
Options for a measure of school and early childhood service socioeconomic position

Report for the Ministry of Education

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4 March 2018

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Executive summary

This paper considers options for replacing the current school decile index and the equity index as the respective measures of a school's and an early childhood service's socioeconomic status. Currently both the school decile index and the equity index serve two purposes. The first is the criterion to allocate funding against socio-economic disadvantage. The second purpose is as a measure of socio-economic status for research and analysis. Formulating options for replacing the current school decile index and the equity index as the funding criterion is subject to its own work programme and outside the scope of this paper. This paper is concerned with identifying options for replacing the current school decile index and equity index for the purposes of research and analysis.

Part of our commission was to understand how the current measures are applied in research and analysis. Our scan of the literature revealed the use of the current school decile index was extensive. We characterise its use four ways:

- As a way to tabulate indicators for reporting/ analysis purposes.
- In surveys .to (1) tabulate and present the results and (2) ensure the survey sample is representative (i.e. stratify the sample).
- In evaluation studies of specific programmes, particularly those relating to programmes aimed at alleviating socio-economic disadvantage, researchers will select case studies from low decile schools.
- In formal statistical models, decile is used as a covariate to either understand the impact of, or control for, socio-economic disadvantage.

The equity index was found to be used less extensively.

This paper argues that any new measure of socio-economic status for the purposes of research and analysis must satisfy three criteria. These criteria are:

1. the measure has a high probability of addressing known issues associated with current decile index;
2. the measure is practical to develop/implement in terms of time/cost; and
3. the measure is likely to be a conceptually sound measure of socio-economic status in its likely applications in educational research and analysis.

The 'known issues' referred to under criteria one are the incorrect use of the current decile index as a measure of school quality and its erroneous use as a measure of the socio-economic circumstances of individual students within a school.

Eight options were considered against these criteria. Three options performed poorly against criteria two (practical in terms of time and cost). A survey based measure (for example the PISA index of economic, social and cultural status) performed poorly on the grounds there would be considerable monetary and time cost to survey (and then process) the required information. Using the New Zealand Index of Socio-economic status would require the linking of children and parents which would also be time consuming. The New Zealand Index of Socio-economic status also defines socio-economic status solely with reference to (parental) occupation, which could be seen as a conceptual weakness if one agrees socio-economic status is multi-dimensional.

Two options – an univariate indicator¹ and an adaptation of the risk index being developed for funding purposes – did not, in our opinion, satisfy criteria three: conceptual soundness. Identifying a suitable univariate indicator is problematic and any indicator identified will, most probably, not capture all the dimensions of

¹ Like the UK's percentage of students eligible for a free school lunch

socio-economic status adequately. Further if the univariate indicator is ‘service-based’ (i.e. measured by if the student or their parent(s) accesses a certain service), then it may miss those who are eligible for the service but do access it. The funding risk index, which has been developed for funding purposes, is constructed to predict NCEA level two achievement at a student level (in a binary sense). In certain statistical applications its method of construction is problematic, as the metric cannot be thought of as an ‘independent’ measure of socio-economic status.

We identify two area-based measures.² The New Zealand Index of Deprivation (NZDep2013 in its current iteration) is well-known and has been extensively researched and validated. The New Zealand Index of Multiple Deprivation (NZIMD), a variant of other multiple deprivation indices developed overseas, measures deprivation using more variables than the New Zealand Index of Deprivation, but is less well-known in New Zealand.

Both the NZDep2013 and NZIMD have drawbacks relative to an idealised measure. Both would define high socio-economic status in its negative sense (i.e. not being likely to be deprived). Secondly, given both are area-based measures, if there is selection bias within an area (high achievers go to different schools, and achievement is correlated with individual socio-economic status), school level socio-economic measures might under- and over-state the true socio-economic status of the school systematically.³ This issue affects the current decile and equity indices as well.

The final measure we consider is the well-being index developed by the Oranga Tamariki/Ministry of Children. This index has the desirable properties of being

² These are measures based on the area the student comes from rather than the student’s household.

³ The bias will be correlated with school achievement: the socio-economic status of schools with higher achievement rates will be understated, while the opposite will be true for schools with lower achievement rates.

child centric and based on the child’s home circumstances (rather than the area or the neighbourhood they are from). However the measure focuses on detriment, meaning high socio-economic status is defined in its negative sense. Further at this time there is no method for aggregation of the various ‘domains’ into one overall measure. The researcher is therefore unsure if a score of ‘1’ on different domains is equivalent in terms of their overall contribution to (reduced) ‘well-being’. We note the measure is relatively new and this issue may be resolved in due course.

This paper concludes there is no ideal measure for adopting as a measure of a school’s or an early childhood service’s socioeconomic status. Adopting each measure has its own trade-offs. In certain analytical applications, the analyst or researcher might feel comfortable that the positive attributes of one particular measure outweigh its negative attributes and the analyst or researcher can use a particular measure ‘as is’. This course of action might be more probable if the monetary and non-monetary cost of developing a bespoke ‘ideal’ measure is considered.

In terms of developing an ‘ideal’ measure, the Ministry of Education is best placed to do this work (in collaboration with other government departments). Reflecting our discussions with Ministry of Education officials, an ideal measure would:

- be based on the student’s home circumstances (rather than the area or the neighbourhood they are from);
- Not define high socio-economic status in its ‘negative sense’ (i.e. not defined as having a low probability of being in deprivation);
- be child centric and be used uniformly in research on children across the public sector, and
- be able to be transformed into measures of the distribution or variation of socio-economic status within a school or early childhood service.

1. Introduction

1.1 The context of this report

The Ministry of Education is considering changing the way it funds schools and early childhood services to overcome the “barriers to learning” students from socio-economic disadvantaged backgrounds face.⁴ In short, instead of the current school decile-based measure or the early childhood service equity index determining the level of funding associated with socio-economic disadvantage, the level of funding will be determined on the basis of the number of children deemed at significant risk of not achieving.

