variables that reduced the variation across schools by the greatest amount was school characteristics (MOR 1.12), followed by school-level parent perceptions of school (MOR 1.35) and sociodemographic variables (MOR 1.39).

Table 5-57 Adjusted models: Parent-rated child health (*PRH*), deciduous subset, multilevel models (Models 7–8)

	Model no.					Model no.			
	7		8			7		8	
Category	Adj. OR	95% CI	Adj. OR	95% CI	Category	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc					***SocEnv***				
Metro	Ref		Ref		Poor	Ref			
Non-metro	1.20	0.75–1.92	1.32	0.80–2.17	Medium-poor	0.85	0.55–1.32		
PCOB					Medium-good	0.55*	0.34–0.90		
Australia	Ref		Ref		Good	0.52**	0.31–0.87		
Other	1.51**	1.13–2.02	1.46*	1.09–1.95	***HPE***				
HCC					Poor	Ref			
Has HCC	Ref		Ref		Medium-poor	0.71	0.43–1.15		
No HCC	0.90	0.65–1.23	0.90	0.65–1.24	Medium-good	0.77	0.47–1.25		
PEduc					Good	0.77	0.46–1.28		
School	Ref		Ref		***QualBGC***				
Vocational	1.01	0.59–1.74	0.99	0.57–1.73	Poor	Ref			
Tertiary	0.86	0.54–1.38	0.87	0.54–1.40	Medium	1.09	0.71–1.68		
HHI					Good	0.94	0.57–1.55		
Low	Ref		Ref		***QualTch***				
Medium	0.57**	0.39–0.85	0.57**	0.38–0.85	Poor	Ref			
High	0.44**	0.26–0.75	0.41**	0.24–0.69	Medium	0.96	0.58–1.61		
					Good	0.83	0.47–1.47		
S_SchType					***S_SchQual***				
Combined	Ref		Ref		Poor			Ref	
Primary	1.52	0.98–2.38	1.28	0.78–2.08	Medium-poor			0.96	0.51–1.80
Secondary					Medium-good			0.63	0.33–1.21
					Good			0.87	0.40–1.88
S_SchSES					***S_Relat***				
Low	Ref		Ref		Poor			Ref	
Medium-low	0.59	0.34–1.01	0.56	0.30–1.05	Medium-poor			0.99	0.55–1.80
Medium-high	0.55*	0.31–0.97	0.56	0.28–1.13	Medium-good			1.17	0.58–2.36
High	0.66	0.35–1.23	0.70	0.32–1.52	Good			1.07	0.51–2.26
S_SchSize					***S_Integ***				
Small	Ref		Ref		Poor			Ref	
Medium-small	0.82	0.48–1.41	0.78	0.43–1.41	Medium-poor			1.73	0.88–3.41
Medium-large	0.78	0.43–1.42	0.71	0.36–1.42	Medium-good			1.32	0.65–2.68
Large	1.02	0.48–2.16	1.13	0.49–2.61	Good			1.11	0.55–2.23
S_TchWkld					***S_HthServ***				
Low	Ref		Ref		Poor			Ref	
Medium	1.23	0.78–1.93	1.45	0.86–2.45	Medium-poor			0.79	0.42–1.49
High	1.08	0.67–1.74	1.27	0.73–2.22	Medium-good			0.59	0.29–1.18
					Good			0.85	0.44–1.67
S_NESB					***S_SupServ***				
Low	Ref		Ref		Poor			Ref	
Medium-low	0.86	0.46–1.61	0.73	0.36–1.49	Medium-poor			0.84	0.44–1.59
Medium-high	1.15	0.59–2.23	1.14	0.56–2.33	Medium-good			0.86	0.43–1.73
High	1.83	0.91–3.69	1.95	0.87–4.39	Good			1.05	0.53–2.09
					S_Volunt				
					Poor			Ref	
					Medium-poor			1.30	0.65–2.59
					Medium-good			1.03	0.52–2.03
					Good			0.99	0.48–2.03
					S_ChSick				
					Poor			Ref	
					Medium-poor			0.78	0.41–1.47
					Medium-good			0.62	0.31–1.20
					Good			0.70	0.35–1.43
MOR	1.21	0.98–1.49	1.21	0.97–1.51	MOR	1.21	0.98–1.49	1.21	0.97–1.51

Models are for suboptimal parent ratings of child health; Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

MOR = Median odds ratio

5.3.3.2.2 Parent-rated child oral health

The reference model (Model 0) for suboptimal parent-rated oral health (*PROH*) in the deciduous subset saw odds of a suboptimal rating significantly higher among older age groups compared to five-year-olds (Table 5-58). Odds were highest among 10-year old children with two-and-a-half times the odds of suboptimal *PROH* (OR 2.48). Females had significantly lower odds of suboptimal *PROH* (OR 0.85) compared with males. Variation across schools was significant but the lower limit of the confidence interval was close to zero (MOR 1.09).

Table 5-58 Adjusted models: Parent-rated child oral health (*PROH*), deciduous subset, reference model (Model 0)

Variable	Category	Adj. OR	95% CI
Age	5	Ref	
	6	1.45	0.98–2.15
	7	1.66**	1.13–2.45
	8	2.25***	1.52–3.35
	9	2.20***	1.47–3.30
	10	2.48***	1.68–3.67
Sex	Male	Ref	
	Female	0.85*	0.74–0.99
MOR		1.09	1.02–1.17

Model is for suboptimal parent ratings of child oral health
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

When controlling for sociodemographic variables in Model 1 (Table 5-59), significantly higher odds of suboptimal *PROH* was seen among children with parents born outside of Australia (OR 1.21) compared to children of Australian-born parents (*PCOB*). Children had lower odds of suboptimal *PROH* if their parents had tertiary education (OR 0.66) compared to school-only (*PEduc*), and if they lived in medium- (OR 0.61) or high-income households (OR 0.50) compared to low-income households (*HHI*). School-level variation was lower than in the reference model bordering on non-significance (MOR 1.07).

In Model 2, children of parents who perceived medium-good and good social environment (*SocEnv*) in their child's school has significantly lower odds of suboptimal *PROH* (OR 0.73 and 0.63 respectively) compared to low social environment. The odds of suboptimal *PROH* were significantly lower among children whose parents perceived medium-good (OR 0.65) or good health promoting environment (OR 0.67) compared to poor health promoting environment (*HPE*). There were some odds ratios which were non-significant by a small margin. These included medium-poor health promoting environment (OR 0.79) compared to poor health promoting environment and medium quality of teachers (OR 0.74) compared to poor quality of teachers (*QualTch*). Variation across schools was the same as for the reference model (MOR 1.09).

In Model 3, combining variables from Models 1 and 2, significance was not affected and odds of suboptimal *PROH* were attenuated only slightly from Model 1 for sociodemographic variables parent country of birth (*PCOB)*, parent highest level of education (*PEduc*) and household income (*HHI*). Significance was lost from Model 2 for medium-good and good social environment (OR 0.82 and 0.74 respectively) compared to poor, though good social environment was non-significant by a very small margin. Medium-good and good categories of health promoting environment lost significance from Model 2, but were also non-significant by a small margin (OR 0.75 for both). The odds of suboptimal *PROH* were strengthened from Model 2 among children of parents perceiving good quality of buildings/grounds and classrooms (*QualBGC*) to the point of significance (OR 0.71), with lower odds of suboptimal *PROH* compared to poor quality. A greater amount of school-level variation was explained by Model 3 than the reference model but less than was explained by Model 1 (MOR 1.08).

Table 5-59 Adjusted models: Parent-rated child oral health (*PROH*), deciduous subset, child-level models (Models 1–3)

		Model no.					
		1		2		3	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc	Metropolitan	Ref				Ref	
	Non-metropolitan	0.89	0.72–1.09			0.89	0.73–1.10
PCOB	Australia	Ref				Ref	
	Other	1.21*	1.01–1.44			1.20*	1.00–1.43
HCC	Has HCC	Ref				Ref	
	No HCC	0.90	0.73–1.10			0.90	0.73–1.11
PEduc	School	Ref				Ref	
	Vocational	0.93	0.66–1.32			0.95	0.66–1.35
	Tertiary	0.66**	0.49–0.88			0.67**	0.50–0.91
HHI	Low	Ref				Ref	
	Medium	0.61***	0.47–0.80			0.63**	0.48–0.82
	High	0.50***	0.37–0.68			0.53***	0.39–0.73
SocEnv	Poor			Ref		Ref	
	Medium-poor			0.89	0.67–1.17	0.96	0.72–1.29
	Medium-good			0.73*	0.55–0.96	0.82	0.61–1.10
	Good			0.63**	0.47–0.84	0.74	0.54–1.01
HPE	Poor			Ref		Ref	
	Medium-poor			0.79	0.59–1.05	0.86	0.64–1.17
	Medium-good			0.65**	0.48–0.87	0.75	0.55–1.03
	Good			0.67**	0.49–0.91	0.75	0.54–1.05
QualBGC	Poor			Ref		Ref	
	Medium			0.99	0.76–1.28	0.92	0.70–1.21
	Good			0.80	0.59–1.07	0.71*	0.53–0.97
QualTch	Poor			Ref		Ref	
	Medium			0.74	0.54–1.02	0.76	0.54–1.06
	Good			0.76	0.54–1.07	0.77	0.53–1.11
MOR		1.07	1.00–1.15	1.09	1.01–1.17	1.08	1.00–1.16

Models are for suboptimal parent ratings of child oral health; Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

When controlling for school characteristics (Model 4), children attending primary schools (*S_SchType*) had significantly higher odds of suboptimal *PROH* (OR 1.28) compared to children attending combined schools (Table 5-60). School socioeconomic status (SES) was also significantly associated with suboptimal *PROH*, with lower odds at schools of medium-low (OR 0.73), medium-high (OR 0.62) and high school SES (OR 0.55) compared to low (*S_SchSES*). Variation across schools was lower than in Model 0 and non-significant (MOR 1.05).

In Model 5 controlling for school-level parent perceptions of school, no odds ratio reached significant levels. Non-significance was maintained by only a small margin for good school quality (OR 0.70) compared to poor school quality (*S_SchQual*). School-level variation was marginally lower than in Model 0 and retained significance (MOR 1.08).

Combining Models 4 and 5 in Model 6 saw the odds ratio for primary schools lose significance (OR 1.19). The same occurred for medium-low and medium-high school SES while high school SES retained significance from Model 4 (OR 0.60) compared to low school SES. All categories for school-level parent perceptions of school variables remained non-significant. More school-level variation in suboptimal *PROH* was explained by Model 6 than the reference model but less than was explained by Model 4 (MOR 1.06).

Table 5-60 Adjusted models: Parent-rated child oral health (*PROH*), deciduous subset, school-level models (Models 4–6)

		Model no.					
		4		5		6	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
S_SchType	Combined	Ref				Ref	
	Primary	1.28*	1.02–1.61			1.19	0.92–1.55
	Secondary						
S_SchSES	Low	Ref				Ref	
	Medium-low	0.73*	0.53–0.98			0.72	0.50–1.04
	Medium-high	0.62**	0.45–0.86			0.70	0.47–1.04
	High	0.55***	0.39–0.78			0.60*	0.38–0.92
S_SchSize	Small	Ref				Ref	
	Medium-small	1.11	0.82–1.48			1.12	0.80–1.56
	Medium-large	1.24	0.90–1.71			1.35	0.91–2.00
	Large	1.29	0.86–1.95			1.42	0.88–2.30
S_TchWkld	Low	Ref				Ref	
	Medium	1.08	0.85–1.37			0.99	0.74–1.31
	High	1.22	0.94–1.58			1.15	0.84–1.59
S_NESB	Low	Ref				Ref	
	Medium-low	0.77	0.56–1.07			0.80	0.55–1.17
	Medium-high	0.92	0.68–1.25			0.93	0.66–1.33
	High	1.02	0.73–1.43			1.03	0.68–1.54
S_SchQual	Poor			Ref		Ref	
	Medium-poor			1.10	0.77–1.56	1.11	0.77–1.60
	Medium-good			0.86	0.60–1.23	0.93	0.64–1.35
	Good			0.70	0.48–1.02	0.86	0.57–1.31
S_Relat	Poor			Ref		Ref	
	Medium-poor			1.02	0.74–1.41	1.06	0.75–1.48
	Medium-good			0.98	0.68–1.39	1.02	0.69–1.53
	Good			0.87	0.59–1.27	0.92	0.61–1.39
S_Integ	Poor			Ref		Ref	
	Medium-poor			1.09	0.76–1.57	1.05	0.72–1.54
	Medium-good			1.07	0.74–1.56	0.10	0.74–1.63
	Good			1.05	0.73–1.53	1.08	0.72–1.61
S_HthServ	Poor			Ref		Ref	
	Medium-poor			1.06	0.75–1.49	1.10	0.77–1.57
	Medium-good			1.06	0.75–1.52	1.08	0.74–1.59
	Good			1.16	0.81–1.66	1.20	0.82–1.75
S_SupServ	Poor			Ref		Ref	
	Medium-poor			0.95	0.67–1.36	0.95	0.66–1.37
	Medium-good			0.96	0.66–1.40	0.91	0.62–1.35
	Good			1.18	0.81–1.71	1.15	0.78–1.70
S_Volunt	Poor			Ref		Ref	
	Medium-poor			0.90	0.63–1.31	1.05	0.70–1.58
	Medium-good			0.74	0.51–1.07	0.89	0.61–1.32
	Good			0.74	0.51–1.08	0.90	0.60–1.37
S_ChSick	Poor			Ref		Ref	
	Medium-poor			1.03	0.73–1.47	1.00	0.69–1.44
	Medium-good			1.06	0.74–1.53	1.02	0.70–1.48
	Good			0.91	0.62–1.33	0.91	0.61–1.35
MOR		1.05	0.99–1.11	1.08	1.00–1.15	1.06	0.99–1.14

Models are for suboptimal parent ratings of child oral health; Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

The fully adjusted multilevel Model 7 (Table 5-61) saw significance retained from Models 1 and 3 among odds ratios of suboptimal *PROH* for children of tertiary-educated parents (OR 0.71) compared to school-only-educated parents (*PEduc*), and children of medium- (OR 0.66) and high-income households (OR 0.57) compared to low-income (*HHI*). The odds of suboptimal *PROH* for children of parents born outside of Australia (*PCOB*) attenuated from Models 1 and 3 just to the point of non-significance (OR 1.19) compared to children of Australian-born parents. There were no significant odds among any other variables. Non-significance was maintained by a small margin for good social environment (OR 0.74) compared to poor (*SocEnv*), medium-good (OR 0.75) and good health promoting environment (OR 0.75) compared to poor (*HPE*), good quality of buildings/grounds and classrooms (OR 0.73) compared to poor (*QualBGC*) and high school SES (OR 0.70) compared to low (*S_SchSES*).

In Model 8, significance was retained from Model 1 among sociodemographic variables parent country of birth (*PCOB*), parent highest level of education (*PEduc*) and household income (*HHI*) but there were no other significant effects.

More school-level variation in suboptimal *PROH* was explained by Model 7 (MOR 1.07) than Model 8 (MOR 1.08) though the difference is slight. Variation across schools was non-significant in both models. The block of variables that explained the most school-level variation was school characteristics (Model 4, MOR 1.05), followed by sociodemographic variables (Model 1, MOR 1.07) and school-level parent perceptions of school (Model 5, MOR 1.08).

Table 5-61 Adjusted models: Parent-rated child oral health (*PROH*), deciduous subset, multilevel models (Models 7–8)

	Model no.					Model no.			
	7		8			7		8	
Category	Adj. OR	95% CI	Adj. OR	95% CI	Category	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc					***SocEnv***				
Metro	Ref		Ref		Poor	Ref			
Non-metro	0.86	0.65–1.12	0.79	0.59–1.06	Medium-poor	0.96	0.72–1.29		
PCOB					Medium-good	0.82	0.61–1.10		
Australia	Ref		Ref		Good	0.74	0.54–1.01		
Other	1.19	0.99–1.43	1.21*	1.01 ,1.45	***HPE***				
HCC					Poor	Ref			
Has HCC	Ref		Ref		Medium-poor	0.87	0.64–1.18		
No HCC	0.90	0.72–1.11	0.88	0.71–1.09	Medium-good	0.75	0.55–1.03		
PEduc					Good	0.75	0.54–1.04		
School	Ref		Ref		***QualBGC***				
Vocational	0.97	0.68–1.38	0.96	0.67–1.38	Poor	Ref			
Tertiary	0.71**	0.52–0.96	0.67**	0.49–0.92	Medium	0.93	0.71–1.22		
HHI					Good	0.73	0.54–1.00		
Low	Ref		Ref		***QualTch***				
Medium	0.66**	0.50–0.86	0.65**	0.50–0.86	Poor	Ref			
High	0.57**	0.42–0.81	0.57**	0.41–0.78	Medium	0.76	0.54–1.07		
					Good	0.79	0.55–1.15		
S_SchType					***S_SchQual***				
Combined	Ref		Ref		Poor			Ref	
Primary	1.12	0.86–1.45	1.06	0.79–1.42	Medium-poor			1.13	0.76–1.68
Secondary					Medium-good			0.86	0.57–1.29
					Good			0.79	0.50–1.24
S_SchSES					***S_Relat***				
Low	Ref		Ref		Poor			Ref	
Medium-low	0.83	0.59–1.17	0.79	0.54–1.18	Medium-poor			1.18	0.82–1.70
Medium-high	0.75	0.52–1.07	0.78	0.51–1.20	Medium-good			1.18	0.77–1.82
High	0.70	0.47–1.05	0.73	0.45–1.18	Good			1.02	0.65–1.59
S_SchSize					***S_Integ***				
Small	Ref		Ref		Poor			Ref	
Medium-small	1.15	0.83–1.60	1.15	0.81–1.64	Medium-poor			1.12	0.74–1.70
Medium-large	1.17	0.82–1.68	1.23	0.81–1.88	Medium-good			1.03	0.67–1.58
Large	1.12	0.70–1.78	1.18	0.69–1.99	Good			1.08	0.70–1.66
S_TchWkld					***S_HthServ***				
Low	Ref		Ref		Poor			Ref	
Medium	1.05	0.80–1.37	0.98	0.72–1.32	Medium-poor			1.11	0.76–1.62
High	1.14	0.85–1.52	1.09	0.77–1.54	Medium-good			1.11	0.74–1.68
					Good			1.31	0.87–1.96
S_NESB					***S_SupServ***				
Low	Ref		Ref		Poor			Ref	
Medium-low	0.77	0.54–1.11	0.80	0.53–1.20	Medium-poor			1.06	0.72–1.57
Medium-high	0.90	0.61–1.31	0.87	0.58–1.32	Medium-good			1.04	0.68–1.59
High	0.89	0.58–1.35	0.88	0.55–1.42	Good			1.23	0.80–1.89
					S_Volunt				
					Poor			Ref	
					Medium-poor			1.02	0.66–1.57
					Medium-good			0.87	0.57–1.32
					Good			0.84	0.54–1.33
					S_ChSick				
					Poor			Ref	
					Medium-poor			1.07	0.72–1.59
					Medium-good			1.01	0.67–1.52
					Good			0.96	0.63–1.47
MOR	1.07	0.99–1.16	1.08	0.99–1.18	MOR	1.07	0.99–1.16	1.08	0.99–1.18

Models are for suboptimal parent ratings of child oral health; Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

MOR = Median odds ratio

5.3.3.2.3 Presence of caries

In Model 0 for presence of deciduous caries (*poc*), children aged eight and nine years had significantly higher odds of *poc* (OR 1.81 and 1.75 respectively) compared to five year olds (Table 5-62). Females had lower odds of *poc* (OR 0.81) compared to males. School-level variation was significant (MOR 1.14).

Table 5-62 Adjusted models: Presence of caries (*poc*), deciduous subset, reference model (Model 0)

Variable	Category	Adj. OR	95% CI
Age	5	Ref	
	6	1.29	0.89–1.87
	7	1.32	0.91–1.91
	8	1.81**	1.24–2.63
	9	1.75**	1.19–2.56
	10	1.40	0.96–2.04
Sex	Male	Ref	
	Female	0.81**	0.71–0.94
MOR		1.14	1.05–1.23

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 1 (Table 5-63), significantly higher odds of *poc* were seen among children residing in non-metropolitan areas (OR 1.43) compared to metropolitan (*ResLoc*), and children of parents born outside of Australia (OR 1.21) compared to children of Australian-born parents (*PCOB*). Children in medium-income households (*HHI*) had three-quarters the odds of *poc* (OR 0.77) and children in high-income households three-fifths the odds (OR 0.60) of children in low-income households. Variation across schools was lower than in the reference model but remained significant (MOR 1.09).

In Model 2 controlling for child-level parent perceptions of school, there were no significant results. School-level variation was higher than in the reference model (MOR 1.15).

When combining Models 1 and 2 in Model 3, the odds did not change from Model 1 and remained significant for children in non-metropolitan areas, children of parents born outside of Australia and children in high-income households. The odds ratio for children residing in medium-income households attenuated by 0.01 from Model 1 and lost significance by a small margin. Variation across schools was lower than in the reference model but higher than in Model 1 (MOR 1.10).

Table 5-63 Adjusted models: Presence of caries (*poc*), deciduous subset, child-level models (Models 1–3)

		Model no.					
		1		2		3	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc	Metropolitan	Ref				Ref	
	Non-metropolitan	1.43**	1.17–1.74			1.43**	1.16–1.75
PCOB	Australia	Ref				Ref	
	Other	1.21*	1.02–1.43			1.21*	1.02–1.44
HCC	Has HCC	Ref				Ref	
	No HCC	0.96	0.78–1.18			0.96	0.78–1.18
PEduc	School	Ref				Ref	
	Vocational	1.13	0.80–1.59			1.17	0.83–1.66
	Tertiary	0.86	0.64–1.15			0.90	0.67–1.21
HHI	Low	Ref				Ref	
	Medium	0.77*	0.60–1.00			0.78	0.60–1.01
	High	0.60**	0.44–0.81			0.60**	0.44–0.81
SocEnv	Poor			Ref		Ref	
	Medium-poor			1.01	0.77–1.33	1.05	0.79–1.40
	Medium-good			0.87	0.66–1.14	0.96	0.72–1.28
	Good			0.88	0.66–1.17	0.91	0.67–1.24
HPE	Poor			Ref		Ref	
	Medium-poor			0.97	0.73–1.29	1.00	0.74–1.35
	Medium-good			0.93	0.69–1.24	0.93	0.68–1.26
	Good			0.95	0.70–1.29	0.95	0.69–1.31
QualBGC	Poor			Ref		Ref	
	Medium			1.08	0.83–1.40	1.06	0.81–1.39
	Good			1.14	0.85–1.52	1.09	0.80–1.47
QualTch	Poor			Ref		Ref	
	Medium			1.02	0.74–1.41	0.99	0.70–1.39
	Good			1.00	0.71–1.42	0.99	0.68–1.43
MOR		1.09	1.01–1.17	1.15	1.05–1.25	1.10	1.02–1.19

Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 4 controlling for school characteristics, children attending schools with high teacher workload (*S_TchWkld*) had significantly higher odds of *poc* (OR 1.33) compared to children from schools with low teacher workload (Table 5-64). School-level variation was lower than in the reference model but remained significant (MOR 1.10).

In Model 5 controlling for school-level parent perceptions of school, schools with medium-good school-level provision of health services (*S_HthServ*) had significantly higher *poc* (OR 1.44) than poor school-level provision of health services. The model explained more school-level variation than the reference model, but variation remained significant (MOR 1.10).

In Model 6 combining variables from Models 4 and 5, the odds of *poc* were significantly lower (OR 0.65) at schools with high school socioeconomic status (SES) compared to low (*S_SchSES*), and higher for children at schools with high teacher workload (OR 1.38) compared to low, and medium-good school-level provision of health services (OR 1.64) compared to poor. Good school-level provision of health services was also associated with higher *poc* (OR 1.42) but did not reach significance. Medium-poor school-level child sick leave (*S_ChSick*) was significantly associated with higher *poc* (OR 1.44) compared to poor school-level child sick leave. Variation across schools was lower than in the reference model and non-significant (MOR 1.05).

Table 5-64 Adjusted models: Presence of caries (*poc*), deciduous subset, school-level models (Models 4–6)

		Model no.					
		4		5		6	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
S_SchType	Combined	Ref				Ref	
	Primary	0.90	0.71–1.14			0.81	0.63–1.04
	Secondary						
S_SchSES	Low	Ref				Ref	
	Medium-low	1.08	0.78–1.50			1.16	0.82–1.65
	Medium-high	0.75	0.53–1.05			0.87	0.59–1.28
	High	0.65	0.45–0.94			0.65*	0.42–0.99
S_SchSize	Small	Ref				Ref	
	Medium-small	0.90	0.66–1.23			0.95	0.69–1.31
	Medium-large	0.91	0.65–1.29			0.93	0.63–1.36
	Large	0.91	0.60–1.40			0.98	0.62–1.56
S_TchWkld	Low	Ref				Ref	
	Medium	1.07	0.83–1.38			1.02	0.78–1.34
	High	1.33*	1.01–1.74			1.38*	1.01–1.88
S_NESB	Low	Ref				Ref	
	Medium-low	0.98	0.70–1.38			1.03	0.72–1.49
	Medium-high	0.92	0.66–1.28			1.09	0.77–1.53
	High	0.97	0.68–1.39			1.01	0.68–1.50
S_SchQual	Poor			Ref		Ref	
	Medium-poor			1.08	0.75–1.55	1.16	0.82–1.66
	Medium-good			0.88	0.61–1.26	1.02	0.71–1.46
	Good			0.93	0.64–1.36	1.09	0.73–1.63
S_Relat	Poor			Ref		Ref	
	Medium-poor			0.87	0.62–1.21	0.88	0.64–1.23
	Medium-good			0.76	0.53–1.09	0.85	0.58–1.25
	Good			0.79	0.54–1.16	0.87	0.58–1.29
S_Integ	Poor			Ref		Ref	
	Medium-poor			1.16	0.81–1.68	1.24	0.86–1.81
	Medium-good			0.91	0.62–1.34	0.97	0.66–1.42
	Good			1.21	0.83–1.76	1.13	0.77–1.67
S_HthServ	Poor			Ref		Ref	
	Medium-poor			1.19	0.84–1.68	1.20	0.85–1.70
	Medium-good			1.44*	1.01–2.07	1.64**	1.14–2.37
	Good			1.37	0.95–1.98	1.42	0.99–2.03
S_SupServ	Poor			Ref		Ref	
	Medium-poor			0.97	0.68–1.40	0.87	0.61–1.23
	Medium-good			1.01	0.69–1.49	0.90	0.62–1.31
	Good			1.05	0.71–1.53	0.95	0.65–1.40
S_Volunt	Poor			Ref		Ref	
	Medium-poor			1.21	0.83–1.76	1.31	0.88–1.94
	Medium-good			0.86	0.59–1.26	0.96	0.66–1.40
	Good			0.98	0.66–1.44	1.11	0.73–1.67
S_ChSick	Poor			Ref		Ref	
	Medium-poor			1.31	0.91–1.88	1.44*	1.01–2.06
	Medium-good			1.30	0.90–1.90	1.33	0.92–1.91
	Good			1.16	0.79–1.70	1.31	0.90–1.93
MOR		1.10	1.02–1.18	1.10	1.02–1.19	1.05	0.98–1.13

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

MOR = Median odds ratio

In fully adjusted multilevel Model 7 (Table 5-65), odds of *poc* retained significance from Model 1 for children residing in non-metropolitan areas (OR 1.41) compared to metropolitan areas (*ResLoc*), children of parents born outside of Australia (OR 1.21) compared to Australian-born parents (*PCOB*), and children of high-income households (OR 0.64) compared to low-income households (*HHI*). There were no other significant results.

In Model 8, odds of *poc* also retained significance from Model 1 for children residing in non-metropolitan areas (OR 1.38) compared to metropolitan areas, children of parents born outside of Australia (OR 1.22) compared to Australian-born parents, and children of high-income households (OR 0.67) compared to low-income households. Odds of *poc* were significantly higher for children at schools with medium-good and good school-level provision of health services (OR 1.61 and 1.50 respectively) compared to poor (*S_HthServ*), and for medium-poor school-level child sick leave (OR 1.46) compared to poor (*S_ChSick*). Odds of *poc* were higher but marginally non-significant for children at schools with high teacher workload (OR 1.33) compared to low teacher workload (*S_TchWkld*).

A greater amount of school-level variation was explained by Model 8 (MOR 1.05) than Model 7 (MOR 1.10). The block of variables that explained the most school-level variation was sociodemographic items (Model 1, MOR 1.09), followed by school characteristics (Model 4, MOR 1.10) and school-level parent perceptions of school (Model 5, MOR 1.10).

Table 5-65 Adjusted models: Presence of caries (*poc*), deciduous subset, multilevel models (Models 7–8)

	Model no.					Model no.			
	7		8			7		8	
Category	Adj. OR	95% CI	Adj. OR	95% CI	Category	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc					***SocEnv***				
Metro	Ref		Ref		Poor	Ref			
Non-metro	1.41*	1.08–1.85	1.38*	1.05–1.80	Medium-poor	1.07	0.80–1.42		
PCOB					Medium-good	0.98	0.73–1.31		
Australia	Ref		Ref		Good	0.93	0.69–1.27		
Other	1.21*	1.02–1.45	1.22*	1.02–1.45	***HPE***				
HCC					Poor	Ref			
Has HCC	Ref		Ref		Medium-poor	1.01	0.75–1.36		
No HCC	0.96	0.78–1.19	0.95	0.77–1.17	Medium-good	0.92	0.68–1.25		
PEduc					Good	0.95	0.69–1.31		
School	Ref		Ref		***QualBGC***				
Vocational	1.18	0.84–1.68	1.13	0.79–1.61	Poor	Ref			
Tertiary	0.92	0.68–1.25	0.88	0.65–1.20	Medium	1.08	0.82–1.41		
HHI					Good	1.13	0.83–1.53		
Low	Ref		Ref		***QualTch***				
Medium	0.81	0.62–1.05	0.84	0.64–1.09	Poor	Ref			
High	0.64**	0.47–0.88	0.67**	0.49–0.92	Medium	0.99	0.70–1.40		
					Good	1.00	0.69–1.46		
S_SchType					***S_SchQual***				
Combined	Ref		Ref		Poor			Ref	
Primary	0.99	0.76–1.29	0.90	0.68–1.19	Medium-poor			1.20	0.82–1.73
Secondary					Medium-good			1.04	0.71–1.52
					Good			1.22	0.80–1.86
S_SchSES					***S_Relat***				
Low	Ref		Ref		Poor			Ref	
Medium-low	1.16	0.82–1.64	1.22	0.84–1.76	Medium-poor			0.91	0.65–1.28
Medium-high	0.82	0.57–1.18	0.92	0.61–1.37	Medium-good			0.88	0.59–1.32
High	0.81	0.54–1.22	0.79	0.50–1.25	Good			0.91	0.60–1.38
S_SchSize					***S_Integ***				
Small	Ref		Ref		Poor			Ref	
Medium-small	0.99	0.71–1.38	1.03	0.74–1.43	Medium-poor			1.24	0.84–1.83
Medium-large	0.96	0.67–1.38	0.93	0.63–1.39	Medium-good			0.92	0.62–1.38
Large	1.02	0.64–1.63	1.08	0.66–1.76	Good			1.08	0.72–1.61
S_TchWkld					***S_HthServ***				
Low	Ref		Ref		Poor			Ref	
Medium	1.18	0.90–1.54	1.12	0.85–1.48	Medium-poor			1.20	0.84–1.71
High	1.24	0.92–1.67	1.33	0.96–1.85	Medium-good			1.61**	1.09–2.36
					Good			1.50*	1.03–2.19
S_NESB					***S_SupServ***				
Low	Ref		Ref		Poor			Ref	
Medium-low	1.05	0.73–1.50	1.06	0.73–1.55	Medium-poor			0.95	0.66–1.37
Medium-high	1.08	0.73–1.59	1.24	0.84–1.83	Medium-good			0.96	0.65–1.42
High	1.11	0.73–1.70	1.09	0.69–1.72	Good			0.90	0.60–1.34
					S_Volunt				
					Poor			Ref	
					Medium-poor			1.26	0.84–1.90
					Medium-good			0.98	0.66–1.45
					Good			1.05	0.69–1.62
					S_ChSick				
					Poor			Ref	
					Medium-poor			1.46*	1.01–2.12
					Medium-good			1.31	0.89–1.92
					Good			1.39	0.93–2.07
MOR	1.10	1.02–1.20	1.05	0.97–1.14	MOR	1.10	1.02–1.20	1.05	0.97–1.14

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

MOR = Median odds ratio

5.3.3.2.4 Decayed, missing and filled surfaces

In Model 0 (Table 5-66) age was statistically associated with higher decayed, missing and filled deciduous surfaces (*dmfs*), with a beta coefficient of 0.14, and being female was associated with a lower *dmfs* (β -0.66). School-level variation (SLV) was significant (0.69) and accounted for 2.5% of total variance as demonstrated by the intraclass correlation (ICC).

Table 5-66 Adjusted models: Decayed, missing and filled surfaces (*dmfs*), deciduous subset, reference model (Model 0)

Variable	Category	Adj. β	95% CI
Intercept		2.65***	2.37–2.93
Age	Mean-centred	0.14**	0.04–0.24
Sex	Male	Ref	
	Female	-0.66**	-1.01—0.31
SLV (Error)		0.69**	(0.23)
Total variance		26.55	
ICC		2.5%	
AIC		21348.8	

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
Intercept = mean of outcome for reference group; SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

In Model 1 (Table 5-67), significantly higher *dmfs* was seen among children living in a non-metropolitan areas (β 0.75) compared to metropolitan (*ResLoc*) and children with parents born outside of Australia (β 0.40) compared to Australian-born parents (*ResLoc*). Among children of parents with tertiary education (*PEduc*), *dmfs* was significantly lower (β -0.58) than among children of parents with school-only education. Children from medium- and high-income households (*HHI*) had lower *dmfs* (β -0.58 and -0.83 respectively) than children from low-income households. SLV was lower than in Model 0 (0.38) and accounted for less of the total variance (ICC 1.5%).