As a consequence of the shift to the new funding formula for the level of funding associated with socio-economic disadvantage, the Ministry of Education is investigating the possibility of phasing out the use of the current school decile-based measure (hereafter “the decile”) and the early childhood services equity index (hereafter “the equity index”) for the purposes of research and analysis.

The current school decile system is constructed from mesh block level five socio-economic variables from the New Zealand Census:

- Percentage of households with income in the lowest 20% nationally.
- Percentage of employed parents in the lowest skill level occupational groups.
- Household crowding.
- Percentage of parents with no educational qualifications.

⁴ When we talk of early childhood services include Ngā Kohanga Reo.

- Percentage of parents receiving income support benefits.

The five indicators are weighted by the number of students from each mesh block for a given school. Schools are then ranked in relation to every other school for each of the five indicators, giving them a score based on their percentile. The five percentile scores are added together (without any weightings) to get a total. This total gives the overall standing of the school in relation to all other schools in the country. Schools are then divided into ten groups called deciles.

The early childhood service equity index (EQI) is constructed from the same Census indicators noted above. Similar to decile, each early childhood service is allocated a score from 1 to 10 on a relative scale; the lower the EQI indicator the higher degree of socio-economic disadvantage and therefore the more Equity Funding the service receives. Services that have an EQI of 5 or above are not eligible to receive Equity Funding.⁵

1.2 The purpose of this report

1.2.1 The purpose

This paper considers the options for replacing the decile and equity indices for the purposes of research and analysis.⁶ Options for replacing decile and equity

⁵ Based on personal correspondence with a Ministry of Education official.

⁶ We would like to thank Jo Prince for assistance with the literature review and David Moore, Gary Blick and Ministry of Education officials for comments on an earlier draft.

indices for the purposes of *funding* are outside the scope of this paper; replacing the indices for funding purposes has its own process.

The Ministry of Education defines school decile as “a measure of the socio-economic position of a school’s student community relative to other schools throughout the country”.⁷ Therefore our commission is to find alternative measures of school and early childhood service socio-economic position.

Note we use socio-economic position and socio-economic status interchangeably throughout this paper. We treat socio-economic status and position as one-and-the-same given ABS (2011) defines socio-economic status as referring:

“to the social and economic position of a given individual, or group of individuals, within the larger society. Socio-economic status is usually, but not always, conceived of as a relative concept and can be measured for the individual, family, household or community/area” (pg. 1).

To us, at least for our purpose, they represent equivalent concepts.

1.2.2 Our criteria

At a minimum our measure must meet three criteria. The measure must:

- have a high probability of addressing known issues associated with the current decile index;
- be practical to develop/implement in terms of time/cost; and
- be conceptually sound as measure of socio-economic status in its likely applications in educational research and analysis.

One aspect of conceptual soundness we consider particularly important is variable selection. ABS (2011) note socio-economic status “is generally unobserved and

⁷ <https://www.education.govt.nz/school/running-a-school/resourcing/operational-funding/school-decile-ratings/>

hence proxy measures are required”. Therefore careful thought and consideration needs to go into what those proxy variables are and what the pros and cons of including and excluding certain variables are.

Under our first criteria where we note a new measure must address known issues with the current measure we have two specifically in mind. These issues are the confusion of the current decile index as 1) a measure of school quality and 2) a measure of the socio-economic circumstances of an individual student.

On the second issue, care needs to be taken in the interpretation of school level socio-economic measures when doing student level analysis. ABS(2011) note:

“Judgements about individuals based solely on the area in which they live have a high potential for error in the conclusions, due to this variation in the characteristics of the individuals.” (pg. 11).

To illustrate how problematic the issue can be, consider the following study. Hanley and Morgan (2008) compared income deciles from both area-based Census data and Canada Revenue Agency validated household-level data and found 37% of households classified by area-based measures to be within one decile of the classification based on household-level incomes. Further in some illustrative analysis they show the coefficient size on the two income measures can differ significantly leading to different conclusions about the magnitude of the effect of socio-economic status.⁸ Such a result in the health literature would be expected to hold in the education literature. An educational researcher we spoke to indicated that from an ‘ecological’ point of view the student’s individual or

⁸ The authors examine the distribution of total prescription drug expenditures by income deciles stratified by senior and non-senior households, first using Census-based neighbourhood income measure and then using the household based income measure. The authors note: “Total prescription drug expenditures appear more equally distributed when we rank households by neighbourhood income than by household-level income, suggesting that neighbourhood level income masks variation in the underlying household-level income variable”.

household circumstances are likely to have a larger impact on educational outcomes than the circumstances of the area the child comes from.⁹

1.3 Our approach and a ‘roadmap’

In developing the option set presented in this paper we carried out two stages of research:

- The first was a literature scan of the current use of the decile and equity indices in research and analysis by the Ministry of Education, other government departments and agencies, academic researchers and other non-government organisations. This step was designed to establish both the breadth and depth of its use.
- The second step was a set of interviews with those who use the decile and equity indices for research and analysis.

The results of these two research stages are presented in section two of this paper. The third section of this paper details the set of options considered, while section four assesses the option set against our criteria and considers other pros and cons. Section five concludes.

⁹ The relative effect on achievement of individual vs neighbourhood socio-economic conditions is much discussed in the literature. For example the OECD (2010) looking at PISA results reports a one unit increase in student level socio-economic status (SES) increases the student’s SES score by 36 points, while a one unit increase in school level SES increases the school’s SES score by 61 points (see pg. 186). Marks (2015) disagrees with this conclusion and shows (using a different longitudinal dataset) that if cognitive ability or prior achievement are taken into account that the effect of school level SES disappears.

2. Literature review and interviews

We set out the approach and results of our review of literature and subsequent interviews in this section.

2.1 The literature scan

We split the literature into two categories for the purposes of our scan.

- The first category could be broadly categorised as the grey literature (and henceforth we will refer to it as such) and is largely but not exclusively produced by government departments. The grey literature includes annual reports and other reporting documents and datasets, as well as research and technical reports (including working papers) and evaluations.
- The second category of the literature scan is the academic literature.¹⁰ We will now discuss each category of literature in turn.

2.1.1 The grey literature

For the purposes of searching the grey literature (mainly via Google) for instances of the use of decile and equity indices, we defined research and analysis to be instances where there was a systematic examination and evaluation of data or information. Generally under this definition we excluded documents outlining policy proposals.

From our scan of the grey literature it is clear the use of the decile index in research and analysis is extensive. Indeed owing to volume of the literature the

¹⁰ We conducted a systematised academic literature search of a range of relevant databases, including (but not limited to): Index New Zealand, Ebsco Business Source Premier, ABI Inform Global, Academic Search Elite, Google Scholar.

search was not exhaustive. To us, the use of the decile index can be characterised four ways:

- As a way to tabulate indicators for reporting/analysis purposes, for example reporting the percent of school leavers with NCEA level one or above by school decile. Decile is often one of several alternative economic or demographic variables used for this purpose. Others include gender, ethnic group or locality.
- In surveys to 1) tabulate and present the results of surveys and 2) as a means to ensure the survey sample is representative (i.e. stratify the sample). In particular researchers will often note response rates by school decile to validate the representativeness of the survey.
- In evaluation studies of specific programmes, particularly those relating to programmes aimed at alleviating socio-economic disadvantage, researchers will select case studies from low decile schools.
- In formal statistical models, decile is used as a covariate to either understand the impact of, or control for, socio-economic disadvantage.

The use of the ECE equity index is less prominent with the trend being to make more use of the University of Otago's NZ Deprivation Index.

The broad research themes where the decile index is used in the grey literature can be described (in order of intensity) as follows:

- Education-related.
- Health-related (e.g. nutrition in schools).
- Poverty and social research.
- Income, jobs and employment related.

A more detailed breakdown of how the decile index is used, including extensive examples, is contained in Appendix 2 of this document.

2.1.2 The academic literature

The second literature we searched was the academic literature.¹¹ We conducted a systemised literature search of a range of relevant databases, including (but not limited to):

- INNZ (Index New Zealand)
- Ebsco Business Source Premier
- ABI Inform Global
- Academic Search Elite
- Google Scholar

Sources included both New Zealand and international references. Again owing to volume of the literature the search was not exhaustive.

Broadly we characterise the academic research as being carried out by:

- Education departments, and includes (although is not strictly limited to) studies related to aspects of pedagogy, and achievement and participation by certain subgroups.
- Economics departments, includes studies relating to; the returns on education, labour market outcomes or schools as a unit of organisation/production.
- Other departments in the Arts faculty such as Geography.
- Health sciences, including studies relating to public health, medicine, nutrition, dental, and researchers looking at aspects of mental health and substance abuse.

A catalogue of the academic literature we found is available in Appendix 3 to this document.

¹¹ We acknowledge the work of Jo Prince in carrying out this search for us.

2.2 Interviews

Interviews were conducted with:

- Those who frequently use the decile index and the equity index as part of their work. This section reports themes from those interviews.
- Those who research and think about measures of socio-economic status as part of their work. Information from these interviews informs section 3 on potential options and themes from this interview group are documented in that section.

2.2.1 General themes from those who use the index

Schools will want a measure they can easily access and understand

We heard a strong message that the decile index is used so widely because it is readily available and well-known, although not always correctly understood. Schools will want to be able to both understand and readily access the new measure because it will inform comparator schools to benchmark student results. This benchmarking is used, in some instances, for the basis of marketing.

The change should not be too disruptive

Government organisations we asked reported changing the measure of socio-economic status will not require large changes in their IT systems.¹² Further the sampling for the international studies (e.g. PISA) has already been undertaken (on the basis of school decile) for the next five years, so there is time to incorporate a new measure into the sampling design before the next sampling period..

¹² NZQA, who noted the change will have some implications for their IT system, have already factored this likely change into IT system development plans. They have recently upgraded their system but were cognisant of the system change coming so have put a contingency in the budget for this.

Interviewees identified a set of attributes they deemed desirable

When asked what properties a new measure should have, we heard the desire that:

- the measure is back dated so ‘trend analysis’ can be carried out,
- there are no more than two measures as it may cause confusion or increased workload for Ministry officials,¹³
- the measure be discrete so schools can be allocated into one of several groups like currently happens with the decile system. A continuous score for each school means people will invariably create their own groups and this will be inconsistent.
- There is a clear articulation of which research questions the measure is appropriate to be used and for which research questions the researcher needs to create a bespoke index, and
- a measure of the distribution of socio-economic status within a school is also developed. Under the current system, two schools might have the same decile score, but one might have a much wider range of children in terms of socio-economic status (we will discuss this more in section 2.2.2).

Interviewees also noted a set of concerns

Reflecting on the options for replacing the decile and equity indices, a series of general points were made. These were:

- a concern that the risk index used for funding might be unstable through time,
- a concern that the risk index used for funding may not capture the socio-economic status of students in households where parents are in low-income occupations, and
- many of the possible deprivation or social-economic status indices use data on service use (benefit use for example). Care needs to be taken with

¹³ Particularly as each measure would need a quality assurance process around its production.

equating service use with need. While there is likely to be a correlation, an interviewee noted often those most in need do not access the services they require.

One common issue raised was that of transient students i.e. students that move among several schools within a year. Interviewees made comments from various different points of view:

- There needs to be clarity on the roll used to calculate the index.
- Obtaining any data on transient students is difficult because these students are constantly changing their school and, at times, their home address.
- The percentage of transient students in a school may be a good indicator of school-level socio-economic status as these students tend to come from homes with fewer financial resources and from homes where the parent(s) do not actively engage with their child’s education.

Regarding the comments on the risk index, it is important to note the Ministry of Education has 1) done work on some of the issues noted above, but has not made this publically available and 2) disputes the veracity of some these claims. A Ministry of Education reviewer of an earlier version of this paper noted:

The comments on the risk index ... reflect a general misunderstanding of the index and how it works rather than actual problems that might prevent its wider use or adaptation.