In Model 2, controlling for child-level parent perceptions of school, there were no significant effects. SLV in *dmfs* was slightly higher than in Model 0 (0.72) and accounted for more of total variance (ICC 2.6%).

In Model 3, controlling for variables from Models 1 and 2, significance was lost for children of parents with tertiary education (β -0.55) but all other significant results from Model 1 remained significant. SLV (0.41) and ICC (1.6%) were lower than in Model 0 but higher than in Model 1.

Table 5-67 Adjusted models: Decayed, missing and filled surfaces (*dmfs*), deciduous subset, child-level models (Models 1–3)

		Model no.					
		1		2		3	
Variable	Category	Adj. β	95% CI	Adj. β	95% CI	Adj. β	95% CI
Intercept		3.46***	2.76–4.15	2.42***	1.68–3.16	3.20***	2.24–4.15
ResLoc	Metropolitan	Ref				Ref	
	Non-metropolitan	0.75**	0.32–1.18			0.70**	0.6–1.14
PCOB	Australia	Ref				Ref	
	Other	0.40*	0.01–0.80			0.41*	0.01–0.81
HCC	Has HCC	Ref				Ref	
	No HCC	-0.36	-0.83–0.12			-0.37	-0.86–0.11
PEduc	School	Ref				Ref	
	Vocational	-0.20	-0.88–0.48			-0.18	-0.87–0.51
	Tertiary	-0.58*	-1.16–-0.00			-0.55	-1.14–0.04
HHI	Low	Ref				Ref	
	Medium	-0.58*	-1.09–-0.07			-0.62*	-1.13–-0.10
	High	-0.83**	-1.42–-0.24			-0.92**	-1.52–-0.32
SocEnv	Poor			Ref		Ref	
	Medium-poor			0.11	-0.40–0.62	0.27	-0.24–0.78
	Medium-good			-0.02	-0.53–0.49	0.28	-0.23–0.78
	Good			-0.14	-0.67–0.40	0.17	-0.36–0.71
HPE	Poor			Ref		Ref	
	Medium-poor			-0.16	-0.69–0.37	-0.04	-0.57–0.49
	Medium-good			-0.12	-0.66–0.41	-0.08	-0.61–0.46
	Good			-0.05	-0.61–0.51	0.11	-0.46–0.67
QualBGC	Poor			Ref		Ref	
	Medium			0.19	-0.33–0.72	-0.00	-0.52–0.52
	Good			0.51	-0.08–1.09	0.24	-0.34–0.82
QualTch	Poor			Ref		Ref	
	Medium			0.18	-0.48–0.84	0.11	-0.55–0.78
	Good			-0.08	-0.78–0.63	-0.06	-0.77–0.66
SLV (Error)		0.38*	(0.20)	0.72**	(0.24)	0.41*	(0.20)
Total variance		24.96		27.42		25.08	
ICC		1.5%		2.6%		1.6%	
AIC		19556.1		21038.7		19274.2	

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

Intercept = mean of outcome for reference group; SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

In Model 4 (Table 5-68), lower *dmfs* was seen among children attending schools with medium-high (β -0.88) or high (β -0.90) school socioeconomic status (SES) compared to low school SES (*S_SchSES*). Schools with medium teacher workload (*S_TchWkld*) saw lower *dmfs* among children (β -0.48) compared to low workload but significance was not reached. SLV (0.60) was lower than in the reference model and remained significant. ICC (2.1%) was also lower.

In Model 5, children at schools with medium-poor school-level parent involvement in volunteering (*S_Volunt*) had significantly higher *dmfs* (β 0.71) than poor school-level parent involvement in volunteering. SLV was at a similar significant level to Model 0 (0.67) and ICC was the same (2.5%).

In Model 6, combining Models 4 and 5, significance was retained from Model 4 for high school SES (β -1.15) and medium-poor school-level parent involvement in volunteering (β 0.98). Significance was lost from Model 5 by a small margin for medium-high school SES (β -0.70) and gained for good school integration (β 0.79) compared to poor integration (*S_Integ*). Compared to the reference model SLV was lower (0.55) as was the ICC (2.0%).

Table 5-68 Adjusted models: Decayed, missing and filled surfaces (*dmfs*), deciduous subset, school-level models (Models 4–6)

		Model no.					
		4		5		6	
Variable	Category	Adj. β	95% CI	Adj. β	95% CI	Adj. β	95% CI
Intercept		3.31***	2.57–4.05	2.01**	1.01–3.01	2.02**	0.78–3.26
S_SchType	Combined	Ref				Ref	
	Primary	-0.05	-0.64–0.54			-0.25	-0.90–0.40
	Secondary						
S_SchSES	Low	Ref				Ref	
	Medium-low	0.04	-0.57–0.66			-0.06	-0.75–0.64
	Medium-high	-0.88**	-1.51–-0.25			-0.70	-1.45–0.05
	High	-0.90**	-1.57–-0.22			-1.15**	-1.98–-0.32
S_SchSize	Small	Ref				Ref	
	Medium-small	0.07	-0.50–0.65			0.29	-0.33–0.91
	Medium-large	0.14	-0.50–0.77			0.44	-0.30–1.18
	Large	-0.08	-0.88–0.71			0.48	-0.42–1.39
S_TchWkld	Low	Ref				Ref	
	Medium	-0.48	-1.00–0.04			-0.50	-1.08–0.08
	High	-0.17	-0.73–0.39			-0.14	-0.81–0.52
S_NESB	Low	Ref				Ref	
	Medium-low	-0.26	-0.88–0.36			-0.38	-1.08–0.32
	Medium-high	-0.10	-0.71–0.51			0.11	-0.56–0.78
	High	0.18	-0.48–0.85			0.25	-0.53–1.02
S_SchQual	Poor			Ref		Ref	
	Medium-poor			0.24	-0.44–0.92	0.21	-0.49–0.90
	Medium-good			-0.24	-0.92–0.44	-0.11	-0.81–0.59
	Good			0.18	-0.52–0.89	0.33	-0.45–1.11
S_Relat	Poor			Ref		Ref	
	Medium-poor			-0.00	-0.63–0.63	0.08	-0.57–0.72
	Medium-good			-0.38	-1.05–0.30	-0.30	-1.06–0.45
	Good			-0.18	-0.90–0.54	0.02	-0.75–0.79
S_Integ	Poor			Ref		Ref	
	Medium-poor			0.53	-0.15–1.21	0.63	-0.10–1.35
	Medium-good			0.14	-0.57–0.85	0.36	-0.39–1.10
	Good			0.61	-0.09–1.32	0.79*	0.03–1.54
S_HthServ	Poor			Ref		Ref	
	Medium-poor			0.17	-0.48–0.81	0.34	-0.32–0.99
	Medium-good			0.38	-0.29–1.06	0.57	-0.14–1.28
	Good			0.25	-0.44–0.94	0.38	-0.32–1.09
S_SupServ	Poor			Ref		Ref	
	Medium-poor			-0.13	-0.81–0.55	-0.35	-1.04–0.34
	Medium-good			-0.32	-1.03–0.39	-0.69	-1.42–0.05
	Good			-0.29	-1.01–0.42	-0.48	-1.22–0.26
S_Volunt	Poor			Ref		Ref	
	Medium-poor			0.71*	0.01–1.42	0.98*	0.21–1.75
	Medium-good			0.09	-0.61–0.79	0.41	-0.32–1.14
	Good			0.49	-0.24–1.21	0.67	-0.13–1.46
S_ChSick	Poor			Ref		Ref	
	Medium-poor			0.04	-0.63–0.71	0.23	-0.47–0.92
	Medium-good			0.08	-0.62–0.78	0.12	-0.59–0.83
	Good			-0.23	-0.95–0.48	0.03	-0.71–0.76
SLV (Error)		0.60**	(0.22)	0.67**	(0.24)	0.55*	(0.24)
Total variance		27.12		27.01		26.90	
ICC		2.1%		2.5%		2.0%	
AIC		21335.2		20944.2		20930.3	

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

Intercept = mean of outcome for reference group; SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

In fully adjusted Model 7 (Table 5-69 and Table 5-70), significant differences in *dmfs* were produced for children in non-metropolitan areas (β 0.91) compared to metropolitan (*ResLoc*), and children from medium- (β -0.58) or high-income households (β -0.84) compared to low-income households (*HHI*). The beta coefficient was not significant for children of parents born outside of Australia (β 0.40) compared to children of Australian-born parents (*PCOB*). Children attending a school with medium-high school SES (*S_SchSES*) had significantly lower *dmfs* (β -0.74) than at schools with low school SES but significance was lost from Models 4 and 6 for high school SES schools (β -0.35).

In Model 8, significance was retained from Models 1 and 3 for children in non-metropolitan areas (β 1.02) and in high-income households (β -0.62), but was lost among children of parents born outside of Australia (β 0.35) compared to Australian-born, of parents with tertiary education (β -0.56) compared to school-only education (*PEduc*) and in a household with medium household income (β -0.38) compared to low. Significance was lost by a small margin for tertiary parent highest level of education. The beta coefficient demonstrated higher *dmfs* among children at schools with large school size (β 0.92) compared to small (*S_SchSize*). Good school integration (*S_Integ*) continued to show association with higher *dmfs* (β 0.71), and medium-poor integration also demonstrated significance (β 0.70) in this model. Significantly higher dmfs was associated with medium-poor school-level parent involvement in volunteering (β 0.86) compared to poor school-level parent involvement in volunteering (*S_Volunt*).

SLV for Model 8 (0.29) was below that for Model 7 (0.36). The ICC was lower in Model 8 (1.2%) than Model 7 (1.4%). Model fit was slightly better for Model 8 than Model 7 (AIC 19195.8 vs 19266.4). The block of variables that accounted for the most variance was sociodemographic variables (Model 1, ICC 1.5%) followed by school characteristics (Model 4, ICC 2.1%) and school-level parent perceptions of school (Model 5, ICC 2.5%).

Table 5-69 Adjusted models: Decayed, missing and filled surfaces (*dmfs*), deciduous subset, multilevel models (Models 7–8), Part 1

	Model no.			
	7		8	
Category	Adj. β	95% CI	Adj. β	95% CI
Intercept	2.82***	1.54–4.10	1.70*	0.28–3.11
ResLoc				
Metro	Ref		Ref	
Non-metro	0.91**	0.34–1.48	1.02**	0.43–1.60
PCOB				
Australia	Ref		Ref	
Other	0.40	-0.01–0.80	0.35	-0.05–0.76
HCC				
Has HCC	Ref		Ref	
No HCC	-0.39	-0.87–0.09	-0.42	-0.90–0.07
PEduc				
School	Ref		Ref	
Vocational	-0.14	-0.83–0.55	-0.14	-0.84–0.56
Tertiary	-0.54	-1.14–0.05	-0.56	-1.15–0.04
HHI				
Low	Ref		Ref	
Medium	-0.58*	-1.11–-0.06	-0.38	-0.91–0.15
High	-0.84**	-1.46–-0.22	-0.62*	-1.24–-0.01

	Model no.		
	7		8
Category	Adj. β	95% CI	Adj. β 95% CI
SocEnv			
Poor	Ref		
Medium-poor	0.28	-0.23–0.79	
Medium-good	0.29	-0.21–0.80	
Good	0.20	-0.34–0.73	
HPE			
Poor	Ref		
Medium-poor	-0.04	-0.57–0.49	
Medium-good	-0.06	-0.60–0.48	
Good	0.12	-0.45–0.69	
QualBGC			
Poor	Ref		
Medium	0.00	-0.52–0.52	
Good	0.31	-0.28–0.89	
QualTch			
Poor	Ref		
Medium	0.10	-0.57–0.77	
Good	-0.05	-0.77–0.66	

Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
Intercept = mean of outcome for reference group

Table 5-70 Adjusted models: Decayed, missing and filled surfaces (*dmfs*), deciduous subset, multilevel models (Models 7–8), Part 2

	Model no.					Model no.			
	7		8			7		8	
Category	Adj. β	95% CI	Adj. β	95% CI	Category	Adj. β	95% CI	Adj. β	95% CI
S_SchType					***S_SchQual***				
Combined	Ref		Ref		Poor			Ref	
Primary	0.32	-0.27–0.91	0.16	-0.47–0.80	Medium-poor			0.36	-0.30–1.01
Secondary					Medium-good			-0.07	-0.73–0.58
					Good			0.59	-0.14–1.33
S_SchSES					***S_Relat***				
Low	Ref		Ref		Poor			Ref	
Medium-low	0.11	-0.48–0.70	-0.10	-0.76–0.55	Medium-poor			0.12	-0.48–0.72
Medium-high	-0.74*	-1.35–-0.13	-0.63	-1.34–0.08	Medium-good			-0.27	-0.97–0.43
High	-0.35	-1.04–0.33	-0.68	-1.48–0.12	Good			0.09	-0.64–0.81
S_SchSize					***S_Integ***				
Small	Ref		Ref		Poor			Ref	
Medium-small	0.40	-0.15–0.96	0.55	-0.03–1.13	Medium-poor			0.70*	0.02–1.37
Medium-large	0.32	-0.30–0.93	0.49	-0.20–1.18	Medium-good			0.29	-0.41–0.99
Large	0.41	-0.38–1.21	0.92*	0.05–1.78	Good			0.71*	0.01–1.42
S_TchWkld					***S_HthServ***				
Low	Ref		Ref		Poor			Ref	
Medium	-0.25	-0.74–0.25	-0.29	-0.82–0.25	Medium-poor			0.39	-0.23–1.00
High	-0.27	-0.81–0.28	-0.17	-0.79–0.45	Medium-good			0.52	-0.14–1.19
					Good			0.51	-0.15–1.17
S_NESB					***S_SupServ***				
Low	Ref		Ref		Poor			Ref	
Medium-low	-0.11	-0.71–0.50	-0.30	-0.95–0.36	Medium-poor			-0.15	-0.80–0.49
Medium-high	0.31	-0.33–0.96	0.50	-0.17–1.17	Medium-good			-0.52	-1.21–0.16
High	0.39	-0.31–1.10	0.38	-0.40–1.17	Good			-0.58	-1.28–0.12
					S_Volunt				
					Poor			Ref	
					Medium-poor			0.86*	0.14–1.58
					Medium-good			0.35	-0.33–1.04
					Good			0.43	-0.31–1.17
					S_ChSick				
					Poor			Ref	
					Medium-poor			0.31	-0.34–0.95
					Medium-good			0.12	-0.55–0.78
					Good			0.19	-0.50–0.88
SLV (Error)	0.36*	(0.20)	0.29	(0.21)	SLV (Error)	0.36*	(0.20)	0.29	(0.21)
Total variance	25.03		24.65		Total variance	25.03		24.65	
ICC	1.4%		1.2%		ICC	1.4%		1.2%	
AIC	19266.4		19195.8		AIC	19266.4		19195.8	

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

5.3.3.2.5 Untreated decayed surfaces

The reference model (Model 0) demonstrated a significantly lower average of untreated decayed deciduous surfaces (*ud*) among females (β -0.29) than males (Table 5-71). School-level variation (SLV) was significant (0.24) and accounted for 4.0% of total variance as indicated by the intraclass correlation (ICC).

Table 5-71 Adjusted models: Untreated decayed surfaces (*ud*), deciduous subset, reference model (Model 0)

Variable	Category	Adj. β	95% CI
Intercept		1.02***	0.88–1.15
Age	Mean-centred	-0.02	-0.06–0.03
Sex	Male	Ref	
	Female	-0.29**	-0.45–-0.13
SLV (Error)		0.24***	(0.06)
Total variance		5.84	
ICC		4.0%	
AIC		15976.5	

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
Intercept = mean of outcome for reference group; SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

In a model controlling for sociodemographic variables (Model 1) children of parents born outside of Australia (*PCOB*) had significantly higher *ud* (β 0.27) than those of Australian-born parents (Table 5-72). Children had lower ud if they had parents with tertiary education (β -0.38) compared to school-level education (*PEduc*) or lived in a medium- (β -0.40) or high-income household (β -0.67) compared to low-income (*HHI*). SLV was less than in Model 0 (0.14) and still significant, and accounted for a smaller percent of total variance (ICC 2.6%).

In Model 2 controlling for child-level parent perceptions of school, no parent perception variables demonstrated significance. SLV of *ud* was not lower (0.24) and accounted for more of the total variance (ICC 4.1%) than Model 0.

In Model 3, significant associations with *ud* remained from Model 1 for children of parents born outside of Australia (β 0.26), of parents with tertiary education (β -0.36) and living in medium- (β -0.41) or high-income households (β -0.71). The model had lower SLV (0.15) than Model 0 but SLV was higher than in Model 1. The same pattern was seen for the ICC (2.7%). The variance remained significant.

Table 5-72 Adjusted models: Untreated decayed surfaces (*ud*), deciduous subset, child-level models (Models 1–3)

		Model no.					
		1		2		3	
Variable	Category	Adj. β	95% CI	Adj. β	95% CI	Adj. β	95% CI
Intercept		1.58***	1.25–1.90	1.02***	0.67–1.36	1.45***	1.01–1.90
ResLoc	Metropolitan	Ref				Ref	
	Non-metropolitan	0.07	-0.15–0.28			0.03	-0.18–0.25
PCOB	Australia	Ref				Ref	
	Other	0.27**	0.09–0.46			0.26**	0.08–0.45
HCC	Has HCC	Ref				Ref	
	No HCC	-0.01	-0.23–0.22			0.00	-0.22–0.23
PEduc	School	Ref				Ref	
	Vocational	-0.21	-0.53–0.10			-0.19	-0.51–0.13
	Tertiary	-0.38**	-0.65–0.11			-0.36**	-0.63–-0.09
HHI	Low	Ref				Ref	
	Medium	-0.40**	-0.64–-0.16			-0.41**	-0.65–-0.17
	High	-0.67***	-0.94–-0.39			-0.71***	-0.99–-0.43
SocEnv	Poor			Ref		Ref	
	Medium-poor			-0.01	-0.24–0.22	0.07	-0.16–0.31
	Medium-good			-0.12	-0.35–0.12	0.01	-0.22–0.25
	Good			-0.13	-0.37–0.12	0.05	-0.20–0.30
HPE	Poor			Ref		Ref	
	Medium-poor			-0.14	-0.38–0.11	0.01	-0.24–0.26
	Medium-good			-0.15	-0.39–0.10	-0.09	-0.31–0.19
	Good			-0.01	-0.27–0.25	0.13	-0.13–0.39
QualBGC	Poor			Ref		Ref	
	Medium			0.09	-0.15–0.33	0.02	-0.22–0.26
	Good			0.16	-0.12–0.43	0.07	-0.20–0.34
QualTch	Poor			Ref		Ref	
	Medium			0.03	-0.27–0.34	0.06	-0.26–0.36
	Good			0.03	-0.30–0.36	0.01	-0.31–0.34
SLV (Error)		0.14**	(0.05)	0.24***	(0.06)	0.15**	(0.05)
Total variance		5.41		5.85		5.41	
ICC		2.6%		4.1%		2.7%	
AIC		14621.0		15751.5		14416.4	

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

Intercept = mean of outcome for reference group; SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

In Model 4 (Table 5-73), children had significantly lower *ud* if they attended a school with medium-low (β -0.30), medium-high (β -0.49) or high (β -0.59) school socioeconomic status (SES) compared to low school SES (*S_SchSES*). Higher *ud* was seen among children at schools with high teacher workload (β 0.46) compared to low teacher workload (*S_TchWkld*). SLV was lower than in the reference model (0.13) as was the ICC (2.3%). The variance remained significant.

In Model 5, significantly lower *ud* was associated with medium-good school relations (β -0.42) compared to poor school relations (*S_Relat*) and higher *ud* was associated with medium-poor (β 0.52), medium-good (β 0.60) and good school-level provision of health services (β 0.62) compared to poor school-level provision of health services (*S_HthServ*). Children at schools with medium-good and good school-level provision of support service (*S_SupServ*) had lower *ud* (β -0.29 and -0.32 respectively) compared to schools with low school-level provision of support service but significance was not reached. SLV was lower than in Model 0 (0.16), remaining significant, and accounted for less of the total variance (ICC 2.9%).

Among school characteristic variables in Model 6, significant results remained from Model 4 for medium-low (β -0.35), medium-high (β -0.42) and high school SES (β -0.72), and high teacher workload (β 0.51). Compared to children attending a school with low percent non-English speaking background (NESB) children (*S_NESB*), children at schools with medium-high percent NESB children had significantly lower *ud* (β -0.30). Significance was retained from Model 5 for the beta coefficient for medium-poor (β 0.53), medium-good (β 0.65) and good school-level provision of health services (β 0.61). An additional significant result was seen with significantly higher *ud* for good school quality (β 0.43) compared to poor school quality (*S_SchQual*). SLV remained significant but was lower (0.09) and accounted for less of the total variance (ICC 1.6%) than for the reference model.

Table 5-73 Adjusted models: Untreated decayed surfaces (*ud*), deciduous subset, school-level models (Models 4–6)

		Model no.					
		4		5		6	
Variable	Category	Adj. β	95% CI	Adj. β	95% CI	Adj. β	95% CI
Intercept		1.17***	0.82–1.51	0.81**	0.34–1.29	0.64*	0.09–1.19
S_SchType	Combined	Ref				Ref	
	Primary	0.13	-0.14–0.41			0.13	-0.16–0.42
	Secondary						
S_SchSES	Low	Ref				Ref	
	Medium-low	-0.30*	-0.58–-0.01			-0.35*	-0.66–-0.04
	Medium-high	-0.49**	-0.78–-0.19			-0.42*	-0.75–-0.08
	High	-0.59**	-0.91–-0.28			-0.72**	-1.09–-0.35
S_SchSize	Small	Ref				Ref	
	Medium-small	-0.08	-0.36–0.19			-0.01	-0.28–0.27
	Medium-large	-0.05	-0.34–0.25			0.05	-0.28–0.38
	Large	-0.04	-0.41–0.33			0.12	-0.29–0.52
S_TchWkld	Low	Ref				Ref	
	Medium	0.18	-0.06–0.43			0.14	-0.11–0.40
	High	0.46**	0.19–0.72			0.51**	0.22–0.81
S_NESB	Low	Ref				Ref	
	Medium-low	-0.00	-0.29–0.29			-0.13	-0.44–0.18
	Medium-high	-0.27	-0.55–0.02			-0.30*	-0.60–-0.01
	High	0.15	-0.16–0.46			0.02	-0.32–0.36
S_SchQual	Poor			Ref		Ref	
	Medium-poor			0.07	-0.25–0.39	0.22	-0.09–0.53
	Medium-good			-0.03	-0.35–0.29	0.18	-0.13–0.49
	Good			0.00	-0.33–0.34	0.43*	0.08–0.77
S_Relat	Poor			Ref		Ref	
	Medium-poor			-0.08	-0.37–0.22	-0.02	-0.30–0.27
	Medium-good			-0.42**	-0.74–-0.10	-0.21	-0.54–0.13
	Good			-0.19	-0.53–0.15	-0.04	-0.39–0.30
S_Integ	Poor			Ref		Ref	
	Medium-poor			-0.01	-0.33–0.32	-0.04	-0.36–0.28
	Medium-good			0.07	-0.27–0.40	0.02	-0.31–0.35
	Good			0.25	-0.09–0.58	0.09	-0.25–0.42
S_HthServ	Poor			Ref		Ref	
	Medium-poor			0.52**	0.22–0.83	0.53**	0.23–0.82
	Medium-good			0.60**	0.28–0.91	0.65***	0.34–0.97
	Good			0.62**	0.29–0.94	0.61**	0.30–0.93
S_SupServ	Poor			Ref		Ref	
	Medium-poor			-0.21	-0.53–0.12	-0.18	-0.49–0.12
	Medium-good			-0.29	-0.62–0.05	-0.25	-0.57–0.08
	Good			-0.32	-0.65–0.02	-0.32	-0.65–0.01
S_Volunt	Poor			Ref		Ref	
	Medium-poor			0.07	-0.26–0.40	0.17	-0.17–0.52
	Medium-good			-0.24	-0.57–0.09	-0.03	-0.36–0.29
	Good			-0.09	-0.43–0.25	0.17	-0.19–0.52
S_ChSick	Poor			Ref		Ref	
	Medium-poor			0.21	-0.11–0.53	0.09	-0.21–0.40
	Medium-good			0.12	-0.21–0.45	0.03	-0.29–0.34
	Good			0.07	-0.26–0.41	0.02	-0.31–0.35
SLV (Error)		0.13**	(0.05)	0.16**	(0.06)	0.09*	(0.05)
Total variance		5.73		5.71		5.64	
ICC		2.3%		2.9%		1.6%	
AIC		15951.4		14393.0		15653.2	

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

Intercept = mean of outcome for reference group; SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

In Model 7 controlling for sociodemographic, child-level parent perception and school characteristic variables (Table 5-74 and Table 5-75), the beta coefficient remained significant from Models 1, 3 and 4 for other parent country of birth (β 0.24) compared to Australian-born (*PCOB*), tertiary parent highest level of education (β -0.28) compared to school-only education (*PEduc*), medium (β -0.33) and high household income (β -0.57) compared to low (*HHI*), medium-high (β -0.40) and high school SES (β -0.40) compared to low (*S_SchSES*) and high teacher workload (β 0.41) compared to low (*S_TchWkld*). Significance was lost for medium-low school SES (β -0.20) and gained for medium teacher workload (β 0.25).

In Model 8, controlling for school-level parent perceptions instead of child-level, significance was retained from Model 1 for other parent country of birth (β 0.24), tertiary parent highest level of education (β -0.35), medium (β -0.290) and high household income (β -0.48). Significance was retained from Models 4 and 6 for medium-low (β -0.34), medium-high (β -0.42) and high school SES (β -0.59), and high teacher workload (β 0.48). Significance was also retained for good school quality (β 0.44) compared to poor (*S_SchQual*) from Models 5 and 6, and medium-poor (β 0.49), medium-good (β 0.59) and good school-level provision of health services (β 0.62) compared to poor (*S_HthServ*). An additional significant result appeared with good school-level provision of support service (*S_SupServ*) associated with lower *ud* (β -0.34) than poor school-level provision of support service.

Both the SLV and the ICC were lower for Model 8 (SLV 0.06, ICC 1.2%) than Model 7 (SLV 0.10, ICC 1.9%). Model fit was also slightly better in Model 8 (AIC 14388.6) than Model 7 (AIC 14411.1). The block of variables that accounted for the most variance was school characteristics (Model 4, ICC 2.3%), followed by sociodemographic variables (Model 1, ICC 2.6%) and school-level parent perceptions of school (Model 5, ICC 2.9%).

Table 5-74 Adjusted models: Untreated decayed surfaces (*ud*), deciduous subset, multilevel models (Models 7–8), part 1

	Model no.			
	7		8	
Category	Adj. β	95% CI	Adj. β	95% CI
Intercept	1.39***	0.79–1.99	1.10**	0.44–1.75
ResLoc				
Metro	Ref		Ref	
Non-metro	-0.04	-0.31–0.23	0.03	-0.24–0.31
PCOB				
Australia	Ref		Ref	
Other	0.24*	0.05–0.43	0.24*	0.06–0.43
HCC				
Has HCC	Ref		Ref	
No HCC	0.02	-0.20–0.24	-0.03	-0.25–0.20
PEduc				
School	Ref		Ref	
Vocational	-0.16	-0.48–0.16	-0.21	-0.53–0.12
Tertiary	-0.28*	-0.56–-0.01	-0.35*	-0.62–-0.07
HHI				
Low	Ref		Ref	
Medium	-0.33**	-0.58–-0.09	-0.29*	-0.53–-0.04
High	-0.57**	-0.85–-0.28	-0.48**	-0.76–-0.19
SocEnv				
Poor	Ref			
Medium-poor	0.08	-0.16–0.32		
Medium-good	0.02	-0.21–0.26		
Good	0.06	-0.19–0.31		
HPE				
Poor	Ref			
Medium-poor	0.01	-0.23–0.26		
Medium-good	-0.08	-0.33–0.17		
Good	0.11	-0.15–0.38		
QualBGC				
Poor	Ref			
Medium	0.03	-0.21–0.27		
Good	0.11	-0.16–0.38		
QualTch				
Poor	Ref			
Medium	0.09	-0.22–0.40		
Good	0.09	-0.24–0.42		

Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
Intercept = mean of outcome for reference group

Table 5-75 Adjusted models: Untreated decayed surfaces (*ud*), deciduous subset, multilevel models (Models 7–8), part 2

	Model no.					Model no.			
	7		8			7		8	
Category	Adj. β	95% CI	Adj. β	95% CI	Category	Adj. β	95% CI	Adj. β	95% CI
S_SchType					***S_SchQual***				
Combined	Ref		Ref		Poor			Ref	
Primary	0.04	-0.24–0.32	0.08	-0.22–0.37	Medium-poor			0.22	-0.08–0.53
Secondary					Medium-good			0.13	-0.18–0.43
					Good			0.44*	0.10–0.78
S_SchSES					***S_Relat***				
Low	Ref		Ref		Poor			Ref	
Medium-low	-0.20	-0.48–0.08	-0.34*	-0.64–-0.03	Medium-poor			0.00	-0.27–0.28
Medium-high	-0.40**	-0.69–-0.11	-0.42*	-0.74–-0.09	Medium-good			-0.14	-0.46–0.19
High	-0.40*	-0.73–-0.07	-0.59**	-0.96–-0.22	Good			-0.01	-0.35–0.32
S_SchSize					***S_Integ***				
Small	Ref		Ref		Poor			Ref	
Medium-small	-0.05	-0.32–0.21	-0.02	-0.29–0.25	Medium-poor			-0.05	-0.37–0.26
Medium-large	-0.05	-0.35–0.24	0.03	-0.29–0.35	Medium-good			-0.00	-0.33–0.32
Large	-0.08	-0.46–0.30	0.08	-0.32–0.48	Good			0.06	-0.26–0.39
S_TchWkld					***S_HthServ***				
Low	Ref		Ref		Poor			Ref	
Medium	0.25*	0.01–0.48	0.19	-0.06–0.44	Medium-poor			0.49**	0.21–0.78
High	0.41**	0.16–0.67	0.48**	0.19–0.77	Medium-good			0.59**	0.28–0.90
					Good			0.62***	0.32–0.92
S_NESB					***S_SupServ***				
Low	Ref		Ref		Poor			Ref	
Medium-low	-0.00	-0.29–0.29	-0.11	-0.42–0.19	Medium-poor			-0.17	-0.47–0.12
Medium-high	-0.25	-0.55–0.06	-0.24	-0.55–0.07	Medium-good			-0.19	-0.51–0.13
High	0.07	-0.27–0.40	-0.06	-0.42–0.31	Good			-0.34*	-0.66–-0.01
					S_Volunt				
					Poor			Ref	
					Medium-poor			0.16	-0.18–0.49
					Medium-good			-0.01	-0.32–0.31
					Good			0.17	-0.18–0.51
					S_ChSick				
					Poor			Ref	
					Medium-poor			0.11	-0.19–0.41
					Medium-good			0.07	-0.24–0.38
					Good			0.10	-0.22–0.42
SLV (Error)	0.10*	(0.05)	0.06	(0.05)	SLV (Error)	0.10*	(0.05)	0.06	(0.05)
Total variance	5.36		5.32		Total variance	5.36		5.32	
ICC	1.9%		1.2%		ICC	1.9%		1.2%	
AIC	14411.1		14388.6		AIC	14411.1		14388.6	

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

5.3.3.3 *Permanent dentition subpopulation*

5.3.3.3.1 Parent-rated child health

In the reference Model 0 for parent-rated health (*PRH*) (Table 5-76), females had a significantly lower odds of suboptimal *PRH* (OR 0.74) compared to males. Variation across schools was significant (MOR 1.42).

Table 5-76 Adjusted models: Parent-rated child health (*PRH*), permanent subset, reference model (Model 0)

Variable	Category	Adj. OR	95% CI
Age	9	Ref	
	10	1.10	0.63–1.91
	11	0.84	0.46–1.52
	12	0.89	0.50–1.59
	13	1.21	0.67–2.18
	14	0.82	0.40–1.68
Sex	Male	Ref	
	Female	0.74*	0.58–0.94
MOR		1.42	1.14–1.75

Model is for suboptimal parent ratings of child health
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 1 controlling for sociodemographic items (Table 5-77) children had lower odds of suboptimal *PRH* if they resided in non-metropolitan (OR 0.67) compared to metropolitan areas (*ResLoc*), had parents with tertiary education (OR 0.56) compared to school-only education (*PEduc*), or lived in a medium- (OR 0.55) or high-income household (OR 0.38) compared to a low-income household (*HHI*). Children whose parents were born outside of Australia (*PCOB*) had higher odds of suboptimal *PRH* (OR 1.30) compared to children of Australian-born parents but the figure did not reach significance. School-level variation was lower than in the reference model (MOR 1.17) and was non-significant.

In Model 2 controlling for child-level parent perceptions of school, children had significantly lower odds of suboptimal *PRH* if their parents perceived medium-good (OR 0.37) or good social environment (OR 0.53) at their child's school compared to poor social environment (*SocEnv*). Parent perception of medium quality of teachers (*QualTch*) was associated with significantly lower odds of suboptimal *PRH* (OR 0.65) compared to a perception of poor quality of teachers. The odds of suboptimal *PRH* was lower for children whose parents perceived good quality of buildings/grounds and classrooms (OR 0.64) compared to poor (*QualBGC*) but the value did not reach significance. Variation across schools was lower than in Model 0 (MOR 1.29) and significant.

When the variables for Models 1 and 2 were combined in Model 3 the odds of suboptimal *PRH* for children in non-metropolitan compared to metropolitan areas strengthened (OR 0.64) from Model 1 as did the odds for children of parents born outside of Australia compared to Australian-born parents to the point of significance (OR 1.41). Significant odds associated with categories under parent highest level of education, household income, social environment and quality of teachers were slightly attenuated from Models 1 and 2 but retained significance with the exception of medium quality of teachers which lost significance by a small margin (OR 0.66). The odds of suboptimal *PRH* for children of parents who perceived good quality of buildings/grounds and classrooms was also non-significant by a small margin (OR 0.63). Variation across schools was non-significant (MOR 1.12).

Table 5-77 Adjusted models: Parent-rated child health (*PRH*), permanent subset, child-level models (Models 1–3)

		Model no.					
		1		2		3	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc	Metropolitan	Ref				Ref	
	Non-metropolitan	0.67*	0.48–0.92			0.64**	0.46–0.88
PCOB	Australia	Ref				Ref	
	Other	1.30	0.98–1.72			1.41*	1.06–1.87
HCC	Has HCC	Ref				Ref	
	No HCC	0.75	0.55–1.00			0.78	0.58–1.06
PEduc	School	Ref				Ref	
	Vocational	0.77	0.48–1.25			0.82	0.51–1.34
	Tertiary	0.56**	0.37–0.83			0.58**	0.39–0.88
HHI	Low	Ref				Ref	
	Medium	0.55**	0.38–0.79			0.59**	0.40–0.85
	High	0.38***	0.24–0.63			0.46**	0.28–0.75
SocEnv	Poor			Ref		Ref	
	Medium-poor			0.69	0.46–1.03	0.76	0.49–1.15
	Medium-good			0.37***	0.22–0.60	0.40***	0.24–0.69
	Good			0.53**	0.34–0.83	0.56*	0.34–0.91
HPE	Poor			Ref		Ref	
	Medium-poor			0.90	0.60–1.37	0.90	0.58–1.41
	Medium-good			0.89	0.56–1.39	0.91	0.57–1.47
	Good			0.97	0.60–1.58	0.99	0.59–1.67
QualBGC	Poor			Ref		Ref	
	Medium			0.97	0.66–1.42	0.94	0.63–1.41
	Good			0.64	0.40–1.01	0.63	0.39–1.03
QualTch	Poor			Ref		Ref	
	Medium			0.65*	0.43–0.98	0.66	0.43–1.02
	Good			0.70	0.43–1.12	0.71	0.43–1.19
MOR		1.17	0.97–1.42	1.29	1.06–1.58	1.12	0.93–1.35

Models are for suboptimal parent ratings of child health; Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 4 controlling for school characteristics (Table 5-78) children attending schools with high school socioeconomic status (SES) had half the odds of suboptimal *PRH* (OR 0.50) than children attending schools with low school SES (*S_SchSES*). Children had over two-and-a-half times the odds of suboptimal *PRH* (OR 2.65) if they attended a school with high percent non-English speaking background (NESB) children (*S_NESB*) compared to low percent NESB children. Lower odds of suboptimal *PRH* were seen among children at school with medium-low and medium-high school SES (OR 0.65 and 0.63 respectively) compared to low but the values did not reach significance. Variation across schools was lower than in the reference model and was not significant (MOR 1.10).

In a model controlling for school-level parent perceptions of school (Model 5) there were no significant results. School-level variation was lower than in Model 0 and bordered on non-significance (MOR 1.27).

In Model 6, combining variables from Models 4 and 5, odds of suboptimal *PRH* under school SES and percent NESB children were attenuated from Model 4. The odds for high school SES lost significance, but the odds among children at schools with high percent NESB children remained significant (OR 2.56). The model explained more school-level variation than the reference model and variance was non-significant (MOR 1.10).

Table 5-78 Adjusted models: Parent-rated child health (*PRH*), permanent subset, school-level models (Models 4–6)

		Model no.					
		4		5		6	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
S_SchType	Combined	Ref				Ref	
	Primary	1.28	0.80–2.03			1.06	0.61–1.82
	Secondary	1.39	0.83–2.32			1.66	0.81–3.41
S_SchSES	Low	Ref				Ref	
	Medium-low	0.65	0.41–1.03			0.70	0.40–1.23
	Medium-high	0.63	0.38–1.02			0.73	0.39–1.35
	High	0.50**	0.29–0.85			0.53	0.26–1.09
S_SchSize	Small	Ref				Ref	
	Medium-small	0.68	0.40–1.13			0.69	0.38–1.24
	Medium-large	0.85	0.51–1.42			0.75	0.40–1.41
	Large	0.58	0.31–1.09			0.60	0.28–1.30
S_TchWkld	Low	Ref				Ref	
	Medium	1.26	0.85–1.88			1.56	0.96–2.52
	High	1.29	0.84–2.00			1.63	0.95–2.78
S_NESB	Low	Ref				Ref	
	Medium-low	1.27	0.75–2.15			1.09	0.58–2.05
	Medium-high	1.18	0.70–2.00			1.09	0.59–2.01
	High	2.65***	1.58–4.44			2.56**	1.35–4.87
S_SchQual	Poor			Ref		Ref	
	Medium-poor			0.90	0.52–1.56	1.23	0.69–2.19
	Medium-good			0.54	0.28–1.03	0.75	0.38–1.46
	Good			0.68	0.37–1.26	1.45	0.70–2.99
S_Relat	Poor			Ref		Ref	
	Medium-poor			1.11	0.63–1.95	1.04	0.60–1.80
	Medium-good			0.81	0.44–1.47	0.89	0.48–1.65
	Good			0.70	0.39–1.26	0.75	0.39–1.43
S_Integ	Poor			Ref		Ref	
	Medium-poor			1.33	0.76–2.31	1.41	0.82–2.42
	Medium-good			1.06	0.59–1.93	1.07	0.59–1.96
	Good			1.10	0.59–2.06	1.07	0.56–2.06
S_HthServ	Poor			Ref		Ref	
	Medium-poor			1.18	0.65–2.14	1.15	0.65–2.05
	Medium-good			1.21	0.69–2.13	1.01	0.58–1.78
	Good			1.41	0.77–2.59	1.07	0.60–1.94
S_SupServ	Poor			Ref		Ref	
	Medium-poor			0.63	0.35–1.13	0.74	0.42–1.33
	Medium-good			0.71	0.39–1.29	0.89	0.49–1.61
	Good			0.72	0.40–1.31	0.86	0.48–1.53
S_Volunt	Poor			Ref		Ref	
	Medium-poor			1.02	0.57–1.82	1.38	0.73–2.61
	Medium-good			0.72	0.39–1.33	0.92	0.48–1.77
	Good			0.63	0.33–1.21	1.07	0.52–2.18
S_ChSick	Poor			Ref		Ref	
	Medium-poor			0.80	0.46–1.38	0.66	0.39–1.14
	Medium-good			0.59	0.32–1.09	0.59	0.31–1.11
	Good			0.84	0.46–1.52	0.81	0.44–1.47
MOR		1.10	0.93–1.30	1.27	1.03–1.57	1.10	0.91–1.34

Models are for suboptimal parent ratings of child health; Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 7 (Table 5-79), the odds for children residing in non-metropolitan compared to metropolitan areas (*ResLoc*) were not significant (OR 0.77) while the odds under parent country of birth (*PCOB*), parent highest level of education (*PEduc*) and household income (*HHI*) retained significance from Models 1 and 3. Children of parents who perceived medium-good or good social environment (*SocEnv*) at their child's school retained significantly lower odds of suboptimal *PRH* (OR 0.41 and 0.58 respectively) from Models 2 and 3. Significant results were also retained from Model 4 for schools with high percent non-English speaking background (NESB) children (OR 2.15) compared to low (*S_NESB*).

In Model 8, significant results were evident for children of parents born outside of Australia (OR 1.42), children of parents with tertiary education (OR 0.60), children from medium- (OR 0.57) and high-income households (OR 0.46) and children attending schools with high percent NESB children (OR 2.39).

Model 7 explained slightly more school-level variation (MOR 1.03) than Model 8 (MOR 1.05) and both values were non-significant. The block of variables that accounted for the most school-level variation was school characteristics (Model 4, MOR 1.10), followed by sociodemographic variables (Model 1, MOR 1.17) and school-level parent perceptions of school (Model 5, MOR 1.27).

Table 5-79 Adjusted models: Parent-rated child health (*PRH*), permanent subset, multilevel models (Models 7–8)

	Model no.					Model no.			
	7		8			7		8	
Category	Adj. OR	95% CI	Adj. OR	95% CI	Category	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc					***SocEnv***				
Metro	Ref		Ref		Poor	Ref			
Non-metro	0.77	0.50–1.19	0.82	0.51–1.32	Medium-poor	0.77	0.50–1.18		
PCOB					Medium-good	0.41**	0.24–0.71		
Australia	Ref		Ref		Good	0.58*	0.35–0.94		
Other	1.39*	1.04–1.86	1.42*	1.05–1.94	***HPE***				
HCC					Poor	Ref			
Has HCC	Ref		Ref		Medium-poor	0.92	0.58–1.44		
No HCC	0.81	0.60–1.09	0.81	0.59–1.13	Medium-good	0.89	0.55–1.43		
PEduc					Good	1.01	0.59–1.71		
School	Ref		Ref		***QualBGC***				
Vocational	0.85	0.52–1.38	0.88	0.52–1.47	Poor	Ref			
Tertiary	0.63*	0.41–0.95	0.60*	0.38–0.93	Medium	0.97	0.65–1.46		
HHI					Good	0.71	0.43–1.17		
Low	Ref		Ref		***QualTch***				
Medium	0.61**	0.42–0.90	0.57**	0.38–0.86	Poor	Ref			
High	0.53*	0.32–0.89	0.46**	0.27–0.79	Medium	0.67	0.43–1.03		
					Good	0.74	0.44–1.24		
S_SchType					***S_SchQual***				
Combined	Ref		Ref		Poor			Ref	
Primary	1.09	0.66–1.81	0.85	0.48–1.53	Medium-poor			1.26	0.70–2.28
Secondary	1.24	0.72–2.13	1.72	0.82–3.62	Medium-good			0.75	0.38–1.49
					Good			1.37	0.65–2.93
S_SchSES					***S_Relat***				
Low	Ref		Ref		Poor			Ref	
Medium-low	0.88	0.55–1.41	0.86	0.48–1.53	Medium-poor			1.01	0.58–1.78
Medium-high	0.83	0.50–1.39	0.85	0.45–1.61	Medium-good			1.12	0.60–2.10
High	0.67	0.37–1.22	0.59	0.27–1.28	Good			0.73	0.37–1.44
S_SchSize					***S_Integ***				
Small	Ref		Ref		Poor			Ref	
Medium-small	0.66	0.38–1.14	0.65	0.35–1.19	Medium-poor			1.52	0.87–2.66
Medium-large	0.88	0.52–1.51	0.72	0.38–1.38	Medium-good			1.12	0.61–2.08
Large	0.57	0.29–1.11	0.56	0.25–1.25	Good			0.96	0.49–1.90
S_TchWkld					***S_HthServ***				
Low	Ref		Ref		Poor			Ref	
Medium	1.25	0.82–1.90	1.62	0.98–2.68	Medium-poor			1.18	0.65–2.14
High	1.10	0.69–1.75	1.42	0.81–2.47	Medium-good			1.06	0.59–1.91
					Good			1.19	0.65–2.18
S_NESB					***S_SupServ***				
Low	Ref		Ref		Poor			Ref	
Medium-low	1.31	0.75–2.29	1.12	0.58–2.16	Medium-poor			0.76	0.42–1.36
Medium-high	1.23	0.66–2.29	1.22	0.60–2.46	Medium-good			0.87	0.47–1.61
High	2.15*	1.13–4.09	2.39*	1.11–5.12	Good			0.78	0.43–1.43
					S_Volunt				
					Poor			Ref	
					Medium-poor			1.64	0.85–3.18
					Medium-good			1.11	0.57–2.17
					Good			1.30	0.61–2.73
					S_ChSick				
					Poor			Ref	
					Medium-poor			0.76	0.44–1.30
					Medium-good			0.57	0.30–1.08
					Good			0.78	0.42–1.46
MOR	1.03	0.86–1.23	1.05	0.85–1.29	MOR	1.03	0.86–1.23	1.05	0.85–1.29

Models are for suboptimal parent ratings of child health; Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

MOR = Median odds ratio

5.3.3.3.2 Parent-rated child oral health

In Model 0, significantly lower odds of suboptimal parent-rated oral health (*PROH*) were evident among children aged 13 (OR 0.62) and 14 years (OR 0.55) compared to 9 years, and among females (OR 0.77) compared to males (Table 5-80). There was significant variation across schools (MOR 1.18).

Table 5-80 Adjusted models: Parent-rated child oral health (*PROH*), permanent subset, reference model (Model 0)

Variable	Category	Adj. OR	95% CI
Age	9	Ref	
	10	1.12	0.78–1.62
	11	1.06	0.73–1.54
	12	0.82	0.56–1.19
	13	0.62*	0.41–0.94
	14	0.55**	0.34–0.89
Sex	Male	Ref	
	Female	0.77**	0.65–0.90
MOR		1.18	1.07–1.30

Model is for suboptimal parent ratings of child oral health
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 1 (Table 5-81), children had significantly lower odds of suboptimal *PROH* if they had parents with tertiary education (OR 0.61) compared to school-level education (*PEduc*), or lived in medium- (OR 0.61) or high-income households (OR 0.53) compared to low-income (*HHI*). Children without a health care card (*HCC*) had lower odds of suboptimal *PROH* (OR 0.82) than children with a health care card but the value did not reach significance. School-level variation was less in this model than the reference model but remained significant (MOR 1.13).

In Model 2, significantly lower odds of suboptimal *PROH* was apparent among children whose parents perceived medium-good or good social environment (OR 0.43 and 0.50 respectively) compared to poor social environment (*SocEnv*), good health promoting environment (OR 0.68) compared to poor health promoting environment (*HPE*), good quality of buildings/grounds and classrooms (OR 0.68) compared to poor quality (*QualBGC*), or medium quality of teachers (OR 0.65) compared to poor quality of teachers (*QualTch*). Odds of suboptimal *PROH* for medium-good health promoting environment (OR 0.74) and good quality of teachers (OR 0.72) were non-significant by a small margin. The variation across schools was lower than in Model 0 but remained significant (MOR 1.13).

When variables from Models 1 and 2 were combined in Model 3 significant results remained from Model 1 for children of parents with tertiary education (OR 0.64) and children living in medium- (OR 0.67) and high-income households (OR 0.62). Significance was also retained from Model 2 for odds of suboptimal *PROH* among children whose parents perceived medium-good (OR 0.58) or good social environment (OR 0.71), good quality of buildings/grounds and classrooms (OR 0.69) and medium quality of teachers (OR 0.70). The odds of suboptimal *PROH* lost significance from Model 2 by a small margin for children whose parents perceived good health promoting environment (OR 0.71). This model explained more school-level variation than the reference model and slightly more than Model 1 (MOR 1.12).

Table 5-81 Adjusted models: Parent-rated child oral health (*PROH*), permanent subset, child-level models (Models 1–3)

		Model no.					
		1		2		3	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc	Metropolitan	Ref				Ref	
	Non-metropolitan	0.86	0.69–1.07			0.85	0.68–1.05
PCOB	Australia	Ref				Ref	
	Other	1.15	0.96–1.39			1.20	0.99–1.45
HCC	Has HCC	Ref				Ref	
	No HCC	0.82	0.66–1.01			0.84	0.67–1.04
PEduc	School	Ref				Ref	
	Vocational	0.75	0.53–1.06			0.79	0.55–1.13
	Tertiary	0.61**	0.45–0.81			0.64**	0.47–0.86
HHI	Low	Ref				Ref	
	Medium	0.61***	0.47–0.80			0.67**	0.51–0.88
	High	0.53***	0.38–0.73			0.62**	0.44–0.86
SocEnv	Poor			Ref		Ref	
	Medium-poor			0.77	0.58–1.03	0.84	0.62–1.14
	Medium-good			0.43***	0.40–0.74	0.58**	0.42–0.81
	Good			0.50**	0.47–0.86	0.71*	0.51–0.98
HPE	Poor			Ref		Ref	
	Medium-poor			0.87	0.65–1.15	0.91	0.68–1.23
	Medium-good			0.74	0.55–1.00	0.81	0.59–1.11
	Good			0.68*	0.49–0.94	0.71	0.50–1.01
QualBGC	Poor			Ref		Ref	
	Medium			0.82	0.62–1.07	0.83	0.62–1.10
	Good			0.68**	0.50–0.92	0.69**	0.50–0.95
QualTch	Poor			Ref		Ref	
	Medium			0.65*	0.48–0.88	0.70*	0.51–0.96
	Good			0.72	0.51–1.02	0.80	0.56–1.15
MOR		1.13	1.03–1.24	1.13	1.03–1.23	1.12	1.02–1.23

Models are for suboptimal parent ratings of child oral health; Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 4 (Table 5-82), children had lower odds of suboptimal *PROH* if they were attending a school with school socioeconomic status (SES) that was medium-low (OR 0.59), medium-high (OR 0.58) or high (OR 0.52) compared to low (*S_SchSES*). The odds of suboptimal *PROH* was higher among children attending primary (OR 1.35) compared to combined schools (*S_SchType*) but did not reach significance. The variation across schools was lower than in Model 0 but remained significant (MOR 1.11).

In Model 5, children had significantly lower odds of suboptimal *PROH* if their school had good parent-perceived school relations (OR 0.59) compared to poor relations (*S_Relat*). Lower odds of suboptimal *PROH* bordering on significance were seen among children attending schools with medium-good school quality (OR 0.68) compared to poor school quality (*S_SchQual*), medium-good school relations (OR 0.69) compared to poor school relations, and medium-good (OR 0.70) and good school-level parent involvement in volunteering (OR 0.70) compared to poor school-level parent involvement in volunteering (*S_Volunt*). School-level variation was lower than in Model 0 but remained significant (MOR 1.11).

In Model 6, combining variables from Models 4 and 5, significance was retained only for good school relations (OR 0.61) from Model 5. Variation across schools bordered on non-significance (MOR 1.11).

Table 5-82 Adjusted models: Parent-rated child oral health (*PROH*), permanent subset, school-level models (Models 4–6)

		Model no.					
		4		5		6	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
S_SchType	Combined	Ref				Ref	
	Primary	1.35	0.98–1.86			1.42	0.98–2.05
	Secondary	1.21	0.84–1.74			1.25	0.75–2.08
S_SchSES	Low	Ref				Ref	
	Medium-low	0.59**	0.42–0.83			0.72	0.48–1.07
	Medium-high	0.58**	0.40–0.83			0.77	0.50–1.21
	High	0.52***	0.35–0.76			0.66	0.40–1.09
S_SchSize	Small	Ref				Ref	
	Medium-small	1.09	0.76–1.57			1.18	0.79–1.76
	Medium-large	1.17	0.81–1.70			1.24	0.79–1.95
	Large	1.11	0.71–1.74			1.31	0.76–2.27
S_TchWkld	Low	Ref				Ref	
	Medium	0.89	0.67–1.17			0.95	0.69–1.32
	High	1.11	0.82–1.50			1.05	0.73–1.52
S_NESB	Low	Ref				Ref	
	Medium-low	0.95	0.67–1.35			0.86	0.57–1.31
	Medium-high	1.00	0.71–1.41			0.95	0.63–1.41
	High	1.29	0.89–1.88			1.23	0.78–1.93
S_SchQual	Poor			Ref		Ref	
	Medium-poor			0.85	0.59–1.23	0.90	0.60–1.36
	Medium-good			0.68	0.46–1.02	0.77	0.50–1.20
	Good			0.78	0.53–1.16	1.04	0.64–1.68
S_Relat	Poor			Ref		Ref	
	Medium-poor			0.82	0.56–1.20	0.82	0.55–1.22
	Medium-good			0.69	0.46–1.01	0.65	0.42–1.01
	Good			0.59**	0.40–0.86	0.61*	0.39–0.96
S_Integ	Poor			Ref		Ref	
	Medium-poor			1.12	0.77–1.61	1.07	0.72–1.58
	Medium-good			1.10	0.74–1.62	1.07	0.71–1.63
	Good			1.04	0.69–1.55	1.10	0.70–1.74
S_HthServ	Poor			Ref		Ref	
	Medium-poor			0.81	0.56–1.18	0.86	0.58–1.27
	Medium-good			0.91	0.63–1.31	0.92	0.62–1.37
	Good			0.92	0.62–1.37	0.94	0.62–1.41
S_SupServ	Poor			Ref		Ref	
	Medium-poor			0.94	0.64–1.38	1.02	0.68–1.53
	Medium-good			0.86	0.58–1.27	0.92	0.61–1.41
	Good			1.01	0.68–1.50	1.04	0.69–1.58
S_Volunt	Poor			Ref		Ref	
	Medium-poor			0.76	0.52–1.12	0.82	0.52–1.29
	Medium-good			0.70	0.47–1.03	0.75	0.48–1.17
	Good			0.70	0.46–1.05	0.79	0.48–1.29
S_ChSick	Poor			Ref		Ref	
	Medium-poor			1.02	0.70–1.47	0.95	0.65–1.39
	Medium-good			0.83	0.56–1.24	0.83	0.54–1.27
	Good			0.99	0.67–1.47	1.02	0.67–1.55
MOR		1.11	1.02–1.20	1.11	1.02–1.22	1.11	1.01–1.21

Models are for suboptimal parent ratings of child oral health; Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In the fully adjusted Model 7 (Table 5-83), significantly lower odds of suboptimal *PROH* was evident for children of parents with tertiary education (OR 0.67) compared to school-only education (*PEduc*), of households with medium (OR 0.68) or high income (OR 0.67) compared to low (*HHI*), and whose parents perceived medium-good (OR 0.59) or good social environment (OR 0.72) compared to poor (*SocEnv)*, good health promoting environment (OR 0.70) compared to poor (*HPE*), good quality of buildings/grounds and classrooms (OR 0.70) compared to poor (*QualBGC*) or medium quality of teachers (OR 0.72) compared to poor (*QualTch*). Significance was lost for school SES (*S_SchSES*) categories from Models 4 and 6.

In fully adjusted Model 8, children had significantly lower odds of suboptimal *PROH* if they had parents with tertiary education (OR 0.63) compared to school-only education, lived in a medium- (OR 0.60) or high-income household (OR 0.57) compared to low income or attended a school with good school relations (PR 0.60) compared to poor (*S_Relat*).

The same amount of school-level variation of suboptimal *PROH* was explained by Model 7 (MOR 1.14) as by Model 8 (MOR 1.14) and both explained less variation than any of the school-level models (Models 4, 5 and 6). The block of variables which accounted for the greatest amount of school-level variation was school-level parent perceptions of school (MOR 1.11) and school characteristics (MOR 1.11) followed by child-level parent perceptions and schools (MOR 1.13) and sociodemographic variables (MOR 1.13).

Table 5-83 Adjusted models: Parent-rated child oral health (*PROH*), permanent subset, multilevel models (Models 7–8)

	Model no.					Model no.			
	7		8			7		8	
Category	Adj. OR	95% CI	Adj. OR	95% CI	Category	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc					***SocEnv***				
Metro	Ref		Ref		Poor	Ref			
Non-metro	0.79	0.59–1.07	0.80	0.59–1.11	Medium-poor	0.83	0.61–1.13		
PCOB					Medium-good	0.59**	0.42–0.82		
Australia	Ref		Ref		Good	0.72*	0.52–0.99		
Other	1.21	0.99–1.46	1.17	0.96–1.44	***HPE***				
HCC					Poor	Ref			
Has HCC	Ref		Ref		Medium-poor	0.90	0.67–1.22		
No HCC	0.83	0.67–1.03	0.83	0.66–1.04	Medium-good	0.80	0.58–1.10		
PEduc					Good	0.70*	0.49–1.00		
School	Ref		Ref		***QualBGC***				
Vocational	0.80	0.56–1.14	0.77	0.53–1.13	Poor	Ref			
Tertiary	0.67**	0.49–0.91	0.63**	0.46–0.88	Medium	0.85	0.63–1.13		
HHI					Good	0.70*	0.50–0.98		
Low	Ref		Ref		***QualTch***				
Medium	0.68**	0.52–0.90	0.60**	0.45–0.81	Poor	Ref			
High	0.67*	0.48–0.95	0.57**	0.40–0.81	Medium	0.72*	0.52–0.99		
					Good	0.84	0.58–1.21		
S_SchType					***S_SchQual***				
Combined	Ref		Ref		Poor			Ref	
Primary	1.21	0.84–1.74	1.32	0.87–1.99	Medium-poor			0.83	0.54–1.29
Secondary	1.07	0.71–1.60	1.27	0.74–2.20	Medium-good			0.70	0.44–1.13
					Good			0.97	0.58–1.62
S_SchSES					***S_Relat***				
Low	Ref		Ref		Poor			Ref	
Medium-low	0.71	0.49–1.03	0.84	0.54–1.30	Medium-poor			0.85	0.55–1.30
Medium-high	0.73	0.49–1.09	0.91	0.56–1.46	Medium-good			0.71	0.44–1.13
High	0.67	0.43–1.05	0.80	0.46–1.40	Good			0.60*	0.38–0.98
S_SchSize					***S_Integ***				
Small	Ref		Ref		Poor			Ref	
Medium-small	1.02	0.69–1.51	1.09	0.71–1.67	Medium-poor			1.11	0.73–1.69
Medium-large	1.09	0.72–1.64	1.16	0.72–1.88	Medium-good			1.08	0.69–1.69
Large	1.03	0.63–1.70	1.22	0.67–2.20	Good			1.12	0.69–1.83
S_TchWkld					***S_HthServ***				
Low	Ref		Ref		Poor			Ref	
Medium	0.81	0.60–1.10	0.91	0.64–1.29	Medium-poor			0.86	0.56–1.31
High	0.93	0.66–1.30	0.90	0.61–1.34	Medium-good			0.90	0.59–1.39
					Good			0.91	0.58–1.41
S_NESB					***S_SupServ***				
Low	Ref		Ref		Poor			Ref	
Medium-low	0.92	0.63–1.36	0.86	0.55–1.34	Medium-poor			1.05	0.68–1.63
Medium-high	0.93	0.61–1.42	0.90	0.56–1.45	Medium-good			1.00	0.64–1.57
High	0.96	0.60–1.52	1.04	0.61–1.78	Good			1.08	0.69–1.68
					S_Volunt				
					Poor			Ref	
					Medium-poor			0.88	0.54–1.44
					Medium-good			0.84	0.52–1.35
					Good			0.83	0.49–1.40
					S_ChSick				
					Poor			Ref	
					Medium-poor			0.97	0.65–1.46
					Medium-good			0.76	0.48–1.20
					Good			0.97	0.62–1.52
MOR	1.14	1.03–1.25	1.14	1.02–1.26	MOR	1.14	1.03–1.25	1.14	1.02–1.26

Models are for suboptimal parent ratings of child oral health; Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

MOR = Median odds ratio

5.3.3.3.3 Presence of caries

In the reference Model 0 (Table 5-84), older children had significantly higher odds of presence of permanent caries (*POC*) than nine-year-olds, for example 14-year-olds with over three times the odds of *POC* (OR 3.24). School-level variation was significant (MOR 1.48).

Table 5-84 Adjusted models: Presence of caries (*POC*), permanent subset, reference model (Model 0)

Variable	Category	Adj. OR	95% CI
Age	9	Ref	
	10	1.32	0.85–2.05
	11	2.11***	1.37–3.24
	12	2.43***	1.58–3.72
	13	2.71***	1.72–4.27
	14	3.24***	1.97–5.34
Sex	Male	Ref	
	Female	1.13	0.96–1.34
MOR		1.48	1.27–1.72

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 1 (Table 5-85), children had significantly higher odds of *POC* if they resided in a non-metropolitan area (OR 1.40) compared to metropolitan (*ResLoc*). High household income (*HHI*) was associated with significantly lower *POC* (OR 0.59) than low household income. School-level variation was lower than in Model 0 (MOR 1.42) but remained significant.

In Model 2, controlling for child-level parent perceptions of school there were no significant results. Variation at the school level was slightly lower than in Model 0 (MOR 1.46).

In Model 3, significant results were maintained from Model 1 for non-metropolitan residential location (OR 1.43) and high household income (OR 0.61). Variation across schools was significant (MOR 1.41).

Table 5-85 Adjusted models: Presence of caries (*POC*), permanent subset, child-level models (Models 1–3)

		Model no.					
		1		2		3	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc	Metropolitan	Ref				Ref	
	Non-metropolitan	1.40*	1.09–1.80			1.43**	1.11–1.85
PCOB	Australia	Ref				Ref	
	Other	1.13	0.92–1.37			1.16	0.95–1.41
HCC	Has HCC	Ref				Ref	
	No HCC	0.99	0.79–1.23			0.99	0.79–1.24
PEduc	School	Ref				Ref	
	Vocational	1.00	0.69–1.43			0.96	0.66–1.38
	Tertiary	0.88	0.65–1.20			0.85	0.63–1.17
HHI	Low	Ref				Ref	
	Medium	0.77	0.58–1.02			0.78	0.59–1.03
	High	0.59**	0.42–0.84			0.61**	0.43–0.86
SocEnv	Poor			Ref		Ref	
	Medium-poor			0.94	0.70–1.27	1.06	0.78–1.46
	Medium-good			0.77	0.56–1.06	0.85	0.61–1.19
	Good			0.79	0.57–1.09	0.81	0.57–1.14
HPE	Poor			Ref		Ref	
	Medium-poor			0.90	0.67–1.21	0.90	0.66–1.23
	Medium-good			0.73	0.53–1.01	0.74	0.53–1.04
	Good			0.94	0.67–1.31	0.98	0.68–1.39
QualBGC	Poor			Ref		Ref	
	Medium			0.90	0.68–1.19	0.89	0.66–1.20
	Good			0.79	0.57–1.10	0.75	0.53–1.06
QualTch	Poor			Ref		Ref	
	Medium			1.01	0.73–1.39	1.04	0.77–1.51
	Good			1.12	0.78–1.61	1.31	0.89–1.93
MOR		1.42	1.23–1.65	1.46	1.26–1.70	1.41	1.22–1.64

Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
MOR = Median odds ratio

In Model 4 (Table 5-86), children had higher odds of *POC* at schools with high teacher workload (OR 1.80) than low teacher workload (*S_TchWkld*). Variation across schools was lower than in the reference model and was significant (MOR 1.41).

In Model 5 controlling for school-level parent perceptions of school, there were no significant results. School-level variation was at a similar level to the reference model (MOR 1.47).

In Model 6, the significant result was retained from Model 4 for high teacher workload (OR 1.97). Variation across schools was lower than in the reference model (MOR 1.41) and significant.

Table 5-86 Adjusted models: Presence of caries (*POC*), permanent subset, school-level models (Models 4–6)

		Model no.					
		4		5		6	
Variable	Category	Adj. OR	95% CI	Adj. OR	95% CI	Adj. OR	95% CI
S_SchType	Combined	Ref				Ref	
	Primary	1.09	0.72–1.63			0.92	0.58–1.48
	Secondary	0.97	0.64–1.49			1.11	0.60–2.06
S_SchSES	Low	Ref				Ref	
	Medium-low	0.78	0.51–1.18			0.96	0.57–1.60
	Medium-high	0.96	0.61–1.50			1.31	0.74–2.30
	High	0.77	0.47–1.25			0.90	0.47–1.72
S_SchSize	Small	Ref				Ref	
	Medium-small	0.82	0.52–1.30			0.89	0.53–1.49
	Medium-large	0.91	0.57–1.46			0.83	0.47–1.47
	Large	0.98	0.57–1.71			1.00	0.50–1.99
S_TchWkld	Low	Ref				Ref	
	Medium	1.15	0.80–1.63			1.15	0.76–1.74
	High	1.80**	1.22–2.65			1.97**	1.23–3.16
S_NESB	Low	Ref				Ref	
	Medium-low	0.78	0.51–1.20			0.73	0.43–1.23
	Medium-high	0.74	0.48–1.15			0.70	0.42–1.16
	High	0.77	0.48–1.22			0.77	0.44–1.36
S_SchQual	Poor			Ref		Ref	
	Medium-poor			1.25	0.77–2.03	1.52	0.91–2.56
	Medium-good			0.88	0.52–1.51	1.07	0.60–1.90
	Good			1.09	0.65–1.84	1.61	0.87–3.00
S_Relat	Poor			Ref		Ref	
	Medium-poor			0.72	0.44–1.18	0.68	0.41–1.13
	Medium-good			0.70	0.42–1.17	0.67	0.39–1.16
	Good			0.68	0.42–1.12	0.65	0.37–1.13
S_Integ	Poor			Ref		Ref	
	Medium-poor			1.26	0.78–2.06	0.87	0.77–2.09
	Medium-good			1.21	0.73–2.02	0.81	0.72–2.07
	Good			1.30	0.77–2.21	0.78	0.68–2.15
S_HthServ	Poor			Ref		Ref	
	Medium-poor			1.23	0.75–2.01	1.27	0.77–2.10
	Medium-good			1.40	0.86–2.29	1.53	0.93–2.54
	Good			1.39	0.83–2.35	1.48	0.87–2.50
S_SupServ	Poor			Ref		Ref	
	Medium-poor			0.89	0.53–1.47	0.95	0.56–1.59
	Medium-good			0.76	0.45–1.29	0.78	0.45–1.34
	Good			0.94	0.56–1.57	0.87	0.52–1.46
S_Volunt	Poor			Ref		Ref	
	Medium-poor			0.94	0.56–1.56	1.00	0.56–1.78
	Medium-good			0.75	0.45–1.25	0.85	0.48–1.50
	Good			0.75	0.44–1.28	0.86	0.46–1.60
S_ChSick	Poor			Ref		Ref	
	Medium-poor			1.13	0.70–1.84	1.13	0.70–1.85
	Medium-good			0.90	0.53–1.53	0.93	0.54–1.61
	Good			1.10	0.65–1.83	1.13	0.66–1.93
MOR		1.41	1.22–1.63	1.47	1.25–1.74	1.41	1.20–1.66

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

MOR = Median odds ratio

In Model 7 (Table 5-87), significant results were maintained for non-metropolitan residential location (OR 1.50) compared to metropolitan (*ResLoc*), high household income (OR 0.65) compared to low (*HHI*) and high teacher workload (OR 1.62) compared to low (*S_TchWkld*).