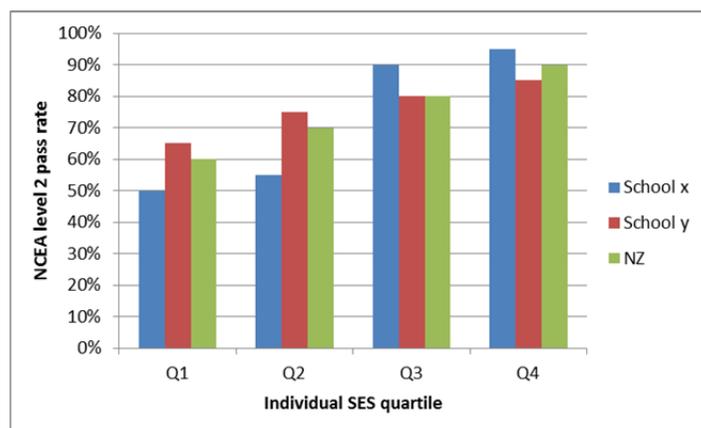
That interviewees had these misunderstandings is not that surprising given we have not to date widely publicised or engaged with the sector or other interested parties on the index and how it will work in any detail.

Like the interviewees, we are not privy to all the work which has gone on within the Ministry we are reluctant to comment further. Hence we make a note of the two points of view (the interviewees’ and the Ministry’s) ‘for the record’.

2.2.2 Intra-school distribution

Several interviewees identified having a measure which describes the distribution of student socio-economic status within a school as being desirable. Figure 1 illustrates this issue by considering the position of two fictional schools.

Figure 1 Fictional pass rates by student risk groupings



Source: Sapere calculations

The NCEA pass rate for students at each fictional school is disaggregated by socio-economic quintile.¹⁴ Both schools might have the same overall NCEA pass rate and the same summary measure of socio-economic status (i.e. both might be decile five under the existing measure). However school *y* is better at getting its students from low socio-economic backgrounds to pass (relative to its national comparators) but underperforms nationally for high socio-economic students. The opposite is true for school *x*. Interviewees we spoke with indicated this additional information would help them undertake richer analysis, but also would hold schools to account around how they are helping children right across the socio-economic spectrum.

¹⁴ Q1 means the children who are in the bottom 25 per cent in terms of socio-economic status nationally (however defined), Q2 means the children who are in the bottom 26 to 50 per cent of socio-economic status nationally etc.

3. Options

The options considered here are grouped into two categories: aggregated student-based measures and area-based measures. Aggregated student-based measures are some aggregation of a measure of the individual characteristics of the student (or their household), for example the mean (average) or the sum of each student's 'the risk index' calculated for funding purposes within a school or early childhood service. Area-based measures reflect the area the student comes from rather than the individual characteristics of the student.

3.1 Aggregated student-based measures

There are five measures we consider in the 'aggregated student-based' category.¹⁵

3.1.1 A univariate indicator such as free school lunch

The simplest approach would be to use a measure of socio-economic status that is based on a single variable. One example could be the eligibility of a student's household for Working for Families. In the UK¹⁶ it is common to talk about disadvantage by talking about whether a student qualifies for a free school lunch

¹⁵ We also looked at Superu's multiple disadvantage indicator (see Superu, 2017). However this is based on data from Statistics New Zealand's General Social Survey, which samples around 12,000 respondents. While Statistics New Zealand will seek to ensure a representative sample in terms of economic circumstances, demographics and locality, this 'representativeness' will be achieved at a higher level than we require given the survey's sample size. Therefore using the survey as a basis to make inference about the socio-economic status of an individual school or early childhood service will require much imputation.

¹⁶ We thank an interviewee for pointing this example out to us.

and therefore a school's socio-economic status can be described by the percentage of students receiving a free school lunch.

In the UK, the eligibility for a free school lunch depends on if the parent receives selected income support, allowances or tax credits. In a way the free lunch eligibility is really a proximate measure of socio-economic status, with the actual measures being eligibility for income support. This means the free lunch measure is quite a multi-dimensional measure of socio-economic status,¹⁷ but all the information is distilled down into one indicator.

As noted one candidate measure available in New Zealand would be the percentage of children in the school or early childhood service whose parents' access Working for Families as it is available regardless of the source of income.^{18,19} There are two main concerns with this as a measure: one, it defines socio-economic status solely in terms of income and as we argue elsewhere in the paper such a definition is too narrow (see section 3.1.5) and, two, it is a very binary measure meaning heterogeneous schools and early childhood services may not be able to be sufficiently differentiated (two schools might have no students whose parents are eligible for working for families but one school's students come from families with moderate incomes, while the other school's students come from families with high incomes).

¹⁷ In that it measures various types of low socio-economic status: low income owing to benefit use, low labour income (captured via tax credits).

¹⁸ The family tax credit part at least. <https://www.workingforfamilies.govt.nz/tax-credits/payment-table.html>

¹⁹ Other candidate measures, the percentage of children whose parents are on benefit for example, might miss important segments of the population (this misses families where the parents work but are on low wages).

3.1.2 The PISA index of economic, social and cultural status

Indices based on surveys involve the student taking a survey about their home life (or the parents themselves taking the survey) and then the results being aggregated by school or early childhood service. In its simplest form the index could be based on one or two questions. Candidate questions are for example: ‘How many books are at home?’ What is your mother’s qualification?²⁰

A better possibility is (perhaps) to adopt the survey-based indicator used by the Programme for International Student Assessment (PISA). This index is called the *PISA index of economic, social and cultural status*. This index is created on the basis of the following surveyed variables: the highest occupation of either parent (which is then mapped to an index of occupation status); the highest level of education of the student’s parents (then converted into years of schooling); family wealth; home educational resources; and possessions related to “classical” culture in the family home.²¹ The OECD²² say socio-economic advantaged children and socio-economic disadvantaged children are respectively the top and bottom 25 per cent of students according to the PISA index in the country.