Model 8 saw significance lost from Models 1 and 3 for non-metropolitan residential location (OR 1.38) and for high household income (OR 0.77). High teacher workload was significantly associated with higher *POC* (OR 1.90) as it was in Models 4 and 6.

School-level variation reached the same level in Model 7 as Model 8 (MOR 1.41 for both) and was not much lower than the level in Model 0 (MOR 1.48). The block of variables which accounted for the greatest amount of school-level variation was school characteristics (MOR 1.41), followed by sociodemographic variables (MOR 1.42) and child-level parent perceptions and schools (MOR 1.46).

Table 5-87 Adjusted models: Presence of caries (*POC*), permanent subset, multilevel models (Models 7–8)

	Model no.					Model no.			
	7		8			7		8	
Category	Adj. OR	95% CI	Adj. OR	95% CI	Category	Adj. OR	95% CI	Adj. OR	95% CI
ResLoc					***SocEnv***				
Metro	Ref		Ref		Poor	Ref			
Non-metro	1.50*	1.07–2.11	1.38	0.95–2.00	Medium-poor	1.06	0.77–1.45		
PCOB					Medium-good	0.85	0.60–1.19		
Australia	Ref		Ref		Good	0.80	0.57–1.14		
Other	1.16	0.94–1.42	1.16	0.93–1.43	***HPE***				
HCC					Poor	Ref			
Has HCC	Ref		Ref		Medium-poor	0.91	0.66–1.24		
No HCC	1.01	0.80–1.26	0.87	0.69–1.11	Medium-good	0.74	0.53–1.04		
PEduc					Good	0.98	0.68–1.40		
School	Ref		Ref		***QualBGC***				
Vocational	0.96	0.66–1.39	0.98	0.66–1.46	Poor	Ref			
Tertiary	0.88	0.64–1.21	0.87	0.62–1.22	Medium	0.93	0.69–1.26		
HHI					Good	0.81	0.56–1.15		
Low	Ref		Ref		***QualTch***				
Medium	0.81	0.61–1.08	0.98	0.72–1.34	Poor	Ref			
High	0.65*	0.45–0.93	0.77	0.53–1.12	Medium	1.09	0.77–1.53		
					Good	1.32	0.90–1.95		
S_SchType					***S_SchQual***				
Combined	Ref		Ref		Poor			Ref	
Primary	1.15	0.74–1.78	0.96	0.59–1.59	Medium-poor			1.58	0.93–2.69
Secondary	0.95	0.61–1.49	1.15	0.61–2.19	Medium-good			1.10	0.61–1.98
					Good			1.70	0.90–3.23
S_SchSES					***S_Relat***				
Low	Ref		Ref		Poor			Ref	
Medium-low	0.85	0.55–1.32	0.97	0.57–1.65	Medium-poor			0.69	0.41–1.17
Medium-high	1.08	0.67–1.74	1.38	0.77–2.48	Medium-good			0.73	0.41–1.28
High	0.99	0.58–1.68	1.01	0.51–2.01	Good			0.75	0.42–1.33
S_SchSize					***S_Integ***				
Small	Ref		Ref		Poor			Ref	
Medium-small	0.76	0.47–1.22	0.85	0.50–1.44	Medium-poor			1.32	0.79–2.20
Medium-large	0.92	0.57–1.50	0.79	0.44–1.43	Medium-good			1.23	0.71–2.12
Large	0.97	0.54–1.75	0.98	0.48–2.00	Good			1.17	0.65–2.12
S_TchWkld					***S_HthServ***				
Low	Ref		Ref		Poor			Ref	
Medium	1.22	0.84–1.76	1.26	0.82–1.95	Medium-poor			1.34	0.80–2.25
High	1.62*	1.08–2.43	1.90**	1.17–3.08	Medium-good			1.53	0.91–2.58
					Good			1.89	0.92–2.73
S_NESB					***S_SupServ***				
Low	Ref		Ref		Poor			Ref	
Medium-low	0.86	0.55–1.35	0.76	0.45–1.31	Medium-poor			1.00	0.58–1.71
Medium-high	0.90	0.54–1.48	0.81	0.46–1.44	Medium-good			0.80	0.46–1.39
High	0.98	0.57–1.71	0.96	0.51–1.84	Good			0.88	0.51–1.50
					S_Volunt				
					Poor			Ref	
					Medium-poor			1.06	0.58–1.92
					Medium-good			0.91	0.50–1.63
					Good			0.90	0.47–1.70
					S_ChSick				
					Poor			Ref	
					Medium-poor			1.14	0.69–1.88
					Medium-good			0.86	0.49–1.52
					Good			1.12	0.65–1.95
MOR	1.41	1.21–1.65	1.41	1.19–1.67	MOR	1.41	1.21–1.65	1.41	1.19–1.67

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

MOR = Median odds ratio

5.3.3.3.4 Decayed, missing and filled surfaces

In the reference Model 0 (Table 5-88), age is significantly associated with higher decayed, missing and filled permanent surfaces (*DMFS*) with a beta coefficient of 0.28. School-level variation (SLV) was significant (0.35) and accounted for 4.4% of total variance as shown by the intraclass correlation (ICC).

Table 5-88 Adjusted models: Decayed, missing and filled surfaces (*DMFS*), permanent subset, reference model (Model 0)

Variable	Category	Adj. β	95% CI
Intercept		1.15***	0.99–1.31
Age	Mean-centred	0.28***	0.22–0.35
Sex	Male	Ref	
	Female	-0.06	-0.26–0.14
SLV (Error)		0.35***	(0.09)
Total variance		8.03	
ICC		4.4%	
AIC		14961.7	

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
Intercept = mean of outcome for reference group; SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

In Model 1 controlling for sociodemographic variables (Table 5-89) significantly higher *DMFS* is evident for children in medium- (β -0.45) and high-income households (β -0.64) when compared with children in low income households (*HHI*). SLV (0.30) and ICC (3.6%) were less than in Model 0 and SLV was significant.

In Model 2, *DMFS* was significantly lower among children whose parents perceived medium-poor (β -0.30), medium-good (β -0.32) or good social environment (β -0.42) at the child's school compared to poor social environment (*SocEnv*). Compared to the reference model, SLV (0.31) and ICC (3.9%) were lower but SLV remained significant.

In Model 3, combining Models 1 and 2, significance was retained from Models 1 and 2 for medium (β -0.41) and high household income (β -0.58) and good social environment (β -0.42), but lost for medium-poor (β -0.20) and medium-good social environment (β -0.22). The beta coefficient was lower for good quality of buildings/grounds and classrooms (β -0.36) compared to poor quality (*QualBGC*) but failed to reach significance by a small margin. SLV (0.27) was lower than in the reference model as was the ICC (3.3%).

Table 5-89 Adjusted models: Decayed, missing and filled surfaces (*DMFS*), permanent subset, child-level models (Models 1–3)

		Model no.					
		1		2		3	
Variable	Category	Adj. β	95% CI	Adj. β	95% CI	Adj. β	95% CI
Intercept		1.50***	1.10–1.89	1.68***	1.31–2.05	1.89***	1.38–2.40
ResLoc	Metropolitan	Ref				Ref	
	Non-metropolitan	0.17	-0.10–0.45			0.18	-0.09–0.46
PCOB	Australia	Ref				Ref	
	Other	0.09	-0.15–0.34			0.12	-0.13–0.37
HCC	Has HCC	Ref				Ref	
	No HCC	0.01	-0.27–0.29			0.00	-0.28–0.29
PEduc	School	Ref				Ref	
	Vocational	-0.06	-0.45–0.33			-0.11	-0.51–0.28
	Tertiary	-0.07	-0.39–0.26			-0.09	-0.42–0.25
HHI	Low	Ref				Ref	
	Medium	-0.45**	-0.75–-0.15			-0.41**	-0.72–-0.11
	High	-0.64**	-0.99–-0.28			-0.58**	-0.94–-0.22
SocEnv	Poor			Ref		Ref	
	Medium-poor			-0.30*	-0.59–-0.01	-0.20	-0.51–0.10
	Medium-good			-0.32*	-0.62–-0.02	-0.22	-0.53–0.10
	Good			-0.42**	-0.72–-0.12	-0.42*	-0.74–-0.09
HPE	Poor			Ref		Ref	
	Medium-poor			-0.16	-0.44–0.12	-0.21	-0.52–0.09
	Medium-good			-0.23	-0.52–0.07	-0.25	-0.57–0.07
	Good			-0.23	-0.55–0.10	-0.24	-0.59–0.10
QualBGC	Poor			Ref		Ref	
	Medium			-0.05	-0.35–0.24	-0.09	-0.41–0.22
	Good			-0.31	-0.64–0.03	-0.36	-0.71–0.00
QualTch	Poor			Ref		Ref	
	Medium			-0.09	-0.42–0.24	0.05	-0.31–0.40
	Good			0.12	-0.26–0.49	0.29	-0.11–0.69
SLV (Error)		0.30**	(0.09)	0.31**	(0.09)	0.27**	(0.09)
Total variance		8.30		8.05		8.33	
ICC		3.6%		3.9%		3.3%	
AIC		13782.7		14746.1		13580.2	

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

Intercept = mean of outcome for reference group; SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

In Model 4, children attending a school with high teacher workload (*S_TchWkld*) had significantly higher *DMFS* (β 0.65) compared to schools with low teacher workload (Table 5-90). SLV was lower than in the reference model (0.33) as was the ICC (4.2%).

In Model 5, significantly lower *DMFS* was evident among children attending schools with medium-good school relations (β -0.48) compared to poor school relations (*S_Relat*) and schools with medium-good school-level provision of support service (β -0.41) compared to poor school-level provision of support service (*S_SupServ*). Medium-poor school relations was associated with lower *DMFS* (-0.35) but did not reach significance. SLV was lower than in the reference model (0.28) as was the ICC (3.5%).

In Model 6, the beta coefficient retained significance from Model 4 for high teacher workload (β 0.69). Children's *DMFS* was significantly lower for medium-poor (β -0.52), medium-good (β -0.60) and good (β -0.53) school relations compared to poor relations. Additional significant results were seen with higher *DMFS* among children at schools with medium-poor (β 0.42) and good school quality (β 0.58) compared to poor school quality (*S_SchQual*). Compared to the reference model, SLV (0.25) and ICC (3.1%) were lower.

Table 5-90 Adjusted models: Decayed, missing and filled surfaces (*DMFS*), permanent subset, school-level models (Models 4–6)

		Model no.					
		4		5		6	
Variable	Category	Adj. β	95% CI	Adj. β	95% CI	Adj. β	95% CI
Intercept		0.98***	0.53–1.43	1.74***	1.23–2.25	1.04**	0.30–1.77
S_SchType	Combined	Ref				Ref	
	Primary	-0.02	-0.40–0.35			-0.14	-0.56–0.27
	Secondary	0.13	-0.28–0.53			0.59*	0.04–1.14
S_SchSES	Low	Ref				Ref	
	Medium-low	-0.10	-0.46–0.26			0.13	-0.29–0.55
	Medium-high	-0.05	-0.44–0.34			0.33	-0.12–0.79
	High	-0.33	-0.46–0.26			-0.05	-0.56–0.46
S_SchSize	Small	Ref				Ref	
	Medium-small	-0.08	-0.46–0.31			-0.04	-0.45–0.37
	Medium-large	-0.09	-0.49–0.31			-0.17	-0.64–0.29
	Large	-0.07	-0.54–0.41			-0.10	-0.66–0.45
S_TchWkld	Low	Ref				Ref	
	Medium	0.15	-0.17–0.47			0.31	-0.05–0.66
	High	0.65**	0.29–1.01			0.69**	0.27–1.10
S_NESB	Low	Ref				Ref	
	Medium-low	0.05	-0.32–0.42			-0.12	-0.54–0.30
	Medium-high	0.09	-0.29–0.46			-0.09	-0.50–0.32
	High	0.10	-0.30–0.50			0.23	-0.23 ,0.69
S_SchQual	Poor			Ref		Ref	
	Medium-poor			0.18	-0.22–0.57	0.42*	0.00–0.84
	Medium-good			-0.19	-0.61–0.23	0.06	-0.39–0.51
	Good			0.06	-0.35–0.47	0.58*	0.09–1.07
S_Relat	Poor			Ref		Ref	
	Medium-poor			-0.35	-0.75–0.04	-0.52*	-0.92—0.10
	Medium-good			-0.48*	-0.89—-0.07	-0.60**	-1.05—0.16
	Good			-0.28	-0.67–0.11	-0.53*	-0.98—0.08
S_Integ	Poor			Ref		Ref	
	Medium-poor			-0.05	-0.36–0.47	-0.01	-0.41–0.39
	Medium-good			0.13	-0.28–0.53	0.14	-0.29–0.56
	Good			0.05	-0.33–0.53	0.00	-0.45–0.46
S_HthServ	Poor			Ref		Ref	
	Medium-poor			0.07	-0.31–0.46	0.08	-0.31–0.48
	Medium-good			0.13	-0.26–0.51	0.10	-0.31–0.50
	Good			0.01	-0.41–0.42	-0.02	-0.44–0.40
S_SupServ	Poor			Ref		Ref	
	Medium-poor			-0.04	-0.44–0.37	0.05	-0.37–0.46
	Medium-good			-0.41*	-0.83—-0.00	-0.30	-0.73–0.13
	Good			-0.29	-0.70–0.12	-0.25	-0.67–0.17
S_Volunt	Poor			Ref		Ref	
	Medium-poor			0.05	-0.36–0.45	0.33	-0.13–0.79
	Medium-good			-0.21	-0.62–0.20	0.05	-0.41–0.50
	Good			-0.18	-0.61–0.25	0.22	-0.27–0.72
S_ChSick	Poor			Ref		Ref	
	Medium-poor			-0.11	-0.49–0.28	-0.15	-0.54–0.24
	Medium-good			-0.23	-0.65–0.18	-0.23	-0.66–0.20
	Good			-0.35	-0.76–0.06	-0.34	-0.77–0.08
SLV (Error)		0.33**	(0.09)	0.28**	(0.10)	0.25**	(0.09)
Total variance		7.99		7.98		7.94	
ICC		4.2%		3.5%		3.1%	
AIC		14957.6		13650.5		13646.2	

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

Intercept = mean of outcome for reference group; SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

In Model 7 (Table 5-91 and Table 5-92), the beta coefficient for *DMFS* was significant for medium (β -0.34) and high household income (β -0.46) compared to low (*HHI*), good social environment (β -0.42) compared to poor (*SocEnv*) and high teacher workload (β 0.53) compared to low (*S_TchWkld*).

In Model 8, significance was lost from Model 1 for household income categories. The beta coefficient was significant for high teacher workload (β 0.63), medium-poor (β 0.45) and good school quality (β 0.61) compared to poor quality (*S_SchQual*) and medium-poor (β -0.51) and medium-good school relations (β -0.53) compared to poor relations (*S_Relat*).

The SLV was significant in both Models 7 (0.30) and 8 (0.23). The ICC was lower in Model 8 (2.8%) than Model 7 (3.6%) and model fit was better for Model 8 (AIC 12618.1) than Model 7 (AIC 13585.6). The block of variables that explained the most-school level variance was school-level parent perception of schools (Model 5, ICC 3.5%), followed by sociodemographic variables (Model 1, ICC 3.6%) and child-level parent perception of schools (Model 2, ICC 3.9%).

Table 5-91 Adjusted models: Decayed, missing and filled surfaces (*DMFS*), permanent subset, multilevel models (Models 7–8), part 1

	Model no.			
	7		8	
Category	Adj. β	95% CI	Adj. β	95% CI
Intercept	1.36**	0.60–2.12	1.00*	0.08–1.92
ResLoc				
Metro	Ref		Ref	
Non-metro	0.29	-0.09–0.66	0.21	-0.18–0.60
PCOB				
Australia	Ref		Ref	
Other	0.10	-0.15–0.35	0.12	-0.13–0.38
HCC				
Has HCC	Ref		Ref	
No HCC	0.02	-0.26–0.31	-0.21	-0.51–0.09
PEduc				
School	Ref		Ref	
Vocational	-0.10	-0.50–0.29	-0.11	-0.53–0.31
Tertiary	-0.04	-0.38–0.29	-0.06	-0.42–0.29
HHI				
Low	Ref		Ref	
Medium	-0.34*	-0.65–-0.04	-0.10	-0.43–0.22
High	-0.46*	-0.84–-0.09	-0.28	-0.67–0.11

	Model no.		
	7		8
Category	Adj. β	95% CI	Adj. β 95% CI
SocEnv			
Poor	Ref		
Medium-poor	-0.21	-0.52–0.09	
Medium-good	-0.22	-0.54–0.10	
Good	-0.42*	-0.74–-0.09	
HPE			
Poor	Ref		
Medium-poor	-0.20	-0.50–0.11	
Medium-good	-0.24	-0.56–0.08	
Good	-0.23	-0.58–0.11	
QualBGC			
Poor	Ref		
Medium	-0.02	-0.33–0.30	
Good	-0.23	-0.60–0.14	
QualTch			
Poor	Ref		
Medium	0.05	-0.31–0.41	
Good	0.30	-0.11–0.70	

Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
Intercept = mean of outcome for reference group

Table 5-92 Adjusted models: Decayed, missing and filled surfaces (*DMFS*), permanent subset, multilevel models (Models 7–8), part 2

	Model no.			
	7		8	
Category	Adj. β	95% CI	Adj. β	95% CI
S_SchType				
Combined	Ref		Ref	
Primary	0.05	-0.35–0.46	-0.13	-0.57–0.32
Secondary	0.11	-0.31–0.54	0.66	-0.09–1.23
S_SchSES				
Low	Ref		Ref	
Medium-low	-0.05	-0.43–0.33	0.15	-0.28–0.59
Medium-high	0.04	-0.37–0.45	0.38	-0.10–0.86
High	-0.17	-0.62–0.29	0.02	-0.53–0.57
S_SchSize				
Small	Ref		Ref	
Medium-small	-0.14	-0.55–0.26	-0.08	-0.51–0.34
Medium-large	-0.08	-0.50–0.35	-0.20	-0.68–0.28
Large	-0.04	-0.55–0.47	-0.11	-0.70–0.47
S_TchWkld				
Low	Ref		Ref	
Medium	0.16	-0.18–0.49	0.34	-0.03–0.71
High	0.53**	0.15–0.91	0.63**	0.20–1.06
S_NESB				
Low	Ref		Ref	
Medium-low	0.10	-0.29–0.49	-0.11	-0.54–0.33
Medium-high	0.22	-0.21–0.65	0.05	-0.41–0.51
High	0.23	-0.24–0.71	0.35	-0.18–0.87
SLV (Error)	0.30**	(0.10)	0.23**	(0.10)
Total variance	8.34		8.22	
ICC	3.6%		2.8%	
AIC	13585.6		12618.1	

	Model no.			
	7		8	
Category	Adj. β	95% CI	Adj. β	95% CI
S_SchQual				
Poor			Ref	
Medium-poor			0.45*	0.02–0.89
Medium-good			0.05	-0.42–0.52
Good			0.61*	0.10–1.11
S_Relat				
Poor			Ref	
Medium-poor			-0.51*	-0.94–-0.09
Medium-good			-0.53*	-0.99–-0.07
Good			-0.46	-0.92–0.01
S_Integ				
Poor			Ref	
Medium-poor			0.00	-0.41–0.42
Medium-good			0.13	-0.31–0.57
Good			-0.03	-0.51–0.45
S_HthServ				
Poor			Ref	
Medium-poor			0.15	-0.26–0.56
Medium-good			0.11	-0.31–0.53
Good			0.03	-0.41–0.46
S_SupServ				
Poor			Ref	
Medium-poor			0.16	-0.27–0.59
Medium-good			-0.25	-0.69–0.20
Good			-0.18	-0.61–0.26
S_Volunt				
Poor			Ref	
Medium-poor			0.40	-0.08–0.88
Medium-good			0.16	-0.31–0.63
Good			0.26	-0.26–0.77
S_ChSick				
Poor			Ref	
Medium-poor			-0.11	-0.52–0.29
Medium-good			-0.27	-0.71–0.18
Good			-0.33	-0.78–0.11
SLV (Error)	0.30**	(0.10)	0.23**	(0.10)
Total variance	8.34		8.22	
ICC	3.6%		2.8%	
AIC	13585.6		12618.1	

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

5.3.3.3.5 Untreated decayed surfaces

In the reference Model 0 higher average untreated decayed permanent surfaces (*UD*) was significantly associated with age (β 0.18) while *UD* was significantly lower among females (β -0.19) than males (Table 5-93). School-level variation (SLV) was significant (0.29) and accounted for 5.3% of total variance as evidenced by the intraclass correlation (ICC).

Table 5-93 Adjusted models: Untreated decayed surfaces (*UD*), permanent subset, reference model (Model 0)

Variable	Category	Adj. β	95% CI
Intercept		0.76***	0.62–0.90
Age	Mean-centred	0.18***	0.13–0.24
Sex	Male	Ref	
	Female	-0.19*	-0.36–-0.02
SLV (Error)		0.29***	(0.07)
Total variance		5.51	
ICC		5.3%	
AIC		13804.3	

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
Intercept = mean of outcome for reference group; SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

In Model 1 (Table 5-94), *UD* was significantly lower among children from households with medium (β -0.30) and high income (β -0.42) than children from households with low income (*HHI*). SLV was lower than in the reference model (0.24) and accounted for less of the total variance (ICC 4.1%).

In Model 2, children had significantly lower *UD* if their parents perceived medium-poor (β -0.25) or good social environment (β -0.29) compared to poor social environment (*SocEnv*). Compared to Model 0, SLV was lower (0.26) and accounted for less of the total variance (ICC 4.8%).

When Models 1 and 2 were combined in Model 3, significance was retained for medium (β -0.27) and high household income (β -0.36) and for good social environment (β -0.28). SLV and ICC were lower than in Models 0, 1 and 2 (SLV 0.22, ICC 3.8%).

Table 5-94 Adjusted models: Untreated decayed surfaces (*UD*), permanent subset, child-level models (Models 1–3)

		Model no.					
		1		2		3	
Variable	Category	Adj. β	95% CI	Adj. β	95% CI	Adj. β	95% CI
Intercept		0.95***	0.61–1.28	1.16***	0.86–1.47	1.25***	0.82–1.68
ResLoc	Metropolitan	Ref				Ref	
	Non-metropolitan	0.08	-0.15–0.32			0.08	-0.15–0.32
PCOB	Australia	Ref				Ref	
	Other	0.16	-0.05–0.36			0.17	-0.03–0.38
HCC	Has HCC	Ref				Ref	
	No HCC	0.12	-0.12–0.35			0.11	-0.13–0.35
PEduc	School	Ref				Ref	
	Vocational	-0.06	-0.38–0.27			-0.10	-0.43–0.23
	Tertiary	-0.11	-0.38–0.17			-0.12	-0.40–0.16
HHI	Low	Ref				Ref	
	Medium	-0.30*	-0.55–-0.05			-0.27*	-0.52–-0.02
	High	-0.42**	-0.72–-0.12			-0.36*	-0.66–-0.05
SocEnv	Poor			Ref		Ref	
	Medium-poor			-0.25*	-0.48–-0.01	-0.20	-0.43–0.08
	Medium-good			-0.20	-0.44–0.05	-0.13	-0.32–0.21
	Good			-0.29*	-0.54–-0.04	-0.28*	-0.44–0.13
HPE	Poor			Ref		Ref	
	Medium-poor			-0.19	-0.43–0.04	-0.17	-0.43–0.08
	Medium-good			-0.06	-0.31–0.18	-0.05	-0.32–0.21
	Good			-0.16	-0.42–0.11	-0.15	-0.44–0.13
QualBGC	Poor			Ref		Ref	
	Medium			0.10	-0.14–0.35	0.05	-0.21–0.32
	Good			-0.10	-0.38–0.18	-0.14	-0.44–0.16
QualTch	Poor			Ref		Ref	
	Medium			-0.17	-0.45–0.10	-0.09	-0.39–0.21
	Good			-0.11	-0.42–0.20	-0.01	-0.35–0.32
SLV (Error)		0.24**	(0.07)	0.26***	(0.07)	0.22**	(0.07)
Total variance		5.81		5.52		5.84	
ICC		4.1%		4.8%		3.8%	
AIC		12788.3		13612.7		12610.9	

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

Intercept = mean of outcome for reference group; SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

In Model 4 (Table 5-95), *UD* was significantly lower among children at schools with high school socioeconomic status (SES) compared to low school SES (*S_SchSES*), with a beta coefficient of β -0.37, and higher at schools with high teacher workload (β 0.52) compared to low teacher workload (*S_TchWkld*). SLV (0.27) was lower than in Model 0, as was the ICC (4.9%).

In Model 5, significantly lower *UD* was associated with medium-poor (β -0.39) compared to poor school relations (*S_Relat*). Both SLV (0.22) and ICC (3.9%) were lower than in Model 0.

In Model 6, combining Models 4 and 5, significant results remained from Model 4 for high teacher workload (β 0.52) and from Model 5 for medium-good school relations (β -0.47). In addition, the beta coefficient for medium teacher workload (β 0.34) and for medium-poor school relations (β -0.44) reached significance. Compared to the reference model, SLV was lower (0.19) as was the ICC (3.5%).

Table 5-95 Adjusted models: Untreated decayed surfaces (*UD*), permanent subset, school-level models (Models 4–6)

		Model no.					
		4		5		6	
Variable	Category	Adj. β	95% CI	Adj. β	95% CI	Adj. β	95% CI
Intercept		0.67**	0.28–1.05	1.23***	0.79–1.66	0.72*	0.10–1.35
S_SchType	Combined	Ref				Ref	
	Primary	0.03	-0.29–0.35			-0.05	-0.40–0.30
	Secondary	0.02	-0.32–0.37			0.37	-0.10–0.84
S_SchSES	Low	Ref				Ref	
	Medium-low	-0.14	-0.44–0.17			0.03	-0.33–0.38
	Medium-high	-0.07	-0.40–0.25			0.18	-0.21–0.57
	High	-0.37*	-0.72–-0.02			-0.19	-0.63–0.25
S_SchSize	Small	Ref				Ref	
	Medium-small	0.02	-0.31–0.35			0.07	-0.29–0.42
	Medium-large	-0.03	-0.37–0.31			-0.10	-0.50–0.29
	Large	0.04	-0.37–0.44			-0.09	-0.56–0.39
S_TchWkld	Low	Ref				Ref	
	Medium	0.18	-0.09–0.46			0.34*	0.03–0.64
	High	0.52**	0.22–0.83			0.52**	0.17–0.87
S_NESB	Low	Ref				Ref	
	Medium-low	-0.11	-0.42–0.21			-0.18	-0.54–0.65
	Medium-high	-0.04	-0.35–0.28			-0.17	-0.31–0.46
	High	0.03	-0.31–0.37			0.16	-0.06–0.78
S_SchQual	Poor			Ref		Ref	
	Medium-poor			0.12	-0.22–0.45	0.29	-0.07–0.65
	Medium-good			-0.13	-0.48–0.23	0.07	-0.31–0.46
	Good			-0.11	-0.46–0.24	0.36	-0.06–0.78
S_Relat	Poor			Ref		Ref	
	Medium-poor			-0.32	-0.66–0.02	-0.44*	-0.79–-0.09
	Medium-good			-0.39*	-0.74–-0.04	-0.47*	-0.85–-0.09
	Good			-0.21	-0.55–0.12	-0.31	-0.70–0.07
S_Integ	Poor			Ref		Ref	
	Medium-poor			-0.13	-0.46–0.20	-0.10	-0.44–0.24
	Medium-good			0.04	-0.31–0.38	0.04	-0.32–0.40
	Good			-0.14	-0.49–0.22	-0.17	-0.56–0.22
S_HthServ	Poor			Ref		Ref	
	Medium-poor			0.07	-0.26–0.40	0.09	-0.25–0.42
	Medium-good			0.19	-0.13–0.52	0.17	-0.18–0.52
	Good			0.09	-0.27–0.44	0.06	-0.30–0.42
S_SupServ	Poor			Ref		Ref	
	Medium-poor			-0.03	-0.37–0.32	0.05	-0.31–0.40
	Medium-good			-0.25	-0.60–0.11	;-0.16	-0.53–0.21
	Good			-0.14	-0.48–0.21	-0.11	-0.47–0.24
S_Volunt	Poor			Ref		Ref	
	Medium-poor			0.05	-0.30–0.39	0.24	-0.15–0.63
	Medium-good			-0.18	-0.53–0.17	-0.01	-0.40–0.37
	Good			-0.08	-0.44–0.28	0.21	-0.22–0.63
S_ChSick	Poor			Ref		Ref	
	Medium-poor			-0.01	-0.34–0.32	-0.06	-0.39–0.27
	Medium-good			-0.17	-0.52–0.18	-0.19	-0.56–0.18
	Good			-0.18	-0.53–0.17	-0.17	-0.54–0.20
SLV (Error)		0.27***	(0.07)	0.22**	(0.07)	0.19**	(0.07)
Total variance		5.48		5.64		5.61	
ICC		4.9%		3.9%		3.5%	
AIC		13804.7		12687.5		12689.4	

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

Intercept = mean of outcome for reference group; SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

In the fully adjusted Model 7 (Table 5-96 and Table 5-97) a significant difference in *UD* was retained from Models 2 and 3 for good social environment (β -0.28) compared to poor (*SocEnv*) and from Model 4 for high teacher workload (β 0.47) compared to low (*S_TchWkld*).

In Model 8, children had significantly different *UD* at schools with medium (β 0.35) and high (β 0.50) teacher workload and medium-poor (β -0.43) and medium-good (β -0.40) school relations (*S_Relat*).

SLV was lower in Model 8 (0.17) than Model 7 (0.24). The result was the same for ICC (2.8% vs 4.1%) and model fit for Model 8 was better than for Model 7 (AIC 11802.7 vs 12620.0). The block of variables that explained the most-school level variance in *UD* was school-level parent perception of schools (Model 5, ICC 3.9%), followed by sociodemographic variables (Model 1, ICC 4.1%) and child-level parent perception of schools (Model 2, ICC 4.8%).

Table 5-96 Adjusted models: Untreated decayed surfaces (*UD*), permanent subset, multilevel models (Models 7–8), part 1

	Model no.					Model no.		
	7		8			7		8
Category	Adj. β	95% CI	Adj. β	95% CI	Category	Adj. β	95% CI	Adj. β 95% CI
Intercept	0.98**	0.34–1.63	0.79*	0.01–1.57	***SocEnv***			
ResLoc					Poor	Ref		
Metro	Ref		Ref		Medium-poor	-0.21	-0.47–0.05	
Non-metro	0.06	-0.25–0.38	0.02	-0.31–0.35	Medium-good	-0.13	-0.40–0.14	
PCOB					Good	-0.28*	-0.55–-0.01	
Australia	Ref		Ref		***HPE***			
Other	0.17	-0.04–0.38	0.9	-0.03–0.41	Poor	Ref		
HCC					Medium-poor	-0.16	-0.41–0.09	
Has HCC	Ref		Ref		Medium-good	-0.05	-0.31–0.22	
No HCC	0.12	-0.12–0.35	-0.00	-0.25–0.25	Good	-0.15	-0.44–0.14	
PEduc					***QualBGC***			
School	Ref		Ref		Poor	Ref		
Vocational	-0.10	-0.43–0.23	-0.13	-0.49–0.23	Medium	0.11	-0.15–0.38	
Tertiary	-0.07	-0.35–0.21	-0.09	-0.39–0.22	Good	-0.04	-0.35–0.27	
HHI					***QualTch***			
Low	Ref		Ref		Poor	Ref		
Medium	-0.21	-0.47–0.04	-0.12	-0.39–0.16	Medium	-0.08	-0.38–0.22	
High	-0.24	-0.55–0.08	-0.19	-0.51–0.14	Good	0.01	-0.33–0.35	

Models adjusted for age and sex
*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)
Intercept = mean of outcome for reference group

Table 5-97 Adjusted models: Untreated decayed surfaces (*UD*), permanent subset, multilevel models (Models 7–8), part 2

	Model no.			
	7		8	
Category	Adj. β	95% CI	Adj. β	95% CI
S_SchType				
Combined	Ref		Ref	
Primary	0.03	-0.31–0.38	-0.08	-0.46–0.30
Secondary	-0.03	-0.40–0.33	0.32	-0.17–0.81
S_SchSES				
Low	Ref		Ref	
Medium-low	-0.10	-0.42–0.22	0.07	-0.30–0.44
Medium-high	-0.00	-0.35–0.35	0.22	-0.19–0.62
High	-0.30	-0.68–0.09	-0.18	-0.65–0.29
S_SchSize				
Small	Ref		Ref	
Medium-small	0.01	-0.33–0.36	0.04	-0.33–0.40
Medium-large	-0.04	-0.40–0.33	-0.14	-0.55–0.26
Large	0.04	-0.40–0.47	-0.12	-0.62–0.38
S_TchWkld				
Low	Ref		Ref	
Medium	0.18	-0.11–0.46	0.35*	0.03–0.66
High	0.47**	0.14–0.79	0.50**	0.13–0.87
S_NESB				
Low	Ref		Ref	
Medium-low	-0.09	-0.42–0.25	-0.18	-0.55–0.20
Medium-high	-0.02	-0.39–0.35	-0.14	-0.53–0.25
High	0.04	-0.36–0.45	0.15	-0.30–0.59
SLV (Error)	0.24**	(0.07)	0.17**	(0.07)
Total variance	5.84		5.94	
ICC	4.1%		2.8%	
AIC	12620.0		11802.7	

	Model no.			
	7		8	
Category	Adj. β	95% CI	Adj. β	95% CI
S_SchQual				
Poor			Ref	
Medium-poor			0.28	-0.09–0.65
Medium-good			0.05	-0.35–0.45
Good			0.36	-0.07–0.80
S_Relat				
Poor			Ref	
Medium-poor			-0.43*	-0.79–-0.07
Medium-good			-0.40*	-0.79–-0.00
Good			-0.23	-0.63–0.17
S_Integ				
Poor			Ref	
Medium-poor			-0.08	-0.43–0.27
Medium-good			0.03	-0.35–0.40
Good			-0.18	-0.59–0.22
S_HthServ				
Poor			Ref	
Medium-poor			0.09	-0.26–0.44
Medium-good			0.18	-0.18–0.54
Good			0.07	-0.30–0.44
S_SupServ				
Poor			Ref	
Medium-poor			0.12	-0.25–0.49
Medium-good			-0.13	-0.51–0.25
Good			-0.06	-0.43–0.31
S_Volunt				
Poor			Ref	
Medium-poor			0.27	-0.13–0.68
Medium-good			0.01	-0.39–0.42
Good			0.23	-0.21–0.67
S_ChSick				
Poor			Ref	
Medium-poor			-0.04	-0.38–0.31
Medium-good			-0.22	-0.60–0.15
Good			-0.20	-0.57–0.18
SLV (Error)	0.24**	(0.07)	0.17**	(0.07)
Total variance	5.84		5.94	
ICC	4.1%		2.8%	
AIC	12620.0		11802.7	

Models adjusted for age and sex

*P < 0.05; **P < 0.01; ***P < 0.001 (significant difference from the reference category)

SLV = School-level variance; ICC = Intraclass correlation (SLV as % of total variance); AIC = Akaike's Information Criterion (model fit, smaller is better)

5.3.3.4 *Post-hoc analysis*

An analysis of collinearity between parent-rated health (*PRH*) and parent-rated oral health (*PROH*) revealed a small to moderate correlation (Cramer's v = 0.34).