There is merit in having a socio-economic status indicator that is internationally comparable and has an established method for its calculation. The downside is the imposition on schools to get the survey completed (for schools and students that aren’t part of the PISA sample) and there will be a cost to the Ministry of Education of administering the survey. Given collecting the data is solely for the

²⁰ Evans *et al.* (2014) find a strong correlation, across 42 countries, between the number of books in the house and student Programme for International Student Assessment (PISA) scores.

²¹ More information is available here: https://www.oecd.org/pisa/pisaproducts/PISA%202012%20Technical%20Report_Chapter%2016.pdf; in particular pg.351 and pg. 352. The weights for each variable in the index are derived from principal components analysis.

²² PISA 2012 results: Ready to learn, see chapter 7, figure 7.5 for example.

purposes of research and analysis rather than the basis of a funding formula, the cost may not outweigh the benefit.

Further, whether or not you use the PISA-based survey or another especially developed survey, there are a number of issues that need to be considered.

- Some parents may not answer the questions due to lack of interest or time, or concerns about privacy.²³
- If administering the survey to children, there are issues around accurate recall (particularly in younger children). Together these issues may result in inaccurate or incomplete responses.
- In administering the survey there is an issue about potential shame, embarrassment or derision. Because although it is unlikely children will see each other’s answers, there may be informal discussion after the survey has been taken.

3.1.3 Adaptation of the funding risk index

A variant of the new risk index for funding schools and early childhood services could be considered, including:

- The mean or the median of the risk score of the school and early childhood service i.e. a measure of central tendency
- The percentage of children in the school or service deemed ‘at risk’ for the purposes of funding

Given the Ministry of Education would be continuously updating and producing this index for funding, this does represent an attractive option in terms of ease and cost. Further, if the percentage of children in the school or service deemed ‘at risk’ for the purposes of funding were adopted as the school or service

²³ Meyer *et al.* (2015) argues the quality from household surveys is in decline and gives a good overview of some of the causes.

summary measure, the extent to which funding is 'leaning against' socio-economic disadvantage could be monitored.²⁴

There are two issues that need to be considered before this option is adopted. The first is the risk index estimates the risk of education underachieving (not passing NCEA level two) given the current level of (decile/ equity index based) disadvantage funding. That is, there is a treatment effect in the data already and thus there is an understatement in the data of the true relationship between socio-economic status and achievement.²⁵ The second issue relates to the weights assigned to each variable in the risk index.

The issue of how the weights are assigned is important and warrants further elaboration. While the set of explanatory variables in the risk model are probably all relevant candidate variables for measuring socio-economic status, the weights (betas) on the variables in the binomial (logistic) regression are assigned to maximise the probability of the model observing the same NCEA level two pass or fail outcomes as we see in the actual data. In formal terms the weights seek to

²⁴ Researchers at the New Zealand Initiative are currently also looking at predicting educational performance using individual student background data. Their purpose is to see which schools under- and over-perform given their students' background. Although tangential to the purpose of this paper, it would be useful for the Ministry to keep in touch with the Initiative's work for two reasons. The first is to see what background characteristics they find as significant predictors of achievement. Two, the WRPI score they are developing is an interesting performance metric based on weighting the student's credits achieved in a given standard by the 'difficulty' of the standard (as measured by the overall pass rate of the standard).

²⁵ Assume that educational achievement is negatively correlated with true socio-economic disadvantage. If (1) the current decile and equity measures do correlate with (to some degree) true socio-economic disadvantage and (2) the additional funding provided via the disadvantage funding mechanism does improve educational achievement, then the positive relationship we observe between decile and NCEA level two achievement at a school level would be even stronger in the absence of disadvantage funding. If child's school decile and the socio-economic variables in the risk index are correlated, the measured effects of these socio-economic variables on educational underachievement will be negatively biased compared to the true effects.

maximise the 'likelihood function' of the model.²⁶ Therefore, if the risk index was adopted as a proxy for socio-economic status, a finding of an analytical relationship between achievement and socio-economic status as measured by this metric has a degree of circularity. The measure of socio-economic status is not defined or constructed independently of the outcome variable: achievement.

This issue has a potential solution which may warrant some investigation if the risk index is to be adopted as a measure of socio-economic status for the purposes of research and analysis. Rather than setting the weights on the socio-economic variables in the index with reference to their relative ability to predict achievement, one could use a procedure, such as Principal Component Analysis, (PCA), to create weights based on the common correlations between all variables. Intuitively using (PCA) would reflect the idea that many of the variables in the risk model are likely to be correlated (income and benefit use for example) and while any one variable might not be an adequate measure of the true, unobserved, socio-economic status, a (constructed) variable reflecting these shared correlations could be.²⁷ This procedure is used, as we shall see later, in the construction of both the New Zealand Deprivation Index and (parts of) the Index of Multiple Deprivation. The important point is weights are not selected with reference to predict any particular outcome.

3.1.4 The Ministry of Children's well-being index

We are aware that the Oranga Tamariki/Ministry of Children is developing a child well-being index that makes use of data held in the Integrated Data Infrastructure (IDI). We understand this index can be aggregated up to a school or early childhood service level and that some work has been done on this (for schools at least). The index has various domains: safety, financial security

²⁶ Further when choosing between model specifications with different combinations of variables, researchers will be seeking to maximise one or more goodness of fit metrics (such as the 'area under the curve').

²⁷ As the variables in the risk index are a mix of continuous and categorical variables it would not be as straight forward as applying principal components. In the software R there are packages written to deal with these mixed data types

(resources/housing), physical wellness, developmental and stability (see Table 1). The stability domain is still under development. The advantage of this index, from an education research perspective, is that it is built on information that is child specific.

Table 1 Domains of the Well-being Index

Domain	Types of indicators
Development	Alternative education, special education, suspensions, stand downs, truancy, school changes, and youth justice activity
Wellness	Immunisations, non-accidental emergency department visits, hospital visits, mental health and substance abuse treatments, parental chronic conditions, maternal smoking during pregnancy
Safety	Family group conferences, MSD investigations, MSD placements, family violence, accidental emergency department visits, injury related hospitalisations, mental health of parents and siblings, parents in prison, sibling youth justice
Security	Social housing register, number of siblings, days on benefit (in own right), proportion of life supported by caregiver on benefit, number of recent address changes

Source: Oranga Tamariki /Ministry of Children

For each domain, with the exception of security, the child is scored either ‘0’ or ‘1’ (presumably reflecting no need and need respectively). Security can take three values (‘0’ - no indication of need, ‘1’ - some indication of need, ‘2’ - more serious need indication).

Examining the indicators under each domain in Table 1, the measure clearly focuses on detriment. This means high socio-economic status is defined in its negative sense (i.e. being highly unlikely to be in detrimental circumstances). The categorical nature of the domain scores and the fact the measure focuses on detrimental events means between 54 and 67 per cent of children²⁸ of a given age have an value ‘0_0_0_0’ i.e. the highest ‘well-being’. This means the indicator cannot differentiate a large proportion of the population. This is not a criticism of the index. It is designed to measure well-being and for that purpose the lack of differentiation of a large part of the population may be acceptable. The fault may be ours in attempting to use it as a measure of socio-economic status.

There are no methods currently available for aggregation of the various ‘domains’ into one overall measure. The researcher is therefore unsure if a score of ‘1’ on different domains is equivalent in terms of its overall contribution to (reduced) ‘well-being’. For example does a value of ‘1_0_0_0’ and ‘0_1_0_0’ indicate a similar reduction in well-being (relative to an indicator score of ‘0_0_0_0’)? The measure is relatively new and this issue may be resolved in due course, particularly if high scores on some domains are found to be more strongly predictive of other adverse outcomes not used in the construction of the index.

3.1.5 The New Zealand Socio-economic Index

The New Zealand Socio-economic Index (NZSEI) is an occupation-based measure of socio-economic status (SES) derived using Census data (see Davis *et al.* 1997, Milne *et al.*, 2013). The NZSEI is in the spirit of the Elley-Irving scale (Elley and Irving, 1976) and prefaced on the idea “that differences in occupation are likely to represent differences in life chances and opportunity, and on this basis occupation can be used to stratify individuals according to socio-economic status”.²⁹

²⁸ Children are defined as being aged between 5 and 16. To calculate the percentage range quoted we looked at the percent of children with a ‘0_0_0_0’ value for each age.

²⁹ This text draws heavily from Milne *et al.* (2013)

The NZSEI attempts to derive an occupation-based measure of SES for New Zealand that can be used both as a continuous or group measure. The version calculated on the Census 2013 is called NZSEI-13. According to the Statistics NZ website, there are NZSEI-13 socio-economic scores (ranging from 10–90) and NZSEI-13 socio-economic groups (either a six-group classification; NZSEI-13 quartiles; or NZSEI-13 deciles).³⁰

The index is constructed using data for both full- and part-time workers, with income adjustments for those in part-time work. Those currently unemployed can be assigned an ‘imputed’ NZSEI-13 score; Fahy *et al.* (2017) describes options for doing this. As an aggregated individual based measure of school socio-economic status, the child would need to be linked to the parents’ NZSEI-13 score (in the IDI most probably), then the average score for each school and service calculated, then deciles or quintiles calculated.

The parent-child linking will be reasonably time consuming although it is already happening for the risk index. Further it appears the NZSEI-13 index is currently not available in the IDI and would need to be created³¹

Another option would be to create an area-based version of the index. This could be done by calculating the average NZSEI-13 score for each mesh block, aggregating these scores up by school or early childhood service based on the number of children in each mesh block that are at the school or early childhood service and then splitting schools and services into deciles or quintiles. For reasons we will discuss in section 3.2.3, such an area-based construct would not be preferred over a construct based on individual data.

In contrast to most of the options we outline here (and the current decile index and equity index), the NZSEI does not focus primarily on measures of low socio-economic status and therefore high socio-economic status is not defined in its negative sense (i.e. being highly unlikely to be deprived). The issue with indices

³⁰ <http://www.stats.govt.nz/methods/research-papers/nz-socio-economic-index-2013.aspx>

³¹ This is based on the Fahy *et al.* (2017) having no ‘IDI disclaimer’ on the front of the paper. However the paper does note they plan, as part of further research, to use the IDI to validate some of their findings.

focusing on measures of low socio-economic status is the index is good at identifying (and correctly ranking) people or communities with low-to-medium socio-economic status but contains little or no information to rank people or communities *within* the group identified as high socio-economic status. By containing information on occupation for the whole population, NZSEI will be better at correctly identifying the ‘true’ socio-economic status rank for with a medium or high level of socio-economic status relative to other indices.

NZSEI focuses solely on occupation. Occupation status is determined by income and education in the NZSEI framework and as such the measure is strong in terms of thinking about socio-economic status in terms of ‘available resources’. It is weaker in terms of measuring social conditions experienced e.g. two families could have the same occupational status but one could provide a safe, stable environment for children, the other one not.³²

3.2 Area-based measures

Within the domain of ‘area’ based measures (measures that reflect the area the student comes from rather than the individual characteristics of the student), there are two options we consider: The New Zealand Deprivation Index and the New Zealand Index of Multiple Deprivation.

3.2.1 New Zealand Index of Deprivation

The New Zealand Index of Deprivation has been calculated for five Censuses – 1991, 1996, 2001, 2006, 2013 – with various modifications through time.³⁴

³² The developers of the NZSEI acknowledge the issue of the index not measuring social conditions (see Milne *et al.*, 2012). We like their comment that when looking at socio-economic status (SES) measures, it is “not the case that one ‘best’ captures SES; each might be seen as complementary to others:”

³⁴ Salmond *et al.* (2012) offers a good summary of the early development of, and changes to, the original index.

The New Zealand Index of Deprivation based on the 2013 Census, hereafter NZDep2013, is calculated using the nine variables from the Census reported in Table 2 reflecting eight dimensions of deprivation. The variables are constructed for ‘small areas’ – one or two mesh blocks.³⁵ These variables are then transformed, using Principal Components Analysis,³⁶ into both an ordinal scale and a continuous score (see Atkinson *et al.*, 2014) for the small area. The ordinal score has a scale of one to ten with one being the least deprived; ten, the most.