Table 5-98 displays the Variance Inflation Factors (VIF) for variables in Models 7 and 8 for *PRH* in the total sample. All VIF values were below five indicating no concerning level of correlation between items. This analysis confirms that the variance was not inflated due to collinearity between explanatory variables.

Table 5-98 Variance Inflation Factors (VIF) for independent variables, Models 7 and 8, *PRH* in the total sample

Variable	Model 7	Model 8
Intercept	0.00	0.00
Age	1.27	1.25
Sex	1.02	1.02
ResLoc	1.74	1.75
PCOB	1.11	1.11
HCC	1.13	1.13
PEduc	1.18	1.18
HHI	1.37	1.35
SocEnv	1.13	
HPE	1.16	
QualBGC	1.55	
QualTch	1.58	
S_SchType	1.42	1.58
S_SchSES	1.44	2.01
S_SchSize	1.35	1.88
S_TchWkld	1.32	1.53
S_NESB	1.66	1.82
S_SchQual		1.77
S_Relat		1.66
S_Integ		1.54
S_HthServ		1.22
S_SupServ		1.32
S_Volunt		1.69
S_ChSick		1.35

5.4 Summary

The sample included 129 primary schools, 76 secondary schools and 70 combined schools across NSW, SA and ACT. There was an underrepresentation of secondary schools and hence a smaller pool of older children than younger children. In total, 5,704 children were included in the analysis, with 5,418 having both a completed survey and dental examination. There was evidence of socioeconomic bias. As expected from the school sample, older children (ages 13 and 14 years) were less well represented than children of younger ages.

Table 5-99 Summary of preliminary and data reduction analyses, part 1

Group	Variables	Label	Outcome
Child socioeconomic characteristics	Age, Sex, Residential location	*Age*, *Sex*, *ResLoc*	Retained – classification variables
	Parent indigenous status, Child indigenous status	*PIndig*, *ChIndig*	Dropped due to low frequency
	Parent employment status, Dental insurance status	*PEmpl*, *DentIns*	Dropped due to high collinearity with Household Income (*HHI*)
	Health care card status, Parent country of birth, Parent highest level of education, Household income	*HCC*, *PCOB*, *PEduc*, *HHI*	Retained for analysis
Parent perceptions of school	Perception of and involvement in school committees		Dropped due to low response
Child-level	Child experience of bullying, Child experience of teasing, Child experience of physical hurt, Disputes at school, General safety at school, Student morale, Child sick leave, Social problems at school	*Bully*, *Tease*, *PhysHurt*, *Dispute*, *Safety*, *Morale*, *ChSick*, *SocProb*	Variables combined to create factor variable Social Environment (*SocEnv*) through PCA
	Parent involvement in general decisions at school, Parent involvement in health decisions at school, Communitiy involvement in school, School provision of health services, School provision of a student support service, School health policies, Parent involvement in volunteering at school, Parent involvement in parent and friends group at school	*GenDec*, *HthDec*, *ComInv*, *HthServ*, *SupServ*, *HthPol*, *Volunt*, *PnFGrp*	Variables combined to create factor variable Health Promoting Environment (*HPE*) through PCA
	Quality of buildings/grounds and classrooms, Quality of teachers	*QualBGC*, *QualTch*	Retained for analysis as standalone variables

PCA = Principal Components Analysis

In the preliminary and data reduction analyses the number of data items retained for final analysis were reduced through various mechanisms (Table 5-99 and Table 5-100). For child socioeconomic items, the classification variables of parent and child indigneous status (*PIndig* and *ChIndig*) were dropped due to low frequency of indigenous respondents. The variables parent employment status (*PEmpl*) and dental insurance status (*DentIns*) were dropped due to high collinearity with household income (*HHI*). The classification variables of age, sex and residential location were retained. Low response to a question on parent perception of and involvement in school committees saw that item dropped from both child- and school-level parent perceptions of school variables. For the child-level parent perceptions of school, 18 items were reduced to four (two factor variables, two standalone variables) for final analysis through

the application of a Principal Components Analysis (PCA). For the school-level perceptions, 18 items were reduced to seven (three factor variables, four standalone variables) using a PCA. For the school characteristics variables, the classification item school type (*S_SchType*) was retained for analysis. School location (*S_SchLoc*) and percent Indigenous at school (*S_Indig*) were dropped as they were part of the calculation of an included composite variable (*ICSEA*). The remaining seven variables were reduced to four (one factor variable, three standalone variables) through the PCA.

Table 5-100 Summary of preliminary and data reduction analyses, part 2

Group	Variables	Label	Outcome
School-level	Quality of teachers, Quality of buildings/grounds and classrooms, Social problems at school, School health policies, General safety at school, Student morale	*S_QualTch*, *S_QualBGC*, *S_SocProb*, *S_HthPol*, *S_GenSafe*, *S_Morale*	Variables combined to create factor variable School quality (*S_SchQual*) through PCA
	Child experience of teasing, Child experience of bullying, Child experience of physical hurt, Disputes at school	*S_Tease*, *S_Bully*, *S_PhysHurt*, *S_Dispute*	Variables combined to create factor variable School relations (*S_Relat*) through PCA
	Parent involvement in general decisions at school, Community involvement at school, Parent involvement in health decisions at school, Parent involvement in parent and friends group at school	*S_GenDec*, *S_ComInv*, *S_HthDec*, *S_PnFGrp*	Variables combined to create factor variable School integration (*S_Integ*) through PCA
	School provision of health services, School provision of a student support service, Parent involvement in volunteering at school, Child sick leave	*S_HthServ*, *S_SupServ*, *S_Volunt*, *S_ChSick*	Retained for analysis as standalone variables
School characteristics	School type	*S_SchType*	Retained – classification variable
	School attendance rate, School academic performance, ICSEA, School income, Class size	*S_Attend*, *S_Acad*, *S_ICSEA*, *S_Income*, *S_ClsSize*	Variables combined to create factor variable School SES (*S_SchSES*) through PCA
	School size, Teacher workload, Percent non-English speaking background	*S_SchSize*, *S_TchWkld*, *S_NESB*	Retained for analysis as standalone variables

PCA = Principal Components Analysis, ICSEA = Index of Community Socioeducational Advantage, SES = Socioeconomic Status

In assessing general contextual effects, variation between schools was significant for all outcome measures across all study populations. The effects seen were marginal and varied in magnitude (MOR for categorical outcome variables between 1.09 and 1.50; ICC for continuous outcome variables between 2.5% and 5.3%).

There were numerous significant specific effects seen in the univariable, bivariable and multivariable analyses. Among the child-level parent perceptions variables, the created factor variable social environment (*SocEnv*) showed the most significant associations with outcome measures across all analyses, including parent-rated health (*PRH*) and parent-rated oral health (*PROH*) in all populations, and decayed, missing and filled permanent surfaces (*DMFS*) and untreated decayed permanent surfaces (*UD*) in the permanent subset.

The findings were less consistent among the school-level parent perceptions variables. Of the created factor variables, school relations (*S_Relat*) and school quality (*S_SchQual*) were most frequently associated significantly with outcome measures. Significant associations with school quality were consistently seen in multivariable analyses for untreated decayed deciduous surfaces (*ud*) in the deciduous subset and decayed, missing and filled permanent surfaces in the permanent subset. With school relations, there were significant associations consistent across analyses only among outcome variables in the permanent subset, including parrent-rated oral health, decayed, missing and filled permanent surfaces and untreated decayed permanent surfaces. The standalone variable health services at school (*S_HthServ*) had consistent significant associations with untreated decayed deciduous surfaces through all analyses.

Among school characteristic variables, the created factor variable school socioeconomic status (SES) (*S_SchSES*) demonstrated a number of significant associations. This included associations with parent-rated health and parent-rated oral health in all populations, and presence of deciduous caries (*poc*), decayed, missing and filled deciduous surfaces (*dmfs*) and untreated decayed deciduous surfaces in the deciduous subset. The standalone variable teacher workload (*S_TchWkld*) showed consistent significant associations across analyses with presence of permanent caries (*POC*), decayed, missing and filled permanent surfaces and untreated decayed permanent surfaces in the permanent subset, as well as with untreated decayed deciduous surfaces in the deciduous subset.

6 Discussion

This section discusses the results in detail and explores the associated complexities. First, general contextual effects are considered, including a summary and interpretation of the relevant findings. Second, a summary of findings and subsequent interpretations of specific effects is presented. Next follows an exploration of the potential implications of the findings, followed by recommendations for future work and acknowledgement of the limitations of the current study. Final conclusions drawn from the research are then presented.

6.1 General contextual effects

This subsection summarises the general contextual findings and draws on the summary to identify the best model for explaining contextual variation and assess the magnitude thereof.

6.1.1 Summary of findings

To explore general contextual effects, the explanation of variance by individual variable-blocks was considered, followed by a determination of which model explained the most variation. Finally, the amount of school-level variation evident from the analysis is assessed. Findings were tabulated to aid summarisation of the data (Table 6-1 and Table 6-2).

In the multivariable analysis, Models 1, 2, 4 and 5 incorporated a different single variable-block with the reference model (Model 0). A comparison of school level variance between these models was assessed to gauge which variable block explained the most school-level variance in outcome measures. School level variance was indicated by the Median Odds Ratio (MOR) in logistic models and Intraclass Correlation (ICC) in linear models. The MOR/ICC in the reference model indicated the amount of school level variation when accounting for only the age and sex of the child. If a model demonstrated a lower MOR/ICC than the reference model it explained some of the school-level variation present for that outcome measure. The model with the lowest MOR/ICC explained the most school-level variation out of the models assessed and was considered the best model.

Table 6-1 Summary of general contextual effects: generalised logistic models (dichotomised outcome measures)

		Full sample		Deciduous subset			Permanent subset		
		PRH	*PROH*	*PRH*	*PROH*	*poc*	*PRH*	*PROH*	*POC*
Rank of variable-blocks by MOR	1 (lowest)	SC	SC	SC	SC	SD	SC	SC	SC
	2	SD	SPP	SPP	SD	SC	SD	SPP	SD
	3	SPP	SD	SD	SPP	SPP	SPP	SD	CPP
	4 (highest)	CPP	CPP	CPP	CPP	CPP	CPP	CPP	SPP
Reference MOR		1.38	1.12	1.50	1.09	1.14	1.42	1.18	1.48
Lowest MOR		1.05	1.05	1.12	1.05	1.05	1.03	1.11	1.41
In Model…		6, 8	4	4	4	6, 8	7	4, 5, 6	3, 4, 6, 7, 8
Significant…		NS	C	NS	NS	NS	NS	C	S
MOR decreased by		89%	58%	76%	44%	64%	93%	39%	15%

SD = Sociodemographic variables, CPP = Child-level parent perceptions of school variables, SC = School characteristics variables, SPP = School-level parent perceptions of school variables
MOR = Median odds ratio
S = significant, NS = not significant, C = close to non-significant

Table 6-2 Summary of general contextual effects: linear models (continuous outcome measures)

		Deciduous subset		Permanent subset	
		dmfs	*Ud*	*DMFS*	*UD*
Rank of variable-blocks by SLV	1 (lowest)	SD	SC	SPP	SPP
	2	SC	SD	SD	SD
	3	SPP	SPP	CPP	CPP
	4 (highest)	CPP	CPP	SC	SC
Reference SLV		0.69	0.24	0.35	0.29
Reference ICC		2.5%	4.0%	4.4%	5.3%
Reference AIC		21348.8	15976.5	14961.7	13804.3
Lowest SLV		0.29	0.06	0.23	0.17
Significant SLV		NS	NS	S	S
In Model…		8	8	8	8
Lowest ICC		1.2%	1.2%	2.8%	2.8%
In Model…		8	8	8	8
Lowest AIC		19195.8	14411.1	12618.1	11802.7
In Model…		8	7	8	8
SLV decreased by		58%	75%	34%	41%
ICC decreased by		52%	70%	36%	47%

SD = Sociodemographic variables, CPP = Child-level parent perceptions of school variables, SC = School characteristics variables, SPP = School-level parent perceptions of school variables
SLV = School-level variation, ICC = Intraclass correlation, AIC = Akaike's Information Criterion
S = significant, NS = not significant

Across all models, the model including only school characteristic variables (Model 4) tended to see the largest decrease in MOR or ICC and the model including only child-level parent perceptions of school variables (Model 2) the smallest decrease. There was variation in which block of variables led to the second and third largest decreases in MOR/ICC. Overall, sociodemographic variables (Model 1) tended to result in a lower MOR/ICC than school-level parent perceptions of school variables (Model 5). Variation was evident, however, between various outcome measures and between populations.

Looking at subjective measures as a separate group, Model 4 (school characteristics) saw the largest decrease in MOR and Model 2 (child-level parent perceptions) the smallest as in the overall assessment. Among these measures Models 1 (sociodemographic) and 5 (school-level parent perceptions) resulted in the second lowest MOR half the time. Across all clinical measures, sociodemographic variables (Model 1) saw the largest decrease in MOR/ICC, followed by both school characteristics (Model 4) and school-level parent perceptions of school variables (Model 5) equally.

Assessing the outcome measures in the deciduous subset, Model 4 (school characteristics) tended to see the lowest MOR/ICC, followed by Model 1 (sociodemographic) and then Model 5 (school-level parent perceptions). Across permanent subset outcome measures the lowest MOR/ICC was most commonly achieved by Model 5 (school-level parent perceptions), followed by Models 1 (sociodemographic) and 4 (school characteristics) equally.

Models for dichotomised outcome measures in the deciduous and permanent subsets separately tended to follow the same pattern as in the overall assessment, with Model 4 (school characteristics) showing the largest decrease in MOR, followed by Model 1 (sociodemographic), Model 5 (school-level parent perceptions) and finally Model 2 (child-level parent perceptions). Continuous outcome measures in the deciduous subset saw Models 1 (sociodemographic) and 4 (school characteristics) equally lower the ICC most, followed by Model 5 (school-level parent perceptions) and then Model 2 (child-level

parent perceptions). Among continuous outcome measures in the permanent subset, Model 5 (school-level parent perceptions) lowered the ICC the most followed by Model 1 (sociodemographic), Model 2 (child-level parent perceptions) and finally Model 4 (school characteristics).

For at least half of the dichotomised outcome measures, Model 4 (school characteristics) had the lowest or one of the lowest MOR out of all models. For three of the outcome measures, Models 6 and 8 (full school and fully adjusted with school-level parent perceptions variables) had the lowest or among the lowest MOR. Of difference was parent-rated health (*PRH*) in the permanent subset, for which Model 7 (fully adjusted with child-level parent perceptions of school) produced the lowest MOR.

A comparison of the overall best model and the rankings for variable-blocks based on the lowest MOR often logically matched, for example school characteristics variables (Model 4) produced the lowest MOR than other variable blocks and was the best model overall. Likewise, for some outcome measures child-level parent perceptions of school variables (Model 2) saw the smallest decrease in MOR and the best model did not include this block of variables. This was not the case for *PRH* in the permanent subset, for which the best model was Model 7, the fully adjusted model that included the variable block that explained the least school-level variance (Model 2) in the rank comparison.

The percentage decrease between MOR in the reference model and in the best model varied, being highest for *PRH* and lowest for presence of permanent caries (*POC*). The decrease for *POC* in the permanent subset was small despite having the second-largest reference MOR and did not approach non-significant levels.

Among the continuous outcome measures, Model 8 (fully adjusted model with school-level parent perceptions of school) accounted for the largest reduction in school-level variance (SLV) and ICC from the reference model, and demonstrated the best model fit for all outcome measures excepting untreated decayed deciduous surface (*ud*) in the deciduous subset. At least among the continuous clinical outcome measures, Model 8 was identified as the best model.

Among dichotomised outcome measures, which included *PRH*, parent-rated oral health (*PROH*), presence of deciduous caries (*poc*) and *POC,* the largest amount of school-level variance was seen for *PRH* in the deciduous subset (MOR 1.50) and *POC* in the permanent subset (MOR 1.48). The smallest amount was seen for *PROH* in the deciduous subset (MOR 1.09) and full sample (MOR 1.12). Overall, outcome measures in the permanent subset tended to have more school-level variance (higher MOR) than outcome measures in other populations, and outcome measures in the deciduous subset had the least. The largest amount of school-level variance was accounted for by the best models for *PRH* in the permanent subset and in the full sample and the smallest amount by *POC* and *PROH* in the permanent subset.

Among the continuous outcome measures, which included decayed, missing and filled deciduous surfaces (*dmfs*), *ud*, decayed, missing and filled permanent surfaces (*DMFS*) and untreated decayed permanent surfaces (*UD*), school-level variance accounted for less of the total variance for deciduous measures than for permanent measures as demonstrated by the ICC values. The ICC decreased by a smaller amount for the permanent measures compared to the deciduous measures.

6.1.2 Interpretations

In assessing general contextual effects, the findings were not consistent across all outcome measures and populations. Notable differences were apparent between the deciduous and permanent subsets in terms of contributing variable-blocks and the amount of school-level variation. In the permanent subset, Model 5 accounted for the highest amount of variance for three out of the five outcome measures (*PROH*, *DMFS*, *UD*) but not for any outcome measures in the deciduous subset or the total sample. This may indicate that the school-level parent perceptions of school variable-block is of more relevance in the permanent subset than the other populations, at least for some outcomes. In general, outcome measures in the permanent subset showed a larger amount of variation at the school level than outcome measures in the deciduous subset. This is consistent with the concept that older children have been exposed to the school environment and experience longer, on average, than younger children. Hence school-level influence should be greater for the permanent subset than the deciduous subset or total sample.

Overall, there was a higher percentage decrease of MOR/ICC from the reference model to the best model among deciduous than permanent outcome measures, indicating that more school-level variation was explained by the best models among deciduous outcome measures than among permanent outcome measures. For the three clinical outcome measures in the permanent subset, the amount of school-level variation remained significant, as it did for *PROH* in the permanent subset although it was bordering on non-significance. In the deciduous subset, school-level variation reached non-significant levels in the best model for all outcome measures. This may be indicative of other data not collected that are important for explaining school-level variation in oral health outcome measures in children with permanent dentition. Of the permanent outcome measures, *POC* saw the smallest percentage decrease in school-level variance. Another particular finding with this outcome measure was that there were five models deemed the best, having equally the lowest MOR. For this outcome measure, it seems the data collected was not sufficient to explain the school-level variance. This particular finding supports the presence of other information that would assist in accounting for school-level variance but was not collected as part of this study.

In the assessment of variable-blocks and their contribution to explaining school-level variation, the results demonstrate that there is no one block of variables that contributes most, or least, to explaining school-level variance in all outcome measures. The most consistent result was that the school-level parent perceptions of school variable-block (Model 5) accounted for more school-level variance than the child-level parent perceptions of school variable-block (Model 2). This finding indicates that the school-level block of parent perceptions of school variables are more relevant than the child-level in explaining school-level variation. This is a positive finding for the current research as it supports the concept of school-level environmental factors influencing school-level variation in the individual oral health outcome measures analysed. It also lends weight to the validity of utilising the parent perceptions of school variables at the school-level.

Variation between schools was significant for all outcome measures across all study populations though the magnitude varied. Only two of the multilevel studies included in the review stated or provided information to determine the magnitude of general contextual effects. Goodman et al. (2003) assessed a multilevel model for depressive symptoms in adolescents, indicating a school-level variance of 2.7% (ICC) in the reference model. Walsemann et al. (2011) found a school-level variation of 1.4% (ICC) in the reference model in depressive symptoms among adolescents. The lowest ICC in the current study was

2.5% (*dmfs*) and the highest 5.3% (*UD*), which is ample relative to literature reviewed. There were no directly comparable results for oral health outcomes in a multilevel model, let alone a model incorporating a school-level, with regards to general contextual effects.

Overall, while significant, the variations at the school level were marginal, even among those variables with the largest MOR/ICC. A small difference can have a large impact, and this may be the case with regards to the current topic for a number of reasons. Firstly, the nature of oral disease, specifically caries, is cumulative (Macek et al. 2001, Thomson et al. 2004). Less oral disease in childhood and adolescence may mean less oral disease and less severe disease later in life. Over the lifetime, a reduction in the compounded burden of poor oral health could mean, for the individual, lower oral-related morbidity (Sheiham 2005), greater engagement in school (Casamassimo et al. 2009) and in work later in life (Harford and Chrisopoulos 2012), less financial hardship due to dental-related health care costs (Harford and Islam 2013), less socioeconomic disadvantage (Brennan and Spencer 2014), and less likelihood of developing other diseases in adulthood (Garcia et al. 2000, Wu et al. 2000, Saito et al. 2001, Khader et al. 2004, Meurman et al. 2004, Lamster et al. 2008). Secondly, the mechanisms by which oral health outcomes are impacted can be considered. If, for example, oral health is improved through enhanced health-promoting behaviours and a reduction in health-averse behaviours, benefits may also accumulate over time and further support the above-mentioned beneficial consequences.

Thirdly, the spread of oral disease is large, with almost half of children aged six years experiencing deciduous caries, and two-fifths of children aged 12 years experiencing permanent caries (Mejia et al. 2012). From a population perspective, a small reduction overall is still large in terms of numbers impacted. Finally along that same line of reasoning, the disparity of disease experience across sectors of the population (Mejia et al. 2012) makes relevant which children are impacted. A five percent reduction in caries, for example, among children least affected by disease is going to be less meaningful than a five percent reduction among those most affected. Benefit applied specifically to those worse affected would also mean a reduction in inequalities in oral disease experience, and consequently a reduction in the worst and most costly consequences of poor oral health, such as medication, general anaesthesia, serious infection and death (Casamassimo et al. 2009).

6.2 Specific effects

This subsection summarises findings for the specific effects both for individual-level school items (child-level parent perceptions of school) and school-level school items (school characteristics and school-level parent perceptions of school). As part of the interpretation, the findings for each variable are discussed, with a particular focus on statistically significant results. Associations that were relative in size to the significant associations but missed reaching significance by a small margin are included in the discussion. Findings were tabulated to aid summarisation of the data and are included in the following subsection.

6.2.1 Summary of findings

Among the child-level parent perceptions variables, the created factor variable social environment (*SocEnv*) showed the most significant and close to significant associations with outcome measures (Table 6-3). These included suboptimal parent-rated health (*PRH*) and parent-rated oral health (*PROH*) in all study populations, though significance was not demonstrated in the fully adjusted analysis for *PRH* in the full sample and *PROH* in the deciduous sample. Some permanent clinical outcomes measures were associated with social environment, namely decayed, missing and filled permanent surfaces (*DMFS*) and untreated decayed permanent surfaces (*UD*). Health promoting environment (*HPE*) and quality of

buildings/grounds and classrooms (*QualBGC*) showed significant and close to significant associations with a number of outcome measures, most frequently suboptimal *PROH* in each study population. Quality of teachers (*QualTch*) only demonstrated relationships with subjective measures in each study population, but more so in the permanent subset. No variable from this block demonstrated association with clinical outcome measures in the deciduous subset, but some associations were evident in the permanent subset with clinical measures. The only significant associations with presence of permanent caries (*POC*) were with health promoting environment.

Table 6-3 Summary of specific effects: child-level parent perceptions of school variables

		Full sample		Deciduous subset					Permanent subset				
	Analysis	*PRH*	*PROH*	*PRH*	*PROH*	*poc*	*dmfs*	*ud*	*PRH*	*PROH*	*POC*	*DMFS*	*UD*
SocEnv	BV	S-	S-	S-	S-				S-	S-			
	M2	S-	S-	S-	S-				S-	S-		S-	S-
	M3	S-	S-	S-	C-				S-	S-		S-	S-
	M7		S-	S-					S-	S-		S-	S-
HPE	BV	S-	S-	S-	S-					S-	S-		
	M2		S-		S-					S-	C-		C-
	M3		S-		C-					C-	C-		
	M7		S-							S-	C-		
QualBGC	BV	S-	S-	S-	S-				S-	S-		S-	
	M2		S-						C-	S-		C-	
	M3		S-		S-				C-	S-		C-	
	M7		C-							S-			
QualTch	BV	S-	S-	S-	S-				S-	S-			
	M2	S-	S-		C-				S-	S-			
	M3	C-	S-						C-	S-			
	M7		S-						C-	S-			

BV = bivariable analysis, M2 = Model 2, M3 = Model 3, M7 = Model 7
S = significant association, C = close to significant, + = positive association, – = negative association

Among school characteristic variables, the created factor variable school socioeconomic status (SES) (*S_SchSES*) demonstrated a number of significant and close to significant associations (Table 6-4). This was true in one of the fully adjusted analyses (Model 7) for *PROH* in the total sample and permanent subset, and decayed, missing and filled deciduous surfaces (*dmfs*) in the deciduous subset. It was true in both fully adjusted analyses (Models 7 and 8) for *PRH* and untreated decayed deciduous surfaces (*ud*) in the deciduous subset. Teacher workload (*S_TchWkld*) was significantly associated with all clinical outcome measures in the permanent subset and *ud* in the deciduous subset in all analyses. A number of analyses showed significant or close to significant associations between teacher workload and presence of deciduous caries (*poc*) in the deciduous subset and *PRH* in the permanent subset. There were a number of significant or close to significant associations for percent non-English speaking background (NESB) children (*S_NESB*), but the only outcome where these associations were evident in fully adjusted analyses was for *PRH* in the permanent subset. School type (*S_SchType*) did not demonstrate consistent significant associations with outcomes and school size (*S_SchSize*) only demonstrated one for *dmfs*. For subjective outcome measures, school SES demonstrated significant associations most commonly, with some demonstrated by teacher workload and percent NESB children. Among deciduous clinical outcome measures, the most frequently associated variable was school SES followed by teacher workload. Among permanent clinical outcome measures, teacher workload demonstrated consistent, significant associations.

Table 6-4 Summary of findings: school characteristic variables

		Full sample		Deciduous subset					Permanent subset				
Analysis		*PRH*	*PROH*	*PRH*	*PROH*	*poc*	*dmfs*	*ud*	*PRH*	*PROH*	*POC*	*DMFS*	*UD*
S_SchType	BV	S~	S~	S~					S~	S~	S~	S~	S~
	M4	S~	S~	S~	S~					C~			
	M6					C~				C~		S~	
	M7			C~									
	M8												
S_SchSES	BV	S-	S-	S-	S-	S-	S-	S-	S-	S-			
	M4	S-	S-	S-	S-	C-	S-	S-	S-	S-			S-
	M6	S-	S-	S-	S-	S-	S-	S-					
	M7		S-	S-			S-	S-		C-			
	M8			C-				S-					
S_SchSize	BV												
	M4												
	M6												
	M7												
	M8						S+						
S_TchWkld	BV	S+	S+	S+	S+			S+	S+	S+	S+	S+	S+
	M4		S+			S+	C-	S+			S+	S+	S+
	M6					S+		S+	C+		S+	S+	S+
	M7							S+			S+	S+	S+
	M8					C+		S+	C+		S+	S+	S+
S_NESB	BV	S+	S~	S+				S+	S+				
	M4	S+		S+				C~	S+				
	M6	S+					C+	S~	S+				
	M7								S+				
	M8								S+				

BV = bivariable analysis, M4 = Model 4, M6 = Model 6, M7 = Model 7, M8 = Model 8

S = significant association, C = close to significant

+ = positive association, – = negative association, ~ = non-linear association

Of the created factor variables in the school-level parent perceptions variables, school relations (*S_Relat*) and school quality (*S_SchQual*) were most frequently associated significantly, or close to, with various outcome measures (Table 6-5). School quality demonstrated significant association in the fully adjusted analysis (Model 8) for some clinical outcome measures; *ud* in the deciduous subset and *DMFS* in the permanent subset. School relations was significantly associated with some clinical outcome measures in the permanent subset (*DMFS* and *UD*) in all multivariable analyses, and with all analyses for *PROH* in the permanent subset. Among stand-alone items, school-level provision of health services (*S_HthServ*) was associated with *poc* in all multivariable analyses and with *ud* in all analyses, both in the deciduous subset. School-level provision of support service (*S_SupServ*) was associated significantly, or close to, with deciduous *ud*. No consistent associations were evident between outcome measures and created factor variable school integration (*S_Integ*), or stand-alone items school-level parent involvement in volunteering (*S_Volunt*) and school-level child sick leave (*S_ChSick*). Most of the significant associations for school relations were in the permanent subset, while the significant and close to significant associations for school-level provision of health services and school-level provision of support service were for deciduous clinical outcome measures.

Table 6-5 Summary of findings: school-level parent perceptions of school variables

		Full sample		Deciduous subset					Permanent subset				
	Analysis	*PRH*	*PROH*	*PRH*	*PROH*	*poc*	*dmfs*	*ud*	*PRH*	*PROH*	*POC*	*DMFS*	*UD*
S_SchQual	BV	S-	S-	S-	S-				S-			S-	
	M5	S-	S-	C-	C-				C-	C-			
	M6							S+				S+	
	M8							S+				S+	
S_Relat	BV		S-							S-			
	M5		C-					S-		S-		S-	S-
	M6									S-		S-	S-
	M8									S-		S-	S-
S_Integ	BV												
	M5												
	M6						S+						
	M8						S~						
S_HthServ	BV							S+					
	M5					S+		S+					
	M6					S+		S+					
	M8					S+		S+					
S_SupServ	BV							S+					
	M5							C-				S-	
	M6						C-	C-					
	M8							S-					
S_Volunt	BV	S-	S-	S-					S-			S-	S-
	M5	C-	S-	S-			S~			C-			
	M6						S~						
	M8						S~						
S_ChSick	BV								S-				
	M5												
	M6	C-				S+							
	M8	C-				S+							

BV = bivariable analysis, M5 = Model 5, M6 = Model 6, M8 = Model 8
S = significant association, C = close to significant
+ = positive association, – = negative association, ~ = non-linear association

The direction of associations was largely as expected, with lower levels of disease or poor health associated with better parent perceptions at child- and school-level, and with higher school SES and lower teacher workload. Where significant associations were evident with percent NESB children, a higher percent tended to be associated with higher likelihood of suboptimal health ratings. Among school-level parent perception of schools, the direction of some of the associations was not as expected. Higher levels of disease were repeatedly seen with better school quality for *ud* and *DMFS*, and better school-level provision of health services for *poc* and *ud*.

6.2.2 Interpretation

Due to the lack of literature specific to the current topic, literature referenced in this subsection is, at best, recognised only as 'in principal' support or refutation of findings.

6.2.2.1 ***Specific individual effects***

6.2.2.1.1 Parent perceptions of school

6.2.2.1.1.1 Comparison across outcomes and sample populations

The child-level parent perceptions of school variables more frequently demonstrated significant associations with *PROH* than with *PRH*. One possible explanation for this is that parent perceptions of school aspects are more relevant to parent ratings of oral health than general health. Unfortunately there is no literature specific to this finding, nor is there literature regarding correlation between parent ratings of child health and oral health. A post-hoc analysis revealed a correlation between the two outcome measures but it was only small to moderate in magnitude. While related, these subjective measures were capturing different information and it is reasonable to consider that they may have been influenced by different factors.

Significant associations among the child-level parent perceptions of school variables were more common with subjective measures of oral health than with clinical measures. This may be due to the independent and outcome measures both being parental perceptions. Psychological states have been found to influence perception of health (Tessler and Mechanic 1978, Salovey et al. 2000) as well as other perceptions, such as of social interactions (Forgas et al. 1984), discrimination (Kessler et al. 1999) and organisational justice (Elovainio et al. 2002). Some unknown common factor may be driving both the parent perception of the child's school and the parent perception of the child's health causing them to be more closely associated than the parent perception of schools and clinical outcome measures.