The New Zealand Index of Deprivation, in its various versions, has been used extensively. Perhaps its best known use is to allocate population-based health funding on the basis of relative need, however Salmond and Crampton (2012) illustrate its breadth of use by saying it is used when “town planners around the country consider the broad local deprivation landscape in their planning strategy...[and] as a tool for advocacy related to issues as diverse as gambling venues and fast food outlets” (pg. s9).

The major advantage of the New Zealand Index of Deprivation it is well-known and widely used. This means less education would be required about what it is (and what it is not i.e. a measure of school quality).

Table 2 Variables in the NZDep2013 index

Dimension of deprivation	Variable (in decreasing order of weight)
Communication	People aged <65 with no internet at home
Income	People aged 18-64 receiving a means test benefit
Income	People living in equivalised households with income below an income threshold
Employment	People aged 18-64 unemployed
Qualification	People aged 18-64 without any qualification
Owned home	People not living in own home
Support	People aged <65 living in a single parent family

³⁵ Where there are fewer than 100 people in a mesh block they are combined.

³⁶ Principal Components Analysis (PCA), in very simple terms, is a technique for finding the common patterns between sets of observed variables. PCA constructs various principal components using the observed variables, the first principal component explains the largest amount of the variation in the observed variables, the second principal component explains the second largest amount of the variation in the observed variables etc. By construction each principal component constructed is uncorrelated with the others. The NZDep13 score (both in its continuous and ordinal forms) is based on the first principal component of the variables in Table 2.

Dimension of deprivation	Variable (in decreasing order of weight)
Living space	People living in equivalised households below a bedroom occupancy threshold [the bedroom occupancy threshold is assessed using the Canadian Occupancy Standard; ³⁷ the occupancy threshold is sensitive to both household size and composition].
Transport	People with no access to a car

Source: Atkinson *et al.* (2014). index is

3.2.2 The New Zealand Index of Multiple Deprivation

A new measure of socio-economic deprivation is the New Zealand Index of Multiple Deprivation (NZIMD), developed by Exeter *et al.* (2017).^{38,39} The index consists of seven domains: Employment, Income, Crime, Housing, Health, Education and Access. Each domain is built on a number of variables that are sourced from the IDI. Each overall domain score is made by calculating a

³⁷ See <http://meteor.aihw.gov.au/content/index.phtml/itemId/386254> for more information on the Canadian Occupancy Standard.

³⁸ The interested reader is also referred to this website: <https://www.fmhs.auckland.ac.nz/en/soph/about/our-departments/epidemiology-and-biostatistics/research/hgd/research-themes/imd.html>

³⁹ Exeter *et al.* (2017) report the first indices of multiple deprivation were developed in the UK. The NZIMD is conceptually similar to the 2000 UK edition. <http://webarchive.nationalarchives.gov.uk/20100407204456/http://www.communities.gov.uk/archived/general-content/communities/indicesofdeprivation/indicesofdeprivation/>

weighted average of these domain variables.⁴⁰ For example the Employment domain score is a weighted average of the percentage of people receiving the unemployment benefit and the sickness benefit (see Figure 2 overleaf). The index is calculated by ‘Data Zone’. In describing the construction of their Data Zones the authors say:

*“We used 45,921 MBs [Mesh blocks] to construct the 5,958 DZs [Data Zones] using six criteria commonly associated with geographic zone design for health and social research (geographic contiguity, population equality, respecting administrative boundaries, respecting physical barriers, internal socio-economic homogeneity and compactness). With the exception of one ‘small’ DZ, representing all of Stewart Island (total population of 384) and 10 ‘large’ DZs with populations between 1,381 and 1,899 (mostly comprising a single MB [meshblock]) the population of the DZs ranged from 501 to 999” (Exeter *et al.*, 2017; pg. 4)*

The NZIMD is also available in a ‘minus one’ form. That is, in addition to the complete index with all seven domains being available, there are seven versions of the index with one domain removed. Using the NZIMD with the Education domain removed, may be advisable in many instances to avoid circularity (i.e. endogeneity) with the education outcome being measured.

We noted earlier socio-economic status “is generally unobserved and hence proxy measures are required”. The NZIMD has a major advantage if you accept that socio-economic status is an unobserved variable that needs to be inferred. By having a range of domains (and variables), each with slightly different information content, means ‘estimates’ of the unobserved variable are more likely to be more accurate.⁴¹

⁴⁰ Either through a traditional weighted average approach or through Factor Analysis.

⁴¹ This comment is motivated by drawing an analogy to the forecasting literature where the general conclusion is that forecasts averaged over many models generally outperform one particular model (see Bates and Granger, 1969).

3.2.3 A comment on area-based measures

Two interviewees noted the presence of school selection bias within area units. Two students from the same area might go to different schools, but the high achieving children go to different schools (with perceived higher quality) than the low achieving students (who go to schools with perceived lower quality). If individual student achievement is correlated with individual student socio-economic status then area based measures understate the socio-economic status of children going to the (perceived) higher quality school and overstate the socio-economic status of the children going to the (perceived) lower quality school. This composition effect could distort analysis and lead to erroneous conclusions about the nature of the relationship between the indicator under study (achievement, participation etc) and socio-economic status.

3.3 A bespoke Ministry of Education measure

One option is for the Ministry of Education to use Census or administrative data to construct a measure of socio-economic status, essentially an alternative – and improved – school decile index or equity index by another name. The measure could be either student- or area-based; although given our comments on area-based measures (see section 3.2.3) a student-based index will be preferred, all else equal. Developing the bespoke index could be an endeavour undertaken solely by the Ministry of Education or in conjunction with other agencies who have expertise or interest.

A bespoke measure developed by the Ministry of Education could (potentially) have all the features we identified as desirable in sections 3.1 and 3.2 when discussing the available options (student-based, child-centric, considers socio-economic status from many different angles), whilst not having the drawbacks we noted.