Significant associations were more common in the permanent subset compared to the deciduous subset or full sample. This finding was explicable, as children in the permanent subset, having an older average age, have attended school for a greater amount of time and will have been exposed to the contributing aspects of schools for longer on average than children in the other study populations. The total sample and deciduous subset include children who have just commenced at school and hence have received negligible exposure to the school environs. Consequently, significant associations should be more common in the permanent subset for the other school variables.

6.2.2.1.1.2 Interpretations by specific independent variables

The created factor variables social environment (*SocEnv*) and health promoting environment (*HPE*) had a greater number of significant and close to significant associations than the stand-alone items quality of buildings/grounds and classrooms (*QualBGC*) and quality of teachers (*QualTch*). The factor variables represent a more complex concept than the stand-alone variables, providing a more complete picture of an aspect of the school environment. This result supports the legitimacy of the created variables, and demonstrates that they work as explanatory constructs.

Social environment encapsulated the child's experience of bullying, teasing and physical hurt, disputes among parents at school and between parents and school personnel, general safety at school, student morale and sick leave, and prevalence of social problems at the school. More than half of the items were drawn from the same source report (OECD 2009), namely child's experience of bullying, teasing and physical hurt, general safety at school and social problems at school. Student morale and sick leave

aimed to assess a similar concept, namely child connectedness or commitment to the school. Only the item assessing disputes was drawn from a completely separate source (Gutman and Feinstein 2008). All items reflected social aspects of the school.

Health promoting environment is a summary measure of parental involvement in general and health decisions at the school, community involvement in the school, the provision of health services and a support service, the breadth of school health policies, and parental involvement in volunteering and a parent and friends group at the school. Each individual item with the exception of parent volunteering and involvement in a parent and friends group were drawn from the same paper (St Leger et al. 2002) and represented three of the six domains of the World Health Organisation's (WHO) Health Promoting School (HPS) framework stipulated therein: school health policies and associated practices, community relationships and health services and associated procedures. That the items evidently measured aspects of the same construct is understandable. The final two included items conceptually fall within the domain of community relationships though they were drawn from a different study. The HPS framework includes social environment as another domain, which explains why a one factor solution in the final principal components analysis demonstrated good internal validity.

There is limited research to draw upon when considering associations between outcomes and each independent item individually and there is no literature specific to the topic. In particular, this variable-block constituted individual parent perceptions for which there is no parallel literature. Where possible, research from the literature review which relates to the research findings in principal is discussed.

In all cases where a significant association was present, better social environment was associated with better outcomes, including lower suboptimal parent-rated health (*PRH*) and parent-rated oral health (*PROH*), and lower average decayed, missing and filled permanent surfaces (*DMFS*) and untreated decayed permanent surfaces (*UD*). Brière et al. (2013) found that better school socioeducational environment was associated with lower depressive symptoms. In the study, socioeducational environment included dimensions of social climate and safety, which were similar to items comprising social environment. Social climate included student-student and student-teacher relationship measures, likewise in the social environment measure child experience of bullying, teasing and physical hurt reflect relationships between students, and student morale included relationships between student and teachers. Safety incorporated climate of security and school violence, which related to general safety and prevalence of social problems in the social environment measure.

Other research found associations between child oral health outcomes and social aspects within the family or neighbourhood. Better family functioning and lower parent psychological distress were associated with better parent-rated child oral health (Renzaho and de Silva-Sanigorski 2013) in various age groups among children aged one to 12 years. Better social environment was associated with better *PRH* and *PROH* in all study populations. Additionally, poorer parent-rated child oral health was associated with the presence of bad influences and perceived lack of social capital and physical safety in their residential neighbourhood (Bramlett et al. 2010) while Iida and Rozier (2013) found perceived neighbourhood safety to have no association with mother-rated oral health. The available literature generally supported in principal the finding that social environment is positively associated with *PROH*.

Social environment was not associated with presence of deciduous or permanent caries (*poc* and *POC*). There was no literature regarding social environment and prevalence of caries. Poutanen et al. (2007) found lower caries prevalence among 11–12-year-old children who knew the state of their parent's

teeth compared to those who did not, which may relate to the relationship aspect of the social environment within the household. However this is not consistent with the findings of the current study.

Various social aspects of the family were negatively associated with caries experience among younger children, with better social aspects associated with lower levels of disease. These aspects include family encouragement, problem-solving and interpersonal atmosphere for children aged five to eight years (de Jong-Lenters et al. 2014) and family responsiveness and communication for children aged five to six years (Duijster et al. 2013) (significant association did not remain in a fully adjusted model in the latter study). This research was supportive of the findings for *DMFS* and possibly *UD* where lower levels of disease were associated with better social environment.

Moysés et al. (2003) found that a higher number of caries free children was associated with a comprehensive health promoting curriculum at school. The current study did not assess curriculum, but one of the findings was a consistent and significant association between better health promoting environment and a lower percentage of children with *POC*. John-Akinola and Nic-Gadhainn (2014) found no association between the HPS approach and general health and wellbeing among children aged nine to 13 years. Bivariable analysis saw an association between *PRH* and health promoting environment in the deciduous subset and full sample, but not in the adjusted models and no association in any analysis in the permanent subset. Other literature found HPS interventions to have a beneficial effect on various health behaviours and outcomes (Lee and Stewart 2013, Langford et al. 2014) among children of various ages. There was not a consistent association between health promoting environment and oral health outcome measures, but where a significant association was evident, better health promoting environment was consistently associated with better outcomes. Previous literature supported findings for specific health outcomes *POC* and *PRH*, and for the general finding of an association between better health promoting environment and better health outcomes.

The physical environment of school is a domain of the HPS framework (St Leger et al. 2002, Moysés et al. 2003) which includes buildings and grounds of the school, but there is no literature specific to this either as an HPS domain or as a standalone concept. Nor is there literature pertaining to quality of teachers. Duijster et al. (2014) found that better neighbourhood quality had a direct beneficial effect on dmft in children aged five to six years. Neighbourhood quality included dimensions of housing, public space and public facilities which are aspects of physical environment and can be conceptually related to quality of buildings grounds and classrooms in schools. Better quality of buildings/grounds and classrooms did demonstrate an association with lower *DMFS* in the permanent subset but significance was not demonstrated in the fully adjusted model. In the deciduous subset, however, no significant association was found. Among children aged 11 to 12 years, de Silva-Sanigorski et al. (2013) found parent oral health knowledge to be positively associated with parent-rated child oral health. Knowledge is a likely aspect considered as part of overall teacher quality. In both the total sample and permanent subsets, better quality of teachers was associated with a lower likelihood of suboptimal *PROH*. Past research was only loosely associated with the current research but what was available was supportive of some findings of the current study and the direction of associations present.

6.2.2.2 ***Specific contextual effects***

6.2.2.2.1 School characteristics

6.2.2.2.1.1 Comparison across outcomes and sample populations

There was no consistent pattern across the school characteristics variable-block. School type (*S_SchType*) was sporadically associated with outcome measures, mainly in the permanent subset and total sample, and mainly in the bivariable analyses. School socioeconomic status (SES) (*S_SchSES*) was more frequently associated with outcomes in the deciduous subset compared to the permanent subset, with the opposite seen for teacher workload (*S_TchWkld*). Percent non-English speaking background (NESB) children (*S_NESB*) demonstrated consistent significant associations only for parent-rated health (*PRH*), and only in the permanent subset was this association seen in all analyses.

6.2.2.2.1.2 Interpretations by specific independent variables

The created factor variable school SES incorporated the school attendance rate, academic performance, index of community socio-educational advantage (ICSEA), income and average class size. The measure demonstrated the largest number of significant and close to significant associations with the outcome measures compared to other variables in this variable-block, supporting the variable's viability as an explanatory construct.

In the principal components analysis (PCA), there were two contrary results. The school income item was reverse in direction to other items, when the expectation was that income per student would run parallel to other items. When collinearity was assessed school income was strongly related to academic performance of the school and moderately to attendance rate, both in a positive direction. Independent schools tend to be of higher socioeconomic status (Olds et al. 2003, Minaker et al. 2006) but the correlation between school income and ICSEA was negative and negligible. This finding may reflect the complicated public funding structure for schools in this country, yet this figure includes recurrent income from all sources. Also, the percentage of income accounted for by government input varies across individual independent schools (ISCA 2015). A review of the difference in funding sources specific to schools involved in the current study may illuminate this finding, but evidently from the preliminary analysis, there is no particular association between ICSEA and school income and hence no cause to expect income to contribute to school SES in any specific way.

Class size was positive in direction in the PCA, contributing in the same direction as most other variables, which was opposite to what was expected based on the premise of literature reviewed (Meunnig and Woolf 2007, Wilde et al. 2011). It has been recognised, however, that class size by itself is not necessarily beneficial to academic outcomes, as its impact depends on interrelation with other variables (Peace and Robertson 2014). As with income, class size may be a complex factor. In the preliminary analysis, class size showed a strong negative association with school income and a moderate positive association with attendance rate. Based on these results the direction is not exceptional.

At household and residential area level, SES was associated with caries prevalence, decayed, missing and filled permanent teeth and surfaces (DMFT/S), decayed, missing and filled deciduous teeth and surfaces (dmft/s) and untreated decay. In children aged zero to 17 years higher household SES was consistently related to lower levels of disease in measures of caries prevalence, dmft/s and DMFT/S (Reisine and Psoter 2001). Higher area-level SES was associated with lower levels of caries prevalence , dmft and untreated decay in children aged five to six years and 12 years (Ha 2011), and with dmft and DMFT

among children aged four to 16 years (Armfield 2007). Income, a key component of individual SES and an item included in the created school SES measure in the current study, also demonstrated a negative relationship with various oral health outcomes, both clinical and subjective, across various age groups in numerous papers (Hallet and O'Rourke 2002, Talekar et al. 2005, Slade et al. 2006, Bramlett et al. 2010, Do et al. 2010, Harford and Luzzi 2013, Renzaho and de Silva-Sanigorski 2013). School-level SES was similarly found to have relationships with various health outcomes. Higher SES as indicated by school sector demonstrated a positive association on fitness performance (Olds et al. 2003) and beneficial dietary indicators (Minaker et al. 2006). Various better health outcomes were related to higher SES including overweight and obesity (O'Dea and Dibley 2010) and depressive symptoms (Goodman et al. 2003). Health outcomes of all types have been consistently related to SES at household/individual, area and school levels including oral health outcomes in prior research as in the current study. Of particular interest is the higher frequency of significant associations in the deciduous subset compared to the permanent subset. School-level SES may have a greater impact on younger children and hence on deciduous outcomes, while older children may be impacted more by social aspects and experiences also indicated by the higher frequency of significant associations among the permanent subset for the parent perception variables.

No literature was reviewed related to teacher workload. Opposite to school SES, teacher workload had a higher frequency of significant associations in the permanent compared to the deciduous subset, particularly among clinical outcome measures. The reasons for this are a matter for speculation. One possible explanation is that the teacher workload variable represents or indicates a social aspect of the school such as teacher stress, which may have more relevance among older children. The measure itself may benefit from further analysis.

At the individual level, Hallet and O'Rourke (2002) found that among children aged four to six years dmft was positively related to being from a NESB compared to an English speaking background (ESB). Kilpatrick et al. (2012) found the same among children aged two to three years, but not among children aged six to seven years. There was no literature pertaining to school-level percentage of NESB children. Where a relationship was evident in the current study, it was generally positive in direction with more suboptimal health or higher levels of disease associated with a higher percentage of NESB children at the school. For most outcomes where a significant association was evident, significance was not demonstrated in the fully adjusted models which may indicate that the inclusion of the individual-level items accounted for the association seen in unadjusted and partially-adjusted analyses. Of possible particular relevance is parent country of birth (*PCOB*) where a child with a parent born in a country other than Australia may be more likely to be from a NESB. The retention of a significant association through all analyses for *PRH* in the permanent subset indicates that this particular result is not necessarily related to individual characteristics indicating a genuine school-level difference between schools with a high percentage of NESB children and schools with a low percentage for this outcome. It is unknown whether this is a replicable finding.

No literature was reviewed regarding or related to school type or school size (*S_SchSize*) and a relationship with any oral health outcome, nor did the variables yield associations requiring specific attention.

6.2.2.2.2 Parent perceptions of school

6.2.2.2.2.1 Comparison across outcomes and sample populations

There was no consistent pattern with the school-level parent perceptions of school variables. As seen among the child-level parent perception and school characteristic variables, the created factor variables tended to have a higher number of significant associations than the standalone variables, signifying their usefulness as explanatory constructs. The created factor variables that demonstrated significance tended to do so more in the permanent subset than the deciduous subset or total sample, particularly school relations (*S_Relat*).

6.2.2.2.2.2 Interpretations by specific independent variables

The created factor variables at the school level differed from those created at the child level. This result implies an important difference between parent perception of individual child experience and average parent perception of child experience at a school. Perception can be considered to be made up of two parts; an external 'objective' stimuli and an internal 'subjective' process. The point of difference between the child-level and school-level parent perception variables is that the first relates to the subjective experience aspect and the second relates to the external stimuli aspect. There are likely to be differences between the two, as has been demonstrated in the current analysis.

Among school-level parent perception variables, school quality (*S_SchQual*) was a summary measure of quality of teachers, quality of buildings/grounds and classrooms, social problems at the school, health policies at the school, general safety and student morale. Three of the included items (school-level quality of teachers, school-level quality of buildings/grounds and classrooms, school-level student morale) were taken from the same paper (Marks 2010). School-level social problems and school-level general safety were concepts from the same source (OECD 2009) while school-level school health policies was collected based on separate material (St Leger et al. 2002). All items were conceptually linked as measures of school environment, but there was crossover between specific concepts in this created variable.

School relations (*S_Relat*) combined the measures of child experience of teasing, bullying and physical hurt and disputes at school. The child experience items were from the same source (OECD 2009) and the parent experience item was from a separate study (Gutman and Feinstein 2008). All items related to interrelations in the school environment.

School integration (*S_Integ*) incorporated parent involvement in general decisions at the school, community involvement in the school, parent involvement in health decisions at the school and parent involvement in a parent and friends' group at the school. The first three items were taken from the same paper (St Leger et al. 2002) with the final item based on separate material (Gutman and Feinstein 2008). All items related to school-community relationships.

There was another aspect explaining the interconnection between items constituting each factor variable. The nature of information collected by the groups of questions may account for the particular relationships uncovered. Conceptually, the items in the first group are purely opinion-based, in the second they are experience based and in the third the items involve a combination of experience and perception. As examples, the first item for school quality was school-level quality of teachers, requiring a parent opinion of the general quality of teachers at their child's school. For school relations, the first item was school-level child experience of teasing, requiring information regarding the actual experience

of teasing at school by the child. For school integration, the first item was school-level parent involvement in general decisions, requiring either parent experience in involvement with decision-making at the school, a general impression of the occurrence of parent involvement in decision-making at the school, or both. School quality then reflects the parent opinion of the school based on various aspects; school relations reflects an average experience of aggravated social interaction within the school; and school integration is a blend of experience and perception of school relationships with family and community.

There was no literature relating to the created factor variable school quality. The most interesting findings with this variable were the unexpected direction of association in the full school model (Model 6) and the fully adjusted Model 8 with untreated deciduous decay (*ud*) in the deciduous subset and decayed, missing and filled permanent surfaces (*DMFS*) in the permanent subset. Higher levels of disease were related to better school quality. For *DMFS* this is particularly unexpected as the bivariable analysis revealed an association of the opposite direction. All other associations found in bivariable analysis and the multivariable analysis incorporating school-level parent perceptions of school variables (Model 5) were in the expected direction. It means that once school characteristics and individual sociodemographic factors are controlled for, a general positive opinion of a school is associated with worse oral outcomes on at least some measures. This is an unprecedented finding and without obvious justification. A possibility is that a general positive parent opinion of a school may not reflect the reality of the school environment or of children's experience therein. Investigation into the drivers of positive parent opinion of a school on these features and the relationship between parent opinion and school aspects may illuminate the reasons for this outcome.

There was no literature specific to aggravated social interactions at school (*S_Relat*) and oral health outcome. At a household level, in children aged zero to 17 years, Iida and Rozier (2013) found that higher aggravation in parenting among mothers was associated with worse mother-rated oral health. Family coercion was found to have some positive association with presence of severe caries (dmft = 4+) among children aged five to eight years (de Jong-Lenters et al. 2014). At the school-level, Henderson et al. (2008) found poor relationships were associated with higher rates of smoking, but only among schools with higher affluence among children and young adults aged 11 to 21 years. A consistent association with the outcome measure was only seen in the permanent subset, for parent-rated oral health (*PROH*) in all analyses, and for *DMFS* and untreated permanent decayed surfaces (*UD*) in all multivariable analyses (Models 5, 6 and 8), with better relations (lower aggravated social interactions) associated with lower suboptimal *PROH*, and lower levels of disease. In principal the findings of the current study is supported by previous research.

No literature specific to the school integration variable was reviewed but some literature addressed related aspects. In children aged five to six years family social network was found to have some association with dmft (better social network with lower dmft) but the association did not remain in a fully adjusted model (Duijster et al. 2013), and family social support was found to have an indirect association with dmft (better social support with lower dmft) (Duijster et al. 2014). There was no research between a school-level equivalent and any health outcome. School integration saw no consistent associations with any outcome measure which was partially supported by prior research.

No literature was reviewed relating to health services at the school, support services at the school, parent volunteering at the school or the amount of child sick leave across the school. An interesting

finding among these variables was an association between presence of deciduous caries (*poc*) and untreated decayed deciduous surfaces (*ud*) in the deciduous subset and school-level provision of health services (*S_HthServ*). In all analyses for *ud* and all multivariable analyses for *poc* worse outcomes were associated with better school-level provision of health services. Health services and associated procedures are a part of the health promoting school (HPS) framework (St Leger et al. 2002) but there was no literature relating to that domain separately and its association with health or oral health outcomes. As it is a consistent result through most or all analyses for the two implicated outcome measures, the association is evidently not being affected by the inclusion of other items. This outcome may represent a discrepancy between average parent perception on the health services provided by the school and what health services are actually provided by the school. An assessment of how closely parent perception matches provision of health services in school would address this concern. Otherwise, the indication is that greater provision of health services in school is associated with some poorer oral health outcomes among children. A possible explanation for this outcome could be that health services have been provided at schools where health is worse, providing resources as a consequence of the poor health of students. In effect, the provision of services represents a reaction to present disease rather than a preventive or health promoting activity minimising presentation of disease.

6.3 Main features

Reference models for all outcome measures showed significant school-level variation. The school characteristics variable-block explained the most school-level variation, demonstrated by the lowest median odds ratio (MOR) or intraclass correlation (ICC), and child-level parent perceptions of school variable-block the least. This was different for decayed, missing and filled permanent surfaces (*DMFS*) and untreated decayed permanent surfaces (*UD*) for which the school-level parent perceptions of school variable-block lowered the ICC most and school characteristics the least. The general contextual effects seen were small, but have the potential for large consequences, due to the cumulative nature of oral disease, the potential cumulative nature of benefits of intervention, the spread of disease across the population and dependent on where the impacts are applied. Outcomes in the permanent subset saw more school-level variation explained in models than outcomes in the deciduous subset, potentially representing effects of longer exposure to school environment among older than younger children. For some outcome measures, particularly presence of permanent caries (*POC*), the results indicated that the included variables were not sufficient to explain between-school variation. Other school information not collected in this study may be relevant to explaining school-level variation in oral health outcomes among children. The school-level parent perception variables demonstrated greater relevance than the child-level in explaining school-level variation, supporting the concept of relevant school-level differences in school environment.

School aspects were associated with outcomes, controlling for individual level factors. Where related literature was reviewed, previous research tended to support current findings ‘in principle’. In the adjusted models, child-level parent perceptions of school variables demonstrated more significant associations with outcome measures in the permanent subset than in the deciduous subset. This was particularly evident among clinical outcome measures. Of school characteristic variables, school socioeconomic status was persistently associated with outcome measures in the deciduous subset, but not so in the permanent subset. Conversely, teacher workload was persistently associated with outcome measures in the permanent subset, but less so among deciduous measures. School relations demonstrated the most persistent associations with outcomes among school-level parent perceptions

of school variables. Better parent perceptions of school were generally associated with better oral health outcomes among children.

6.4 Implications

This research has demonstrated an association between school environment and child oral health outcomes. This issue could be addressed through various approaches but these must be considered with respect to the current political and social climate. Approaches can involve working within the overarching system currently in place, working alongside the system, or seeking to change the system.

Working within the system, individual schools can adopt alternative practices to influence the school environment. Two important specific contextual factors from the current research were teacher workload and relations. Specific individual factors of significance included social environment and health promoting environment. These factors could be specifically targeted within schools with the intention of having beneficial flow-on effects on children's oral health. In targeting teacher workload, a school could ensure that sufficient teachers are employed to cover the full time equivalent teaching requirements, and workload could be monitored to ensure no teacher is overburdened. Addressing relations, specifically minimising aggressive interactions (disputes, bullying, teasing, causing physical harm) could be achieved through a targeted program, such as one aimed to teach empathic skills and foster compassion. A program using a behavioural approach could be used alongside a skill-building program, to teach children alternative ways to deal with conflict. The relations factor incorporated adult interactions also, so similarly focused programs for staff members, with an invitation extended to parents within the school community, could be applied. This approach could also influence the individual factor of social environment. Improvement of school health promoting environment could be addressed by adopting several approaches, including more opportunity for parent and community involvement in the school (input into decision-making, volunteering, parent and friends group), ensuring broad health policies exist at the school, and ensuring good communication to parents and the community about school health policies and practices and opportunities for involvement. A limitation with addressing each of these factors comes in the form of available school resources. As school funding is determined by government, schools have limited or no control over the amount of resources they receive, and it is recognised that some schools in Australia, particularly public schools, are not adequately funded (Gonski 2011). It is also important to note here that the current study only assesses association, not causation, and further research would be prudent before adopting such approaches.

There are some approaches currently adopted in Australian schools which may address some factors highlighted in the study. The National Health Schools Programme in England (Warwick et al. 2009) suggested that:

well designed, broad-based whole-school approaches to promoting health can have an impact on health (p31)

The Health Promoting Framework (HPF) is such an approach, and a number of its facets are relevant to factors highlighted in the current study (particularly health promoting environment). The HPF is a global school health initiative originated by the World Health Organisation (WHO) and supported within Australia by the Australian Health Promoting Schools Association (AHPSA) (AHPSA 2012). The HPF adopts a multifaceted approach, involving various levels of school management and operation, including engaging relevant officials, instigating programs and implementing policies and practices to fulfil the aim

of strengthening the school's capacity as a 'healthy setting for living, learning and working' (WHO 2014). There is some evidence to suggest that adoption of the HPF within schools can have a positive impact on student's health outcomes and on health-related behaviours, knowledge and attitudes (Dyson et al. 2009). Moysés et al. (2003) found some association between HPF aspects and oral health outcomes.

An Australian broad-based whole-school approach, the Australian Sustainable Schools Initiative (AuSSI), may also have some positive impact on factors relevant to the current study. The AuSSI is a partnership effort between the Australian Government and states and territories, providing support to schools and their communities to become sustainable (Department of the Environment n.d.). The initiative incorporates a 'whole-of-school approach', including addressing social issues associated with its activities, which may influence social environment and relations.

Programs and initiatives working within the system are of an 'opt-in' nature requiring pursuit by individual school leaders. The impact these programs may have on the environmental aspects explored in this study and on oral health outcomes is unknown.

Modifications to the school environment through alternative educational practice could possibly lead to changes in the factors highlighted in this study. Working alongside the current system are schools that adopt alternative approaches to education, such as the Montessori or Waldorf (Steiner) approaches. The Montessori approach was based upon research undertaken by an educator, Dr Maria Montessori, and is supported within Australia by the Montessori Australia Foundation (MAF) (Montessori Australia n.d.). The Waldorf approach was developed by a philosopher, Rudolf Steiner, and the group Steiner Education Australia (SEA) represents schools that have adopted this method of schooling (Steiner Education Australia n.d.). Both approaches, though different in application, seek to encourage independence and free-thinking in children, and to ultimately foster a love of learning which can then continue self-directed throughout a lifetime. In Australia, there are 210 Montessori schools and centres and 40 Waldorf schools, operating alongside schools following the traditional paradigm. The operation of schools following alternative schooling approaches requires pursuit by individuals or groups of individuals. The wider impact of alternative schooling approaches, such as the environment fostered within the school and on oral health outcomes, is unknown.

Modifying the current system is another option to generate change in the environment of schools through alternative educational practice. A country widely recognised for its innovative approach to compulsory schooling is Finland. Some of the primary elements that set Finland's school system apart from other developed nations include schooling being free at all levels from pre-primary to higher education, educational autonomy at all levels (e.g. local authorities, schools and teachers), self-evaluation practices for schools rather than external control, teacher-driven continuous assessment including a focus on developing self-assessment in students rather than national standardised testing, high educational requirements for teaching personnel and teaching being a sought-after profession (Finnish National Board of Education 2013). The Finnish approach may be relevant to factors identified in the current study, particularly teacher workload. Finland performs well in international comparisons of literacy and numeracy. In the Organisation for Economic Co-operation and Development's (OECD) rankings in the Programme for International Student Assessment (PISA), Finland was ranked 12th in maths, sixth in reading and fifth in science out of 65 countries in 2012 (OECD 2013). Finland had the highest percentage of 25–34 year-olds achieve the highest literacy level (level 4/5) out of the 20 OECD countries in 2012 (OECD 2014). There appears to be clear educational benefits of the Finnish school

system. The sort of environment this school system creates relative to the system in Australia and how it relates to oral health outcomes is unknown.

The first two broad approaches, working within and alongside the current system, represent bottom-up application, while the last approach, changing the system, ultimately represents a top-down application. Efforts to affect the school environment and child's experience thereof are already being applied within and alongside the system to the extent that the system allows it, as individuals and groups recognise the potential benefits of alternative approaches. Even so, the relevance of outcomes of these approaches to current findings is entirely theoretical. Altering the system is a different matter. The system is so big and entrenched that shifting it in any direction would require a monumental effort.

Reform of the school system is conducted regularly in Australia, yet the focus of reform is telling of the reluctance to enact true change in the system. In 2013, a reform agreement was struck between federal and state and territory governments regarding the funding of the school system (COAG 2013). The Council of Australian Governments (COAG) website currently identifies three areas of focus for their education reform agenda (COAG n.d.); improving teacher quality, better information about schools, and working towards a national curriculum. The need to adequately and fairly fund schools was identified through a thorough review of the current system (Gonski 2011), yet reforming the way the system is funded is not reforming the system itself. The goal of improving teacher quality is focused around raising standards for teachers and better rewarding those identified as the best. Better information about schools means standardised testing and greater external scrutiny of school output. A national curriculum is a focus on what to teach. Each of these 'reforms' reinforce the system in its current state, working towards a functioning system rather than a better one. Top-down change is unlikely at best. Any true change in the way children are schooled in Australia will need to be driven by bottom-up pressure coupled with information through research on the impacts and consequences of school experience.

6.5 Future work

This study has made headway into an important research area that has been little explored, but much is still unknown and there are several aspects that can be further investigated. To better understand the findings of this study, an exploration could be conducted into the associations between parent perceptions and experiences of their child's school and school environmental aspects measured at a school-level. Also of interest would be an exploration into associations between parent perceptions and experiences and children's perception and experiences on relevant topics such as safety and experience of bullying or teasing at school. Both would help to reveal how closely parent responses reflect both the environment of the school as an independent agent, and the real-life experience of the child as the recipient of school environmental input and the subject manifesting relevant oral health outcomes. Furthermore, some assessment of what drives parent perceptions would also be beneficial. All three matters could be investigated via a cross-sectional study designed for the specific purpose.

Legitimate and significant school-level variation in outcome measures was detected, yet there was some inconsistency and inconclusiveness across results. In particular, for some outcome measures relatively little school-level variation was explained by the included variables, indicating that some crucial factor or factors may have been missing from the dataset. Further research designed specifically to explore the associations between school environment and oral health outcomes in children could provide increased clarity regarding the general topic and some specific areas of interest, including the possibility of

compounded harms or benefits over time. Various cohort studies could be conducted to explore further what particular aspects of school environment impact on child oral health.

Starting a study at the beginning of a child's schooling would provide a baseline for their experience of oral health and other family and personal characteristics that may be relevant, such as socioeconomic status, family support and health behaviours. From this baseline, a likely trajectory in oral health outcome could be estimated for a child relevant to the sample and the adherence or divergence from this likely trajectory could be tracked, indicating the value-adding or -subtracting effect of the school environment.

Cohorts could be determined along different lines, to investigate different concepts. For example, to assess a number of the elements incorporated into the current study, children attending schools that have adopted the HPF in part or in full could be compared with children attending schools that have not adopted the HPF. Other school-specific practices could be investigated, such as the AuSSI, and cohorts determined based on schools adopting this practice. Alternative schooling could be another basis for cohort division, with children commencing at schools adhering to an alternative approach to education, such as Montessori or Waldorf, compared to children attending a school following the traditional approach. A final possible division could be based on children educated outside of systematic schooling, with children being home-schooled compared to children attending regular systematic schools. The main issue with some of these possible areas of research is finding a pool of children large enough in some of the cohorts, home-schooled children and children attending alternative schools in particular.

A possibility yet one that can be fraught with logistic limitations is that of applying a defined intervention in schools, such as those identified in section 6.4, and tracking the impact over time on children's oral health outcomes. The intervention could be based on the HPF, as has been done in previous quasi-experimental research to assess resilience (Lee and Stewart 2013). The use of such a framework is beneficial as it is already developed, can be readily adopted by schools operating within the mainstream system and is geared to impact school environment in a multilevel and continuing capacity. Application of an intervention activity without an incorporated component of cultural change is unlikely to address the various aspects raised through this study.

A final direction for possible future work could be guided by an expansion of the conceptual model on which this research was based. Specifically, further work is needed to relate operational definitions to general concepts and to expand the relationships between the conceptual levels to consider possible moderating and mediating pathways.

6.6 Limitations

There were a number of limitations identified in the study across material, design and sampling.

The questionnaires used for this study were fairly long and complex. This can affect completeness and response, with respondents experiencing fatigue and failing to complete the survey, or not taking care to respond accurately. It can also lead to respondents with lower literacy or other skills being put off completing the questionnaire at all. Completeness was good, with no more than three percent data missing for most questions. Response rates were reasonable but not high, and this may indicate an effect of the length and complexity of the survey material.

One question was dropped from analysis due to a high percentage of missing data. Pre-testing was undertaken and this question was flagged in the expert review as a potential issue for parent-respondents, yet there was nothing conclusive to indicate a need to remove the question. Additional pre-testing, such as a thorough pilot test, may have confirmed the issue prior to dissemination.

The collection of school information from parents posed some difficulty and imposed some shortcomings. Firstly, there were no past studies assessing school environment surveying a parent population. As such, all questions used in the present study had to be adapted to some degree. This did not pose a particular limitation, as questions were, for the most part, well answered, but it would have been desirable to have prior study material to incorporate.

Secondly, the aim of the study was to look at school environment. Parent perceptions and experience are as valid a measure of school environment as any other, but provide data on the individual rather than school level. For some topics, such as feelings of safety and child experience of bullying, an individual-level perspective is crucial, while for other topics, such as health services and policies, a school-level perspective would have been preferable. Ideally, both individual- and school-level perspectives could have been included on as many topics as applicable to provide a robust and well-rounded data collection. This was not possible in the present study due to the respondent population available for survey. In addition, it is unknown what aspects influence parent perceptions of school on the various themes included in the survey. This provided a challenge when interpreting the results.

With a parent respondent population, the range of topics was also limited, as parent awareness of aspects of the school environment could only be expected to reach so far. For example, topics pertaining to school organisation and functioning could not be included, nor could questions on student mobility (students coming and going from the school) or school disciplinary preferences, each of which would have provided valuable insight into the school environment.

There was a clear socioeconomic bias within the sample, with an underrepresentation of children of lower socioeconomic status. This may be evidence of the impact of the long and complex questionnaires used for the study. The information for children of all socioeconomic status, in terms of both oral health outcomes and school experience, is key to providing a full spectrum of possible responses. Children of lower socioeconomic status have a higher experience of poor oral health (Reisine and Psoter 2001, Talekar et al. 2005, Armfield 2007, Ha 2011, Harford and Luzzi 2013) and of poor experience in school (Goodman et al. 2003, Wilde et al. 2011). Without the data it cannot be confirmed, but it is reasonable to assume that some associations are not demonstrated or have been under-demonstrated in analysis due to a lack of information from those children at the poorer or worse end of the spectrum for both independent variables and outcome measures. Variation across schools may also be under-indicated.

Finally, limitations of the conceptual model must be acknowledged. The model is fitting to the analysis performed, providing a plausible and parsimonious framework with which to pursue the aims of the thesis. The model could, however, be said to lack the depth and complexity truly representative of the concepts being investigated. The levels of family and community are assumed to exist in a separate parallel model, yet their influence cannot be wholly negated simply by virtue of their indirect influence during school hours. This is not truly accounted for in the model. Similarly, it could be argued that school is in fact an element of the community level rather than a separate level as depicted in the adopted model, in which case two parallel models could instead be made to overlap. The model also deals with operational aspects of the school environment rather than broader concepts, which, while not in and of

itself erroneous, omits a layer of enlightening information. In addition, it is likely there is interaction between components of the school environment, and this is not explored as part of the proffered conceptual model.

6.7 Conclusion

This study addressed a little explored association between school environment and oral health. Schools are in a unique position to exert an influence on virtually all children in Australian society and consequently find themselves in a position of responsibility for more than the provision of curricular material. This is a little acknowledged actuality and the impacts beyond the educational are yet to be fully understood.

The population burden of oral disease among Australian children is large. The individual burden of oral disease is extremely high for a portion of the child population, and this burden is borne disproportionately by those with the least resources with which to manage it. The likelihood of flow-on impacts from poor oral health earlier in life are documented, and result in an accumulation of disadvantage and suffering. Economic impacts are recognised from poor oral health and associated poor general health throughout the life course. Ensuring good oral health in childhood is fundamental to avoiding the worst of these impacts.

The research question addressed by this study asked if there was an association between school environment and a child's oral health outcomes, controlling for the effects of factors at the individual and school levels. The results indicate that such an association does exist. With respect to the stated hypotheses, the first hypothesis stated that 'there is significant school-level variation in child general health and oral health outcomes (presence of general contextual effect)'. The data demonstrated the presence of a general contextual effect for all outcome measures across all populations. The second hypothesis stated that 'schools with a more positive environment (as indicated by individual aspects of schools) are associated with better child health and oral health outcomes (positive directional specific effects)'. Where significant associations were present between independent variables and outcome measures, schools with more positive aspects were largely associated with better child health and oral health outcomes. A number of variables, however, did not demonstrate a significant association and there were a small number of instances where a significant association was uncovered in the opposite direction. The first hypothesis was fully supported by the current research while the second hypothesis was supported in part.

Appropriate adjustments in the school environment could help alleviate overall oral disease experience in children and diminish disadvantage seen in the presentation of oral disease across the population. In itself, this study is insufficient to appropriately inform action and further research is needed. This study provides a solid foundation on which to build future work in the area.

7 Appendices

7.1 Human Research Ethics Committee application to the University of Adelaide

Psycho-social aspects of child oral health
–an extension of the National Child Oral Health Survey

Background

Oral diseases and disorders during childhood can have a negative impact on the life of children and their parents. For example, dental caries can lead to toothache, which can be distressful and worrying for the affected children and their parents. Conversely, good oral health can have positive benefits for children and their parents. Children's confidence and self-esteem can be enhanced by perception of good health. Importantly, positive aspects of oral health can vary considerably in their magnitude, even among people who have no oral diseases or disorders.

Oral disease and disorders are measured in population studies using clinical measures recorded by dental clinicians during oral examinations. These indices indicate the presence and severity of an oral condition. However, perceptions of oral health and positive or negative impacts of oral diseases and conditions on the quality of life must necessarily be reported by the people who experience those conditions. In the case of children, perceptions and impacts also may be reported by parents.

Evidence is growing on the two-way relationship between psycho-social factors and child oral health. Early experience of dental caries may cause dental fear and anxiety, which may consequently prevent the children from receiving timely dental care as they develop. There are also reports of a link between parental dental belief and practice and parental stress with child oral health.

The current National Child Oral Health Survey (NCOHS), a collaboration between state and territory health departments and the Australian Research Centre for Population Oral Health (ARCPOH) at the University of Adelaide, provides the platform from which to expand and contribute to the body of knowledge in this field.

NCOHS acts both as a standalone survey with the purpose to of documenting the oral health status of children in Australia and evaluating time trends in child oral health, as well as a foundation for building a richer understanding of aspects associated with child oral health and oral health experience. The psycho-social aspects of child oral health outlined above are a core component of NCOHS. The Agreement between state and territory health departments and the University of Adelaide recognised the two stage collection process as part of NCOHS as the initial questionnaire was unable to accommodate all items of the nationally agreed data to be collected for NCOHS.

Aims

This proposal aims to meet the obligations under the agreements made with state and territory health departments in completing the full data collection for NCOHS, and value add to the information collected in the initial questionnaire by conducting a follow-up questionnaire survey among the families who have participated in the Survey. This extension is a core component in the current National Child

Oral Health Survey (NCOHS) that is being conducted by researchers at ARCPOH in collaboration with state/territory dental services.

The proposed survey has the following specific objectives:

1. To document the common psycho-social aspects, including oral health-related quality of life (OHRQoL), parental dental belief and stress and parental dental experience, that may be related to child oral health among the Australian child population
2. To examine possible links between those psycho-social aspects with child oral health measured by clinical indicators in this population.

Methods

Study design

This proposed study is a cross-sectional questionnaire survey. The sampling frame of this proposed study will be school children and their parents who completed the primary questionnaire and oral epidemiological examination in the NCOHS. Parents of the children will be contacted to participate in this further survey. This incorporates all states and territories except for Queensland, for which the NCOHS data collection has been completed.

Questionnaire items

The survey questionnaire consists of a number of study instruments that have already been developed and tested as suitable to collect information on different psycho-social aspects of health and oral health. Many of those instruments have been used in a research studies conducted by the research team. Others are expanding on or targeting new areas of interest associated with child health and oral health.

The data collection instruments have been developed and published in the scientific literature. The included data instruments are:

- Barriers to dental care
- Oral Health-related Quality of Life measures:
    - Parental Perception Questionnaire (PPQ)
    - Family Impact Scale (FIS)
- Psycho-social school environment scales
- Parental dental belief
- Parental visiting practices
- Parental dental anxiety scale
- Parental social support
- Parental stress
- Parental dental health including self-reported general and dental health

Data collection

NCOHS questionnaire and examination data are being processed by ARCPOH for data management and analysis. The questionnaires contain details of child and parent name, household contact details including parents' phone, email and postal address. These details are being entered into a secure database at ARCPOH to form the study's master database. One senior researcher manages the database in order to maintain confidentiality. Each child participant has a unique identification number.

The data collection for this supplementary study is to be conducted entirely by ARCPOH staff. The survey questionnaire will be mailed by ARCOH staff, who will not have access to information collected in the primary questionnaire and oral examination. Mailing will be conducted following a modified

Dilman's Total Design method. The family will receive a primary approach brochure, followed by a package containing an Information Sheet, a questionnaire and a reply-paid return envelope. The package will be followed by a blanket reminder/thankyou card. Non-respondents will also be sent two replacement packages allowing for reasonable time to respond.

Data management and analysis

The completed questionnaires will be mailed directly to ARCPOH for processing. Questionnaire data will input into a specially designed access database. Children will only be identified by a unique ID.

The complete dataset will be cleaned and checked for errors. The cleaned dataset will be merged with the existing datasets of selected information from the NCOHS intial questionnaire and oral examination.

Data analysis will progress from descriptive bivariate analysis to inferential explanatory modelling to address the aims of the study. Results will be reported to state and territory health departments and in form of scientific publications.

Ethical implications

There is no risk for the study participants from this survey. Confidentiality of the data will be safeguarded. Children will be identified by a unique ID. A master datafile with personal details will be accessible to the named investigators only.

Expected outcomes and significance

This proposed study will meet the obligations as set out in the agreement made with state and territory health departments and significantly value add to the current nation-wide study of child oral health in Australia (NCOHS). This study will be one of the first large-scale population-based studies to report the two-way relationship between a number of psycho-social aspects surrounding children and their oral health. Results will help informing policies in addressing child oral health and other aspects related to child oral health in Australia.

7.2 Additional data methods information

7.2.1 Data management

Returned phase one (P1) questionnaire information was input manually into two separate custom designed Microsoft Access (MA) databases. One database captured consent and contact information. This database was also designed to manage the phase two (P2) questionnaire collection. The second database captured the parent responses to the research questions. Data entry cells were restricted in the response database to only allow valid response values and rules were devised (see appendix 7.4.1) to manage unconventional parent responses (e.g. two responses were provided where only one was allowed).

Collected P2 questionnaire data was input manually into a third custom designed MA database. As with the P1 response database, data entry cells were restricted to only allow valid responses. Additional restrictions were also incorporated to account for logical fallacies, such as when a parent's response to a filter question indicated they should skip the next question, but they provided a response. A set of rules was devised (see appendix 7.4.2) to guide data entry decisions made in these circumstances. Each question had its own 'data notes' memo field to record such decisions for review in data cleaning, or to record parent comments specific to a question.

All three databases and collected data were stored in a restricted access folder in a shared yet virtual private network (VPN). The consent/P2 mail out management and P2 questionnaire databases were further protected by a password.

A fourth MA database was devised for recording of the school characteristics administrative data. This database was maintained on a restricted access (personal) VPN.

Complete Access datasets were output to excel. The P2 questionnaire and school characteristics datasets were imported into separate Statistical Analysis System (SAS) programs for data cleaning (see appendix 7.2.1). Clean datasets were combined and analysed using SAS. At all stages, the data was managed within a restricted access folder in a shared VPN environment or on a restricted access VPN. Data analysis programs were kept and run within the restricted access VPN.

7.2.2 Data analysis

These sections relate primarily to P2 questionnaire data. As the school characteristics collection was administrative, response analysis was unwarranted but some data checks were performed and are included in the data cleaning section. P1 questionnaire data was received in a cleaned form and sample information had not been made available to assess response.

7.2.2.1 *Data cleaning*

7.2.2.1.1 Phase two questionnaire

Due to the stringent rules applied to data entry fields, minimal cleaning was required for the P2 questionnaire data. The rules circumvented the need to assess outlying data points and logical fallacies. The primary task involved assessing data notes to ensure consistency in the recording of parent responses where response rules were not adhered to (e.g. two responses were provided where only one was allowed) or contradictory information was supplied (e.g. a filter question response indicated the parent should skip the subsequent question but an answer was provided). Parent comments were reviewed for further information that may have indicated an alteration of the recorded data was required. The amount of missing data was also reviewed. A large number of missing responses can indicate issues with reception, comprehension or knowledge which can lead to questionable responses to that question across the parent population. When a change was required to the raw dataset it was performed using SAS code to enable tracking of all changes.

7.2.2.1.2 School characteristics collection

The school characteristics dataset was assessed for outlying values in relevant fields as an indicator of possible error in data entry. Some logic-based checks were applied. There were no text fields or comments to review. Missing data was minimal and did not require review. When an error in data entry was detected, the raw data was corrected in the MA data entry data base.

7.2.2.2 *Response and representativeness*

7.2.2.2.1 Phase one

There were two samples to be considered from P1: the sample of schools and the sample of children. Response rates were not available at time of writing for either sample. An assessment of the representativeness of participating schools and children was performed through a comparison of sample and population demographic information.

7.2.2.2.2 Phase two

To monitor responses to the P2 questionnaire, the consent/P2 mail out management database included fields to record the outcome of the mail out process. At the end of the complete mail out process each record was allocated one of five final mail out outcomes; received, refused, uncontactable, blocked or non-response. A record was marked 'received' once a completed questionnaire was returned via post or email. A record was marked 'refused' if a refusal card was received, or if a parent indicated via telephone or email that they did not wish to participate. A record was recorded as 'blocked' if there was a reason the child or family became ineligible for inclusion. If a record did not include a postal address or a return to sender was received for the recorded postal address, a record may receive a final outcome of 'uncontactable' or 'non response' depending on the outcome of further efforts to contact the parent (Table 7-1).

Table 7-1 Matrix of record outcomes by email and telephone contact outcomes for records with no address or that receive a return to sender

		Email			
		Not provided	Incorrect	No longer used	No answer
Telephone	Not provided	U	U	U	NR
	Incorrect	U	U	U	NR
	Disconnected	U	U	U	NR
	No answer	U	U	U	NR

U = Uncontactable, NR = Non-response

These five outcome allocations were used to analyze response rates for the P2 questionnaire. A representativeness assessment was conducted through a comparison between demographic information of participating children and population statistics.

7.3 Calculation of decayed, missing and filled surfaces

- Decayed (*D*), missing (*M*) and filled (*F*) surfaces in the permanent dentition (*DMFS*):

Some teeth are excluded from the *DMFS* calculation: unerupted teeth, congenitally missing teeth or supernumerary teeth, teeth removed for reasons other than dental caries, primary teeth retained in the permanent dentition, and third molars. The total count is 28 teeth. There are five surfaces on the posterior teeth (back four teeth on either side in both arches) and four surfaces on anterior teeth (front six teeth in both arches), resulting in a total count of 128 surfaces.

When a carious lesion or both a carious lesion and a restoration are present, the surface is listed as *D*. When a tooth has been extracted due to caries, all surfaces are listed as *M*. When a permanent filling is present, or when a filling is defective but not decayed, this surface is counted as *F*. Surfaces restored for reasons other than caries are not counted as *F*. The *DMFS* score is the result of adding the number of decayed, missing and filled surfaces together (*D* + *M* + *F* = *DMFS).*

- Decayed (*d*), missing (*m*) and filled (*f*) surfaces in the deciduous dentition (*dmfs*):

Teeth are also excluded in the *dmfs* calculation: unerupted and congenitally missing teeth, and supernumerary teeth. This results in a total count of 20 teeth. As with the permanent dentition, there are five surfaces on the posterior teeth (back two teeth on either side in both arches) and four surfaces on the anterior teeth (front six teeth in both arches). The total count is 88 surfaces. The rules for recording *d*, *m*, and *f* are the same as for DMFS, hence *d* + *m* + *f* = *dmfs*.

7.4 Data rules for input of parent responses on questionnaire items

7.4.1 Phase one questionnaire questions

7.4.1.1 *Parent-rated health and Parent-rated oral health*

Question	Response options	Rules	
How would you rate the current…	1 Excellent	1 + 2 = 2	2 + 4 = 3
Q1a Overall health of your child?	2 Very good	1 + 3 = 2	2 + 5 = 4
Q1b Dental health of your child?	3 Good	1 + 4 = 3	3 + 4 = 4
	4 Fair	1 + 5 = leave blank	3 + 5 = 4
	5 Poor	2 + 3 = 3	4 + 5 = 5

7.4.1.2 *Health care card status*

Question	Response options	Rules
Q2 Please indicate which of the following cards your child is covered by.	1 Health care card 2 Pensioner concession card 3 Commonwealth seniors card 4 Other card 5 None of the above 6 Don't know	If 1 ticked, HCC = 1 (yes), else = 2 (no)

7.4.1.3 *Dental insurance status*

Question	Response options	Rules
Q3a Does your child have private health insurance other than Medicare?	1 Yes 2 No	1 + 2 and Q3b answered = 1 1 + 2 and Q3b not answered = 2
Q3b Does the private health insurance pay for any of the cost of your child's dental care?	1 Yes 2 No	1 + 2 = random selection

7.4.1.4 *Child Indigenous status*

Question	Response options	Rules
Q4 Is your child of Aboriginal or Torres Strait Islander origin?	1 No 2 Yes, Aboriginal 3 Yes, Torres Strait Islander 4 Yes, Aboriginal and Torres Strait Islander	1 + 2 = 2 1 + 3 = 3 1 + 4 = 4 2 + 3 = 4 2 + 4 = 4 3 + 4 = 4

7.4.1.5 *Type of household (used in Table 5-9)*

Question	Response options	Rules
Q5 Is your child's main place of residence a…	1 One-parent household? 2 Two-parent household?	1 + 2 and Q6–9 answered for 1 parent = 1 1 + 2 and Q6–9 answered for 2 parents = 2

7.4.1.6 *Parent country of birth*

Question	Response options	Rules
Q6 In what country were you born? (asked of both parents/guardians if two-parent household)	1 Australia 2 Other country (please specify)	1 + 2 = 2

7.4.1.7 *Parent Indigenous status*

Question	Response options	Rules
Q7 Are you of Aboriginal or Torres Strait Islander origin? (asked of both parents/guardians if two-parent household)	1 No 2 Yes, Aboriginal 3 Yes, Torres Strait Islander 4 Yes, Aboriginal and Torres Strait Islander	1 + 2 = 2 1 + 3 = 3 1 + 4 = 4 2 + 3 = 4 2 + 4 = 4 3 + 4 = 4

7.4.1.8 *Parent highest level of education*

Question	Response options	Rules
Q8 What is the highest level of education you have? (asked of both parents/guardians if two-parent household)	1 Some high school 2 Completed high school 3 Some vocational training (i.e. trade) 4 Completed vocational training 5 Some University or College 6 Completed University or College	If more than one box ticked, enter highest number

7.4.1.9 *Parent employment status*

Question	Response options	Rules
Q9 Do you currently have full time or part time work of any kind? (asked of both parents/guardians if two-parent household)	1 Yes, full time 2 Yes, part time 3 No, not currently working	1 + 2 = 2 1 + 3 = 3 2 + 3 = 3

7.4.1.10 *Household income*

Question	Response options	Rules
Q10 What category does your total household income (before tax) fall into?	1 Up to $20,000 2 $20,001 to $40,000 3 $40,001 to $60,000 4 $60,001 to $80,000 5 $80,001 to $100,000 6 $100,001 to $120,000 7 $120,001 to $140,000 8 $140,001 to $160,000 9 $160,001 to $180,000 10 Over $180,000	• If ticks one response apart, enter lower value If ticks two responses apart, enter middle category • If ticks three responses apart, enter lowest of middle categories • If ticks more than three responses apart, leave blank

7.4.2 Phase two questionnaire questions

7.4.2.1 *Health services and policies*

Question	Response options	Rules
Has your child's school provided the following health services in the last 12 months? Q15a Health screening services Q15b Services for mental and social health of students Q15c Student support services Q15d Visits by a school dental service for students	1 Yes 2 No 3 Don't know	1 + 2 = 1 1 + 3 = 1 2 + 3 = 3
Does your child's school have policies covering the following health issues? Q16a Protective clothing Q16b Sun protection Q16c Immunisation Q16d Use of backpacks Q16e Recycling Q16f Environmentally friendly Q16g Playground equipment safety Q16h Nutrition/health canteen Q16i Other health-related policies (if other, please describe)		

7.4.2.2 *Family/community involvement, Quality of school aspects and Student morale*

Question	Response options	Rules
Tick one box only for each statement Q17a Families of children at your child's school are involved in health decisions for the school. Q17b Parents are encouraged to be involved in decision making at your child's school. Q17c Local groups participate in school activities at your child's school.	1 Strongly disagree 2 Disagree 3 Neither agree nor disagree 4 Agree 5 Strongly agree	1 and 2 = 2 1 and 3 = 2 1 and 4 = 3 1 and 5 = 3 2 and 3 = 3 2 and 4 = 3 2 and 5 = 3 3 and 4 = 3 3 and 5 = 4 4 and 5 = 4
How would you rate the following aspects of your child's school? Q18a School buildings and grounds Q18b Classrooms and other learning spaces Q18c Teachers	1 Very good 2 Good 3 Adequate 4 Poor 5 Very poor	
Tick one box only for each statement Q19a Your child enjoys school Q19b Your child is enthusiastic about school work Q19c Your child takes pride in his/her school Q19d Your child values academic achievement Q19e Your child is co-operative and respectful at school Q19f Your child values the education they can receive at their school Q19g Your child does his/her best to learn as much as possible Q19h Your child gets along well with teachers at his/her school	1 Strongly disagree 2 Disagree 3 Neither agree nor disagree 4 Agree 5 Strongly agree	

7.4.2.3 *Parent involvement in parent and friends group*

Question	Response options	Rules	
Q20a Does your child's school have a Parents and Friends group	1 Yes 2 No	1 + 2 + Q20b/c answered = 1 1 + 2 + Q20b/c unanswered = 2 No answer + Q20b/c answered = 1 2 + Q20b/c answered = 1	
In the last 12 months…			
Q20b have you or your spouse or partner belonged to the Parents and Friends group at your child's school?	1 Yes 2 No	1 + 2 = 1	
Q20c how many of the meetings of the Parents and Friends group did you or your spouse or partner attend?	1 None 2 Some 3 Half 4 Most 5 All	1 and 2 = 2 1 and 3 = 2 1 and 4 = 3 1 and 5 = 3 2 and 3 = 3	2 and 4 = 3 2 and 5 = 3 3 and 4 = 3 3 and 5 = 4 4 and 5 = 4

7.4.2.4 *Parent involvement in groups/committees at school*

Question	Response options	Rules
Does your child's school have...		(Example Q21a)
Q21a … a governing council? Q21b … an education (curriculum/ literacy/numeracy) committee? Q21c … a sports committee? Q21d … any other group or committee *(please specify)*	1 Yes 2 No	1 + 2 + Q21aa answered = 1 1 + 2 + Q21aa un- answered = 1 No answer + Q21aa answered = 1 2 + Q21aa answered = 1
Q21aa, Q21ba, Q21ca, Q21da In the last 12 months, have you or your spouse or partner belonged to this group? (asked for each of the above groups/committees)	1 Yes 2 No 3 Parental involvement not permitted	1 and 2 = 1 1 and 3 = 1 2 and 3 = 3

7.4.2.5 *Parent involvement in volunteering, Child sick leave and Safety*

Question	Response options	Rules
Q22 In the last 12 months, how many times have you or your spouse or partner volunteered at your child's school. Q23 In the last 12 months, how many sick days has your child taken off school? Q24a Overall, how safe have you felt when you have been at your child's school? Q24b How would you rate your child's safety at school?	1 None 2 1–3 3 4–8 4 9–15 5 Over 15	1 and 2 = 2 1 and 3 = 2 1 and 4 = 3 1 and 5 = 3 2 and 3 = 3 2 and 4 = 3 2 and 5 = 3 3 and 4 = 3 3 and 5 = 4 4 and 5 = 4

7.4.2.6 *Child experience of teasing, physical hurt and bullying*

Question	Response options	Rules	
In the last 12 months, how often has your child been…	1 Never	1 and 2 = 2	2 and 6 = 4
Q25a teased at school?	2 Hardly ever	1 and 3 = 2	3 and 4 = 3
Q25b physically hurt at school?	3 Once a term	1 and 4 = 3	3 and 5 = 4
Q25c bullied at school?	4 Once a month	1 and 5 = 3	3 and 6 = 4
	5 Once a week	1 and 6 = 3	4 and 5 = 4
	6 More than once a week	2 and 3 = 3	4 and 6 = 5
		2 and 4 = 3	5 and 6 = 5
		2 and 5 = 4	

7.4.2.7 *Social problems*

Question	Response options	Rules
In the last 12 months, how big a problem do you think the following have been at your child's school? Q26a Bullying of students Q26b Bullying of teachers Q26c Cigarette possession or use Q26d Alcohol possession or use Q26e Illicit drug possession or use Q26f Theft Q26g Vandalism/graffiti	1 No problem 2 Small problem 3 Fair problem 4 Big problem	1 and 2 = 2 1 and 3 = 2 1 and 4 = 3 2 and 3 = 2 2 and 4 = 3 3 and 4 = 3

7.4.2.8 *Disputes*

Question	Response options	Rules	
In the last 12 months, how often have you or your spouse or partner had a dispute with… Q27a the principal of your child's school? Q27b a teacher at your child's school? Q27c administrative staff at your child's school? Q27d a parent of a child at your child's school?	1 Never 2 Hardly ever 3 Once a term 4 Once a month 5 Once a week 6 More than once a week	1 and 2 = 2 1 and 3 = 2 1 and 4 = 3 1 and 5 = 3 1 and 6 = 3 2 and 3 = 3 2 and 4 = 3 2 and 5 = 4	2 and 6 = 4 3 and 4 = 3 3 and 5 = 4 3 and 6 = 4 4 and 5 = 4 4 and 6 = 5 5 and 6 = 5

7.5 Comparison of NCOHS and ABS Census data across demographic and socioeconomic groups

Table 7-2 ABS population data comparison of demographic characteristics - NSW, Total P2 sample

	Survey estimate		2011 Census
	% of children	(95% CI)	% of children
	Child's demographic characteristics		
Child Indigenous identity			
Non-Indigenous	96.7	(95.7-97.6)	95.0
Indigenous	3.3	(2.4-4.3)	5.0
	Parent/guardian characteristics		
Parent country of birth[(a)]			
Australia	69.0	(65.3-72.8)	61.0
Other	31.0	(27.2-34.7)	39.0
Parent Indigenous identity[(b)]			
Non-Indigenous	97.1	(96.3-97.9)	95.9
Indigenous	2.9	(2.1-3.7)	4.1
Parent highest level of education[(c)]			
Tertiary education	57.1	(53.1-61.1)	33.1
No tertiary education	42.9	(38.9-46.9)	66.9
Parent labour force status[(d)]			
Employed	93.0	(91.4-94.5)	84.2
Unemployed	7.0	(5.5-8.6)	15.8
	Household demographic characteristics		
Type of household			
One parent	14.6	(12.9-16.2)	21.1
Two parent	85.4	(83.8-87.1)	78.9
Household income			
Up to $60,000	26.5	(23.3-29.7)	69.9
Over $60,000	73.5	(70.3-76.7)	30.1

(a) Children were classified to the overseas born category if they had at least one parent who was born overseas

(b) Children were classified to the Indigenous category if they had at least one parent who was Indigenous

(c) Children were classified to the tertiary education category if they had at least one parent with a tertiary education

(d) Children were classified to the employed category if they had at least one parent who was employed

Table 7-3 ABS population data comparison of demographic characteristics - SA, Total P2 sample

	Survey estimate		2011 Census
	% of children	(95% CI)	% of children
	Child's demographic characteristics		
Child Indigenous identity			
Non-Indigenous	99.4	(99.0-99.8)	96.2
Indigenous	0.6	(0.2-1.0)	3.8
	Parent/guardian characteristics		
Parent country of birth[(a)]			
Australia	73.9	(70.3-77.4)	70.3
Other	26.1	(22.6-29.7)	29.7
Parent Indigenous identity[(b)]			
Non-Indigenous	99.6	(99.3-100.0)	97.1
Indigenous	0.4	(0.0-0.7)	2.9
Parent highest level of education[(c)]			
Tertiary education	58.3	(53.3-63.3)	28.0
No tertiary education	41.7	(36.7-46.7)	72.0
Parent labour force status[(d)]			
Employed	96.4	(95.2-97.7)	84.1
Unemployed	3.6	(2.3-4.8)	15.9
	Household demographic characteristics		
Type of household			
One parent	9.5	(7.6-11.4)	22.7
Two parent	90.5	(88.6-92.4)	77.3
Household income			
Up to $60,000	18.8	(15.2-22.3)	77.7
Over $60,000	81.3	(77.7-84.8)	22.3

(a) Children were classified to the overseas born category if they had at least one parent who was born overseas

(b) Children were classified to the Indigenous category if they had at least one parent who was Indigenous

(c) Children were classified to the tertiary education category if they had at least one parent with a tertiary education

(d) Children were classified to the employed category if they had at least one parent who was employed

Table 7-4 ABS population data comparison of demographic characteristics - ACT, Total P2 sample

	Survey estimate % of children	(95% CI)	2011 Census % of children
	Child's demographic characteristics		
Child Indigenous identity			
Non-Indigenous	98.3	(97.6-99.0)	97.3
Indigenous	1.7	(1.0-2.4)	2.7
	Parent/guardian characteristics		
Parent country of birth[(a)]			
Australia	67.2	(61.5-72.9)	63.9
Other	32.8	(27.1-38.5)	36.1
Parent Indigenous identity[(b)]			
Non-Indigenous	98.6	(97.9-99.2)	97.7
Indigenous	1.4	(0.8-2.1)	2.3
Parent highest level of education[(c)]			
Tertiary education	72.2	(66.6-77.7)	51.6
No tertiary education	27.9	(22.3-33.4)	48.4
Parent labour force status[(d)]			
Employed	96.5	(95.3-97.7)	92.0
Unemployed	3.5	(2.3-4.7)	8.0
	Household demographic characteristics		
Type of household			
One parent	12.4	(10.0-14.8)	18.3
Two parent	87.6	(85.2-90.0)	81.7
Household income			
Up to $60,000	11.2	(8.3-14.0)	47.2
Over $60,000	88.9	(86.0-91.7)	52.8

(a) Children were classified to the overseas born category if they had at least one parent who was born overseas

(b) Children were classified to the Indigenous category if they had at least one parent who was Indigenous

(c) Children were classified to the tertiary education category if they had at least one parent with a tertiary education

(d) Children were classified to the employed category if they had at least one parent who was employed

7.6 Parent responses to perceptions of school items - frequencies

Label	Question and response options		Percent (%)
15a	Has your child's school provided the following health services in the last 12 months?		
	Health screening services		(n=5,666)
		Yes	16.0
		No	62.1
		Don't know	21.9
15b	Services for mental and social health of students		(n=5,663)
		Yes	42.5
		No	33.8
		Don't know	23.7
15c	Student support services		(n=5,657)
		Yes	56.9
		No	23.8
		Don't know	19.3
15d	Visits by a school dental service for students		(n=5,656)
		Yes	35.0
		No	41.9
		Don't know	23.1
	Does your child's school have policies covering the following health issues?		
16a	Protective clothing		(n=5,678)

		Yes	76.3
		No	7.2
		Don't know	16.5
16b	Sun protection		(n=5,690)
		Yes	89.2
		No	5.3
		Don't know	5.5
16c	Immunisation		(n=5,673)
		Yes	75.9
		No	5.2
		Don't know	18.9
16d	Use of backpacks		(n=5,678)
		Yes	45.2
		No	20.5
		Don't know	34.3
16e	Recycling		(n=5,686)
		Yes	72.9
		No	5.6
		Don't know	21.5
16f	Environmentally friendly		(n=5,679)
		Yes	73.2
		No	3.9
		Don't know	22.9
16g	Playground equipment safety		(n=5,669)
		Yes	79.2
		No	3.0
		Don't know	17.8
16h	Nutrition/health canteen		(n=5,674)
		Yes	76.3
		No	10.0
		Don't know	13.7
16i	Bullying/behaviour		(n=5,675)
		Yes	92.1
		No	2.2
		Don't know	5.8
16j	Other health-related policies		(n=3,032)
		Yes	21.1
		No	4.9
		Don't know	74.0
	Tick one box for each statement		
17a	Families of children at your child's school are involved in health decisions for the school.		(n=5,592)
		Strongly disagree	9.5
		Disagree	14.2
		Neither agree nor disagree	47.4
		Strongly agree	18.5
		Agree	10.4
17b	Parents are encouraged to be involved in decision making at your child's school.		(n=5,640)
		Strongly disagree	5.2
		Disagree	9.0
		Neither agree nor disagree	27.0
		Strongly agree	33.1
		Agree	25.7

17c	Local groups participate in school activities at your child's school.		(n=5,578)
		Strongly disagree	5.4
		Disagree	11.8
		Neither agree nor disagree	36.3
		Strongly agree	29.3
		Agree	17.2
	How would you rate the following aspects of your child's school?		
18a	School buildings and grounds		(n=5,677)
		Very good	45.3
		Good	38.8
		Adequate	14.4
		Poor	1.3
		Very poor	0.2
18b	Classrooms and other learning spaces		(n=5,675)
		Very good	42.9
		Good	40.1
		Adequate	15.3
		Poor	1.5
		Very poor	0.2
18c	Teachers		(n=5,672)
		Very good	47.0
		Good	41.0
		Adequate	10.4
		Poor	1.3
		Very poor	0.3
	Tick one box for each statement		
19a	Your child enjoys school		(n=5,655)
		Strongly disagree	2.7
		Disagree	4.7
		Neither agree nor disagree	11.1
		Strongly agree	33.8
		Agree	47.7
19b	Your child is enthusiastic about school work		(n=5,651)
		Strongly disagree	3.4
		Disagree	7.5
		Neither agree nor disagree	21.0
		Strongly agree	34.8
		Agree	33.2
19c	Your child takes pride in his/her school		(n=5,645)
		Strongly disagree	2.6
		Disagree	5.0
		Neither agree nor disagree	15.7
		Strongly agree	35.3
		Agree	41.4
19d	Your child values academic achievement		(n=5,646)
		Strongly disagree	2.8
		Disagree	5.8
		Neither agree nor disagree	18.3
		Strongly agree	33.9
		Agree	39.1
19e	Your child is co-operative and respectful at school		(n=5,644)
		Strongly disagree	2.5
		Disagree	2.6
		Neither agree nor disagree	6.7
		Strongly agree	28.9
		Agree	59.3

19f	Your child values the education they can receive at their school		(n=5,648)
		Strongly disagree	2.3
		Disagree	4.7
		Neither agree nor disagree	19.8
		Strongly agree	35.5
		Agree	37.7
19g	Your child does his/her best to learn as much as possible		(n=5,648)
		Strongly disagree	2.4
		Disagree	4.8
		Neither agree nor disagree	15.3
		Strongly agree	35.2
		Agree	42.3
19h	Your child gets along well with teachers at his/her school		(n=5,649)
		Strongly disagree	2.5
		Disagree	2.7
		Neither agree nor disagree	7.0
		Strongly agree	28.9
		Agree	59.0
20a	Does your child's school have a Parents and Friends group?		(n=5,630)
		Yes	89.5
		No	10.5
	In the last 12 months…		
20b	… have you or your spouse or partner belonged to the Parents and Friends group at your child's school?		(n=4,989)
		Yes	23.9
		No	76.1
		n where 20a = 1	5,041[(a)]
20c	… how many of the meetings of the Parents and Friends group did you or your spouse or partner attend?		(n=4,959) TN 5,041
		None	73.6
		Some	12.4
		Half	2.2
		Most	7.2
		All	4.6
		n where 20a = 1	5,041[(a)]
21a	Does your child's school have…		
	… a governing council?		(n=4,919)
		Yes	72.4
		No	27.6
21aa	In the last 12 months, have you or your spouse or partner belonged to this group?		(n=3,206)
		Yes	12.9
		No	79.4
		Parental involvement not permitted	7.8
		n where 21a = 1	3,560[(a)]
21b	… an education (curriculum/ literacy/numeracy) committee?		(n=4,700)
		Yes	53.1
		No	46.9
21ba	In the last 12 months, have you or your spouse or partner belonged to this group?		(n=2,416)
		Yes	11.6
		No	68.2
		Parental involvement not permitted	20.2
		n where 21b = 1	2,496[(a)]
21c	… a sports committee?		(n=4,573)
		Yes	41.8
		No	58.2

21ca	In the last 12 months, have you or your spouse or partner belonged to this group?		(n=1,574)
		Yes	15.1
		No	70.3
		Parental involvement not permitted	14.6
		n where 21c = 1	1,911[(a)]
21d	… any other group or committee		(n=3,420)
		Yes	45.2
		No	54.8
21da	In the last 12 months, have you or your spouse or partner belonged to this group?		(n=1,459)
		Yes	33.5
		No	61.6
		Parental involvement not permitted	4.9
		n where 21d = 1	1,546[(a)]
22	In the last 12 months, how many times have you or your spouse or partner volunteered at your child's school?		(n=5,666)
		None	32.1
		1–3	28.5
		4–8	15.9
		9–15	7.7
		Over 15	15.8
23	In the last 12 months, how many sick days has your child taken off school?		(n=5,640)
		None	8.2
		1–3	49.8
		4–8	32.5
		9–15	6.9
		Over 15	2.6
24a	Overall, how safe have you felt when you have been at your child's school?		(n=5,551)
		Very safe	80.7
		Safe	13.1
		Neither safe nor unsafe	3.0
		Unsafe	1.4
		Very unsafe	1.8
24b	How would you rate your child's safety at school?		(n=5,593)
		Very safe	67.8
		Safe	23.6
		Neither safe nor unsafe	4.8
		Unsafe	2.3
		Very unsafe	1.6
	In the last 12 months, how often has your child been…		
25a	… teased at school?		(n=5,626)
		Never	29.2
		Hardly ever	43.2
		Once a term	11.7
		Once a month	7.4
		Once a week	5.1
		More than once a week	3.5
25b	… physically hurt at school?		(n=5,617)
		Never	52.6
		Hardly ever	34.4
		Once a term	8.5
		Once a month	3.0
		Once a week	1.0
		More than once a week	0.5

25c	… bullied at school?		(n=5,623)
		Never	52.5
		Hardly ever	30.3
		Once a term	7.3
		Once a month	4.4
		Once a week	2.7
		More than once a week	2.9
	In the last 12 months, how big a problem do you think the following have been at your child's school?		
26a	Bullying of students		(n=5,613)
		No problem	20.7
		Small problem	55.3
		Fair problem	17.8
		Big problem	6.2
26b	Bullying of teachers		(n=5,561)
		No problem	71.2
		Small problem	22.4
		Fair problem	5.0
		Big problem	1.4
26c	Cigarette possession or use		(n=5,542)
		No problem	81.7
		Small problem	12.7
		Fair problem	3.5
		Big problem	2.1
26d	Alcohol possession or use		(n=5,537)
		No problem	89.2
		Small problem	8.5
		Fair problem	1.3
		Big problem	1.1
26e	Illicit drug possession or use		(n=5,537)
		No problem	87.9
		Small problem	9.5
		Fair problem	1.5
		Big problem	1.1
26f	Theft		(n=5,549)
		No problem	60.4
		Small problem	32.5
		Fair problem	5.4
		Big problem	1.7
26g	Vandalism/graffiti		(n=5,551)
		No problem	61.5
		Small problem	30.8
		Fair problem	5.7
		Big problem	2.0
	In the last 12 months, how often have you or your spouse or partner had a dispute with…		
27a	.. the principal of your child's school?		(n=5,647)
		Never	90.4
		Hardly ever	7.5
		Once a term	1.6
		Once a month	0.4
		Once a week	0.1
		More than once a week	0.1
27b	.. a teacher at your child's school?		(n=5,647)
		Never	84.4
		Hardly ever	12.6
		Once a term	2.4
		Once a month	0.3

		Once a week	0.2
		More than once a week	0.1
27c	… administrative staff at your child's school?		(n=5,647)
		Never	94.1
		Hardly ever	5.0
		Once a term	0.7
		Once a month	0.2
		Once a week	0.0
		More than once a week	0.0
27d	… a parent of a child at your child's school?		(n=5,647)
		Never	90.6
		Hardly ever	8.2
		Once a term	0.7
		Once a month	0.2
		Once a week	0.2
		More than once a week	0.2
	Total n		5,704

[(a)] Relevant n for filtered questions

7.7 Dichotomisation of data items from Phase Two questionnaire - child level

Label	Variable	Coding

HthServ — Health services at the school

Health service 1	Health service 2	Health service 3	Interpretation	Coding
No/DK	No/DK	No/DK	0 services	Low
Yes	No/DK	No/DK	1 service	
No/DK	Yes	No/DK	1 service	
No/DK	No/DK	Yes	1 service	
No/DK	Yes	Yes	2 services	High
Yes	No/DK	Yes	2 services	
Yes	Yes	No/DK	2 services	
Yes	Yes	Yes	3 services	

HthDec — Parent involvement in health decisions at school

Response	Coding
Neither agree nor disagree/ Disagree/Strongly disagree	Low
Strongly agree/Agree	High

GenDec — Parent involvement in general decisions at school

Response	Coding
Neither agree nor disagree/ Disagree/Strongly disagree	Low
Strongly agree/Agree	High

CommInv — Community involvement in school

Response	Coding
Neither agree nor disagree/ Disagree/Strongly disagree	Low
Strongly agree/Agree	High

QualBGC — Quality of buildings/grounds and classrooms at school

Buildings/ grounds	Classrooms	Coding
P	P	Low
P	G	
P	Missing	
G	P	
Missing	P	
G	G	High

P = Adequate/poor/ very poor
G = Good/very good

QualTch Quality of teachers at school

Response	Coding
Adequate/poor/ very poor	Poor
Good/very good	Good

Morale Student morale

Number of responses			
A	N	D	Coding
1–4	any	any	Low
5	2	1	High
6	1	1	
7	0	1	
8	0	0	

A = agree/strongly agree
N = neither agree nor disagree
D = disagree/strongly disagree

PnFGrp Parent involvement in parent and friends group

Believed is group	Member of group	Meetings attended	Coding
No			Low
Yes	No	No	
Yes	Yes	Any	High
Yes	Any	Yes	

Safety General safety at school

Buildings/ grounds	Classrooms	Coding
U	U	Low
U	S	
U	Missing	
S	U	
Missing	U	
S	S	High

U = Very unsafe/unsafe/neither safe nor unsafe
S = Safe/very safe

SocProb Social problems at school

Number of responses			
No	Small	Fair/Big	Coding
Any	< 4	< 2	Low
Any	Any	2–7	High
Any	4–7	Any	

Dispute Disputes at school

Number of responses			
No	Hardly ever	Repeat	Coding
Any	< 2	0	Low
Any	Any	1–4	High
Any	2–4	Any	

7.8 Principal Components Analysis for Phase Two questionnaire - child level

This appendix details the statistical process employed to created factor variables for the child-level parent perceptions of school items from the Phase 2 (P2) questionnaire. The guidelines for determining the optimal factor structure is detailed in section 4.3.2.1.2.

The scree plot for the Principal Components Analysis (PCA) for the P2 questionnaire variables at the child level showed five factors with an eigenvalue greater than one and a break in the curve at three factors (Figure 7-1).

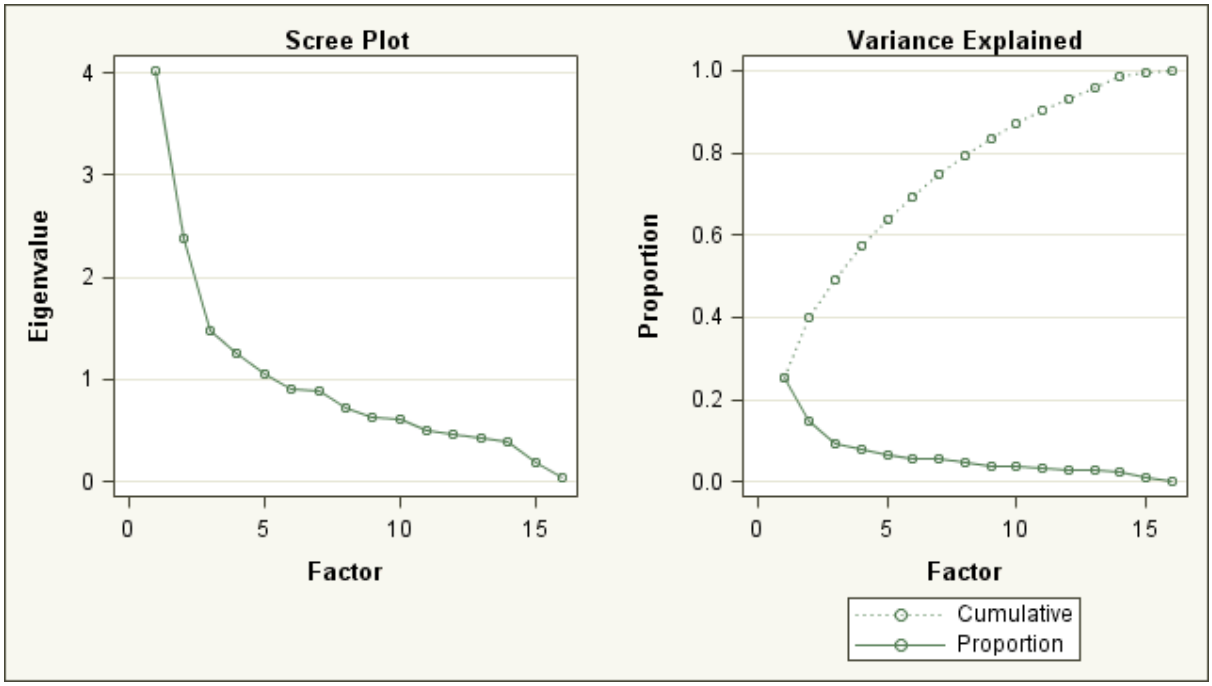


Figure 7-1 Scree plot and Variance explained for PCA for P2 questionnaire - child-level

The five-factor pattern including all 18 items resulted in two non-loading items (Student morale, School health policies) and two cross-loading items (Disputes at school, General safety at school) (Table 7-5). The final two factors had only two loading variables on each. This pattern could not be deemed optimal. The PCA was altered to extract three factors, based on the pattern and the shape of the scree plot.

Table 7-5 PCA for P2 questionnaire - child-level, iteration 1: five-factor solution, 18 items

Rotated Factor Pattern					
	Factor1	Factor2	Factor3	Factor4	Factor5
Child experience of bullying	**0.92766**	0.05079	0.15412	0.03233	0.01803
Child experience of teasing	**0.90323**	0.04782	0.10941	-0.02766	-0.01682
Child experience of physical hurt	**0.76384**	-0.00619	0.11041	-0.02639	0.09203
Disputes at school	**0.47872**	0.09461	**0.44310**	-0.16466	-0.00517
Child's number of sick days	**0.40949**	0.08501	0.07308	0.18680	-0.16841
Student morale	0.38477	0.19237	0.32985	0.23097	-0.06053
Parent involvement in general decisions at school	0.12597	**0.87909**	0.13941	0.07656	0.07860
Parent involvement in health decisions at school	0.06598	**0.86204**	0.11640	0.12791	0.01888
Community involvement in school	0.08702	**0.83526**	0.03976	0.02229	0.07621
School health policies	-0.02959	0.37750	0.26813	-0.04386	0.17739
Teacher quality	0.16974	0.20389	**0.79491**	0.06373	0.10289
Quality of buildings and grounds	0.05739	0.18295	**0.77166**	-0.13771	0.14824
General safety at school	**0.41888**	0.13632	**0.57418**	0.07357	0.09930
Social problems at school	0.13895	-0.04011	**0.64284**	0.17899	-0.14499
Parent involvement in volunteering at school	-0.03111	0.06667	0.14804	**0.83025**	0.07102
Parent involvement in school parent and friends group	0.09582	0.06846	-0.08112	**0.81850**	0.11842
School provision of a student support service	0.03873	0.09772	0.08289	0.10906	**0.82681**
School provision of health services	-0.06320	0.12779	0.02459	0.07073	**0.82204**

A three factor pattern incorporating all 18 items resulted in two non-loading variables (School provision of a student support service, School provision of health services) and two cross-loading factors (General safety at school, Teacher quality) (Table 7-6). Only two items loaded on the final factor. This structure was not optimal. The PCA was altered to extract two factors.

Table 7-6 PCA for P2 questionnaire - child-level, iteration 2: three-factor solution, 18 items

Rotated Factor Pattern			
	Factor1	Factor2	Factor3
Child experience of bullying	**0.89361**	-0.02104	0.07791
Child experience of teasing	**0.85072**	-0.04580	0.02158
Child experience of physical hurt	**0.71947**	-0.03943	0.04303
General safety at school	**0.61358**	**0.33528**	0.00162
Disputes at school	**0.60159**	0.21974	-0.21255
Student morale	**0.50241**	0.22016	0.15215
Social problems at school	**0.43116**	0.18550	-0.05157
Child's number of sick days	**0.42393**	-0.01632	0.13147
Parent involvement in general decisions at school	0.13506	**0.79126**	0.16930
Parent involvement in health decisions at school	0.08183	**0.75520**	0.19300
Community involvement in school	0.05479	**0.71843**	0.13789
Quality of buildings and grounds	0.35239	**0.54513**	-0.24488
Teacher quality	**0.48258**	**0.52990**	-0.07616
School health policies	0.05420	**0.49216**	-0.00595
Parent involvement in school parent and friends group	0.10503	-0.01807	**0.80566**
Parent involvement in volunteering at school	0.09599	0.08914	**0.72928**
School provision of a student support service	0.00214	0.33639	0.38029
School provision of health services	-0.11806	0.35115	0.35459

Table 7-7 shows the two-factor solution incorporating all 18 items. At this stage the consideration of the relatability of items loading on factors became relevant. Assessing factor one, one item (quality of teachers) clearly cross-loaded. But another item (quality of buildings/grounds and classrooms) did not conceptually fit with other items loading on the factor, and loaded on factor two just below the absolute level to be deemed cross-loading. Assessing factor two, two items that conceptually linked with other items loaded on the factor were branded non-loading. Adjusting the absolute value used to determine a large loading to 0.32 (see section 4.3.2.1.2) meant that quality of buildings/grounds and classrooms was then branded as cross-loading, and parent involvement in volunteering at school was branded as loading on factor two. Based on the conceptual link between items on factor two the final non-loading variable was retained for the next iteration and both cross-loading variables were dropped.

Table 7-7 PCA for P2 questionnaire - child-level, iteration 3: two-factor solution, 18 items

Rotated Factor Pattern		
	Factor1	Factor2
Child experience of bullying	**0.87557**	-0.04879
Child experience of teasing	**0.83536**	-0.09058
Child experience of physical hurt	**0.70422**	-0.06761
General safety at school	**0.64402**	0.26766
Disputes at school	**0.63841**	0.07901
Student morale	**0.50808**	0.22788
Social problems at school	**0.45172**	0.12155
Child's number of sick days	**0.40634**	0.00779
Quality of buildings/grounds and classrooms	**0.43013**	0.38208
Quality of teachers	**0.54247**	**0.42500**
Parent involvement in general decisions at school	0.20534	**0.78386**
Parent involvement in health decisions at school	0.14661	**0.76350**
Community involvement in school	0.12067	**0.71008**
School provision of health services	-0.10976	**0.46845**
School provision of a student support service	0.00537	**0.45685**
School health policies	0.10802	**0.44628**
Parent involvement in volunteering at school	0.04046	0.35913
Parent involvement in school parent and friends group	0.03094	0.28972

With the absolute value set at 0.32, the two factor solution including 16 variables saw no non- or cross-loading items and more than four items loading on each factor. This structure was considered optimal. Cronbach's alpha revealed internal consistency of the factors ($\alpha = 0.80$ and 0.70) as well as for a one-factor solution ($\alpha = 0.78$). The final resultant factor pattern is presented in (Table 7-8).

Table 7-8 PCA for P2 questionnaire - child-level, iteration 4: three-factor solution, 16 items

Rotated Factor Pattern		
	Factor1	Factor2
Child experience of bullying	**0.90265**	-0.00522
Child experience of teasing	**0.86301**	-0.04783
Child experience of physical hurt	**0.72858**	-0.03139
Disputes at school	**0.62347**	0.06863
General safety at school	**0.62095**	0.24947
Student morale	**0.50060**	0.23106
Child's number of sick days	**0.42980**	0.04161
Social problems at school	**0.42398**	0.09279
Parent involvement in general decisions at school	0.21100	**0.80454**
Parent involvement in health decisions at school	0.15890	**0.78973**
Community involvement in school	0.13209	**0.73507**
School provision of health services	-0.11709	**0.46379**
School provision of a student support service	0.00090	**0.45700**
School health policies	0.09509	**0.43421**
Parent involvement in volunteering at school	0.04815	**0.37944**
Parent involvement in school parent and friends group	0.05289	**0.32851**
Eigenvalue	4.63	2.39
Explained variance	25.1%	14.9%
Alpha (subscales)	0.80	0.70
Alpha (1 factor)	0.78	

7.9 Principal Components Analysis for Phase Two questionnaire - school level

This appendix details the statistical process employed to created factor variables for the school-level parent perceptions of school items from the Phase 2 (P2) questionnaire. The guidelines for determining the optimal factor structure is detailed in section 4.3.2.1.2.

The scree plot for the Principal Components Analysis (PCA) for the P2 questionnaire variables at the school level showed five factors with an eigenvalue greater than one and a break in the curve at three factors (Figure 7-2)

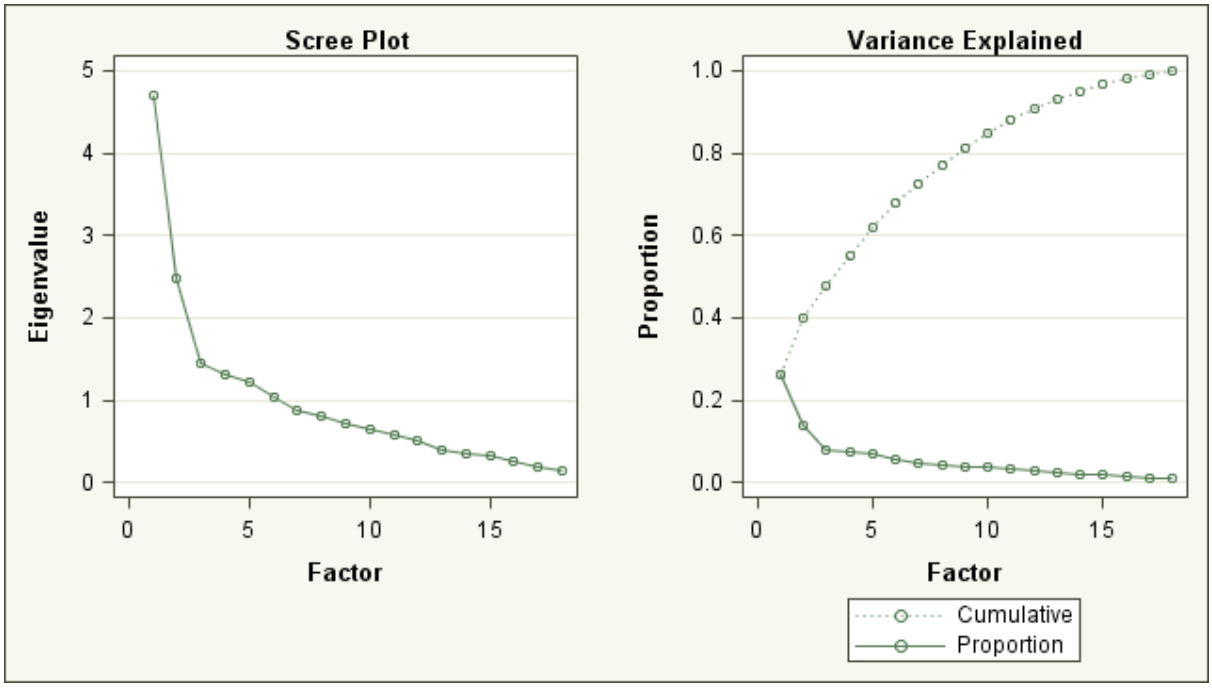


Figure 7-2 Scree plot and Variance explained for PCA for P2 questionnaire - school-level

The five-factor pattern including all 18 items resulted in one non-loading item (Child's number of sick days) and two cross-loading items (General safety at school, Student morale) (Table 7-9). The final two factors had only two loading variables on each, and only three items loaded on factor three. This pattern was not deemed optimal. The PCA was altered to extract three factors, based on the pattern and the shape of the scree plot.

Table 7-9 PCA for P2 questionnaire - school-level, iteration 1: five-factor solution, 18 items

Rotated Factor Pattern					
	Factor1	Factor2	Factor3	Factor4	Factor5
Quality of buildings/grounds and classrooms	**0.85640**	0.06276	0.06445	-0.08625	0.07262
Quality of teachers	**0.83407**	0.21746	0.04856	0.05038	0.02013
Social problems	**0.68713**	0.25863	-0.00024	0.33191	-0.17649
Health policies at school	**0.63078**	-0.14000	0.12272	0.25321	0.20926
General safety at school	**0.59767**	**0.40055**	0.20553	-0.00221	0.14735
Student morale	**0.47096**	0.16286	0.20049	**0.44094**	-0.19457
Child's number of sick days	0.32554	0.26849	0.10981	0.24736	-0.30889
Child experience of teasing	0.08460	**0.88510**	-0.06202	0.06776	-0.11685
Child experience of bullying	0.23127	**0.84242**	0.00650	0.14492	-0.02905
Child experience of physical hurt	-0.02801	**0.82857**	-0.06989	0.00031	0.08150
Disputes at school	0.33081	**0.55139**	0.18178	-0.18212	0.00975
Parent involvement in general decisions at school	0.18422	0.02782	**0.82771**	0.27688	0.02920
Community involvement at school	-0.07385	-0.06331	**0.81123**	0.03320	0.12005
Parent involvement in health decisions at school	0.25162	0.05594	**0.75883**	0.18780	-0.01339
Parent involvement in parent and friends group	-0.05846	0.06921	0.17935	**0.81490**	0.13932
Parent involvement in volunteering at school	0.33868	-0.09864	0.27192	**0.65490**	0.10950
School provision of student support service	-0.02459	-0.08106	0.15428	-0.00981	**0.77217**
School provision of health services	0.23667	0.14542	-0.01566	0.24274	**0.74817**

The three-factor pattern including all 18 items resulted in three non-loading items (Child's number of sick days, School provision of a support service, School provision of health services) and one cross-loading item (Parent involvement in volunteering at school) (Table 7-10). All factors had at least four loading items, however this pattern could not be deemed optimal. The PCA was altered to extract two factors.

Table 7-10 PCA for P2 questionnaire - school-level, iteration 2: three-factor solution, 18 items

Rotated Factor Pattern			
	Factor1	Factor2	Factor3
Quality of buildings/grounds and classrooms	**0.83045**	0.05728	-0.03152
Quality of teachers	**0.82809**	0.22212	0.00845
Social problems	**0.72363**	0.29689	0.06995
Health policies at school	**0.66798**	-0.14614	0.23470
General safety at school	**0.58523**	0.38916	0.15550
Student morale	**0.52372**	0.21463	0.30429
Child's number of sick days	0.34647	0.32149	0.11494
School provision of student support service	0.29581	0.06015	0.25749
Child experience of teasing	0.08471	**0.89258**	-0.06989
Child experience of bullying	0.24338	**0.84578**	0.03631
Child experience of physical hurt	-0.03030	**0.80757**	-0.05541
Disputes at school	0.28777	**0.54592**	0.03097
Parent involvement in general decisions at school	0.20762	0.06615	**0.82290**
Community involvement at school	-0.08242	-0.04808	**0.72984**
Parent involvement in health decisions at school	0.25960	0.09368	**0.70657**
Parent involvement in parent and friends group	0.07463	0.09083	**0.58436**
Parent involvement in volunteering at school	**0.43834**	-0.07237	**0.55307**
School provision of health services	-0.00425	-0.17337	0.30411

The two-factor pattern including all 18 items resulted in two non-loading items (School provision of a support service, School provision of health services) and three cross-loading items (Quality of teachers, Quality of buildings/grounds and classrooms, Student morale) (Table 7-11). This pattern was not deemed optimal. The PCA was reverted to create a three-factor solution excluding the three non-loading factors.

Table 7-11 PCA for P2 questionnaire - school-level, iteration 3: five-factor solution, 18 items

Rotated Factor Pattern		
	Factor1	Factor2
Child experience of bullying	**0.82870**	-0.04580
Child experience of teasing	**0.79267**	-0.22848
Child experience of physical hurt	**0.65741**	-0.25823
Quality of teachers	**0.63821**	**0.40009**
Social problems	**0.63525**	0.37489
General safety at school	**0.62522**	0.34644
Disputes at school	**0.60590**	0.04713
Quality of buildings/grounds and classrooms	**0.50799**	**0.40944**
Child's number of sick days	**0.44273**	0.20128
Parent involvement in general decisions at school	0.07133	**0.75860**
Parent involvement in volunteering at school	0.11577	**0.69988**
Parent involvement in health decisions at school	0.13648	**0.68631**
Health policies at school	0.21889	**0.58567**
Community involvement at school	-0.17164	**0.55483**
Parent involvement in parent and friends group	0.04685	**0.48864**
Student morale	**0.42947**	**0.47563**
School provision of student support service	0.18193	0.35250
School provision of health services	-0.18171	0.28490

The three-factor pattern including 15 items resulted in one cross-loading item (Parent involvement in volunteering at school) and no non-loading items. At least four items loaded on each factor (Table 7-12). Items could be related conceptually but this pattern was not deemed optimal. The cross-loading item was dropped for the next iteration of the PCA.

Table 7-12 PCA for P2 questionnaire - school-level, iteration 4: three-factor solution, 15 items

Rotated Factor Pattern			
	Factor1	Factor2	Factor3
Quality of teachers	**0.83419**	0.23988	0.04171
Quality of buildings/grounds and classrooms	**0.83049**	0.07042	-0.01211
Social problems	**0.71872**	0.29132	0.12221
Health policies at school	**0.66899**	-0.13625	0.22511
General safety at school	**0.57290**	0.39512	0.17390
Student morale	**0.51909**	0.19835	0.35297
Child experience of teasing	0.07783	**0.89434**	-0.03658
Child experience of bullying	0.23784	**0.85467**	0.06936
Child experience of physical hurt	-0.04037	**0.81984**	-0.04245
Disputes at school	0.28739	**0.55601**	0.04770
Parent involvement in general decisions at school	0.19142	0.03301	**0.84875**
Parent involvement in health decisions at school	0.24510	0.06248	**0.73201**
Community involvement at school	-0.09416	-0.07433	**0.72477**
Parent involvement in parent and friends group	0.04857	0.07051	**0.59056**
Parent involvement in volunteering at school	**0.41584**	-0.09169	**0.56248**

A three-factor pattern incorporating 14 items had no non- or cross-loading factors and at least four items loaded on each factor. Items were conceptually relatable. Cronbach's alpha indicated internal consistency for the factor (α = 0.91, 0.90 and 0.87) as well as for a one factor solution (α = 0.87). The resultant final factor structure is shown in Table 7-13.

Table 7-13 PCA for P2 questionnaire - school-level, iteration 5: three-factor solution, 14 items

Rotated Factor Pattern			
	Factor1	Factor2	Factor3
Quality of teachers	**0.84578**	0.22340	0.03969
Quality of buildings/grounds and classrooms	**0.84166**	0.05063	-0.00880
Social problems	**0.71258**	0.29590	0.08132
Health policies at school	**0.67737**	-0.14857	0.21324
General safety at school	**0.58155**	0.38547	0.16692
Student morale	**0.52717**	0.19403	0.33310
Child experience of teasing	0.08659	**0.89336**	-0.02651
Child experience of bullying	0.24400	**0.85545**	0.06520
Child experience of physical hurt	-0.03081	**0.81769**	-0.02587
Disputes at school	0.29585	**0.54934**	0.05278
Parent involvement in general decisions at school	0.21823	0.01548	**0.85436**
Community involvement at school	-0.06176	-0.09809	**0.75744**
Parent involvement in health decisions at school	0.27855	0.03715	**0.75496**
Parent involvement in parent and friends group	0.05014	0.08120	**0.55512**
Eigenvalue	4.54	2.42	1.59
Explained variance	32.4%	17.3%	11.3%
Cronbach α (subscales)	0.91	0.90	0.87
Cronbach α (1 factor)		0.87	

7.10 Principal Components Analysis for School characteristics

This appendix details the statistical process employed to created factor variables for the school characteristics items from the MySchool administrative data collection. The guidelines for determining the optimal factor structure is detailed in section 4.3.2.1.2.

The scree plot for the Principal Components Analysis (PCA) for the school characteristics variables level showed three factors with an eigenvalue greater than one and a break in the curve at two factors (Figure 7-3).

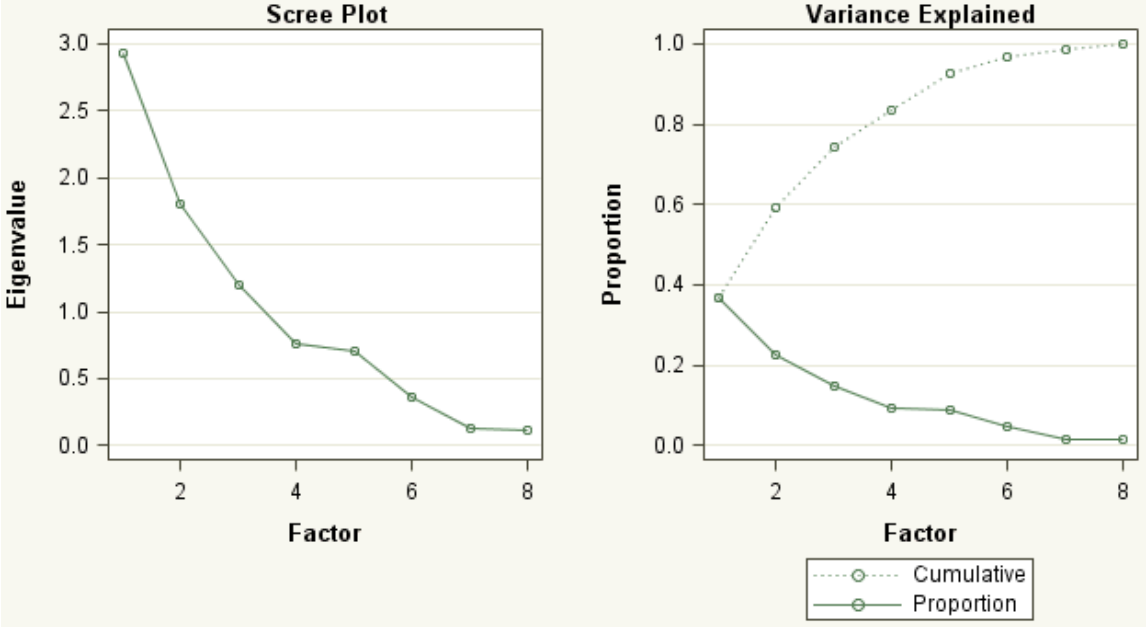


Figure 7-3 Scree plot and Variance explained for PCA for School characteristics

The three-factor pattern including all 8 items resulted in no non-loading items and one cross-loading item (Attendance rate) (Table 7-14). The final two factors had only two loading variables on each. This pattern was not deemed optimal. The PCA was altered to extract two factors.

Table 7-14 PCA for School characteristics, iteration 1: three-factor solution, 8 items

Rotated Factor Pattern			
	Factor1	Factor2	Factor3
ICSEA	**0.86438**	0.11447	0.31102
Academic performance	**0.80514**	0.21524	0.38667
Attendance rate	**0.62387**	**0.52416**	0.05753
Teacher workload	**-0.69720**	0.19688	0.34612
Class size	0.07743	**0.92128**	-0.11764
School income	-0.05540	**-0.94556**	-0.02665
Percent NESB	0.02704	0.03614	**0.77030**
School size	0.17452	-0.13411	**0.71697**

The two-factor pattern including all 8 items resulted in no non-loading items and one cross-loading item (Attendance rate) (Table 7-15). Only three items loaded on the final factor. This pattern was not deemed optimal. The PCA was altered to extract one factor.

Table 7-15 PCA for School characteristics, iteration 2: two-factor solution, 8 items

Rotated Factor Pattern		
	Factor1	Factor2
ICSEA	**0.87801**	0.25131
Academic performance	**0.85906**	0.32395
School size	**0.54720**	-0.20088
Percent NESB	**0.43534**	-0.07710
Teacher workload	**-0.41523**	-0.01528
Class size	-0.09398	**0.92286**
Attendance rate	**0.49790**	**0.63251**
School income	0.03686	**-0.91939**

The one-factor solution including all 8 items resulted in three non-loading items (School size, Percent NESB, Teacher workload) (Table 7-16). This pattern was not deemed optimal. The three non-loading items were dropped from the next iteration of the PCA.

Table 7-16 PCA for School characteristics, iteration 3: one-factor solution, 8 items

Factor Pattern	
	Factor1
Academic performance	**0.85514**
ICSEA	**0.82062**
Attendance rate	**0.79325**
Class size	**0.54774**
School size	0.27219
Percent NESB	0.27190
Teacher workload	-0.31878
School income	**-0.58786**

The one-factor solution incorporating five items saw large loadings for all items (Table 7-17), however Cronbach's alpha did not demonstrate internal consistency (α = 0.43). Included data items were conceptually related. School income had a negative loading while all other items loaded positively. This item was reversed ahead of a further iteration of the PCA.

Table 7-17 PCA for School characteristics, iteration 4: one-factor solution, 5 items

Factor Pattern	
	Factor1
Attendance rate	**0.82290**
Academic performance	**0.79941**
ICSEA	**0.74138**
Class size	**0.65925**
School income	**-0.68998**
Eigenvalue	2.78
Explained variance	55.53%
Cronbach's α	0.43

With School income reversed, Cronbach's alpha demonstrated internal consistency (α = 0.77) and the one-factor solution with five items was deemed optimal (Table 7-18).

Table 7-18 PCA for School characteristics, iteration 5: one-factor solution, 5 items (one item reversed)

Factor Pattern	
	Factor1
Attendance rate	**0.82290**
Academic performance	**0.79941**
ICSEA	**0.74138**
School income*	**0.68998**
Class size	**0.65925**
Eigenvalue	2.78
Explained variance	55.53%
Cronbach's α	0.77

*Item direction reversed

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