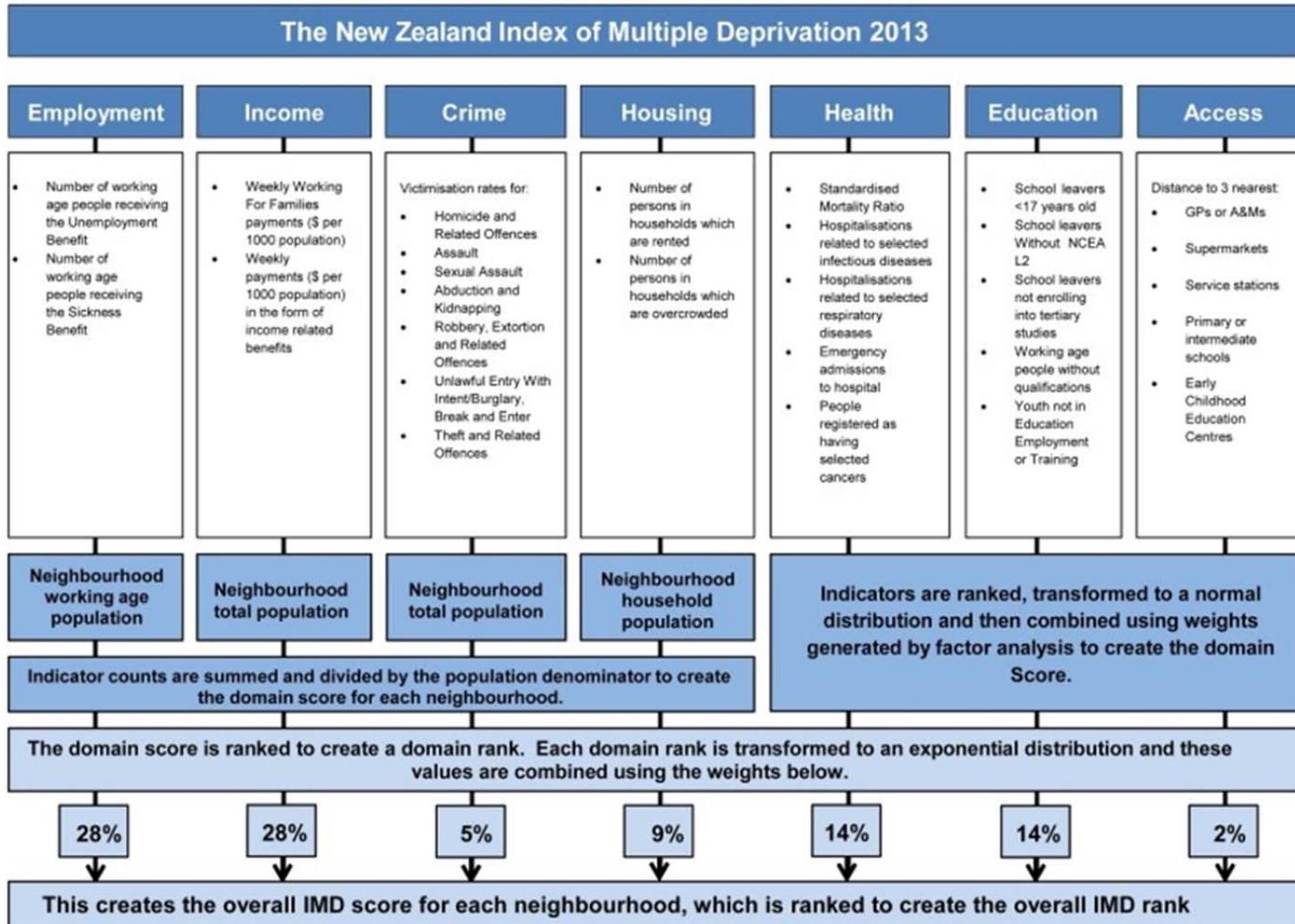
However there are still two issues to be considered with this approach. The first being that it would represent significant cost (in terms of departmental time) to develop (even if in conjunction with other agencies). Secondly, potentially in the absence of a well-delivered communications strategy, the measure could suffer

from one of the problems with the current decile index: being confused with a measure of quality.^{42,43}

⁴² Note we think this issue is restricted to the school decile and is not an issue with the equity index.

⁴³ This is not to say the other options discussed in this report can completely avoid this risk. However the mitigating factors are that their genesis (with the exception of the risk index) is from a source outside the Ministry of Education and this can be pointed to, while noting they are intended to measure socio-economic deprivation among students.

Figure 2 The New Zealand Index of Multiple Deprivation 2013



Source: Exeter *et al.* (2017)

4. Options analysis and recommendations

4.1 Weighing the pros and cons of each option

In section 3 we outlined the options. The table below summarises our assessment of each of our options against our three criteria. As a reminder these criteria are: (1) the measure has a high probability of addressing known issues associated with current school decile index, in particular its confused/ incorrect use as a measure of school quality and its erroneous use as a measure of the socio-economic circumstances of an individual student within a school; (2) the measure is practical to develop/implement in terms of time/cost⁴⁴; (3) the measure is conceptually sound as measure of socio-economic status in the context of its likely applications in educational research and analysis.

The table also discusses other pros and cons, and initial thoughts on how a distributional measure could be constructed from the index/indicator. We restrict our comments in the table below regarding Criteria one to assessing the probability the option will be incorrectly used as a measure of school quality. We have no information to make sensible comment about how the options might differ in mitigating the erroneous use of school and service level socio-economic measures as measure of the socio-economic circumstances of an individual student within a school. It is our opinion that (without relevant guidance) each measure has the potential to be used erroneously in this way.

⁴⁴ Assume cost includes opportunity cost – the other activities crowded out.

Table 3 Assessment of alternative measures against criteria

	Criteria one: Addresses known issues with current decile index (confused use as a measure of school quality)	Criteria two: Practical to develop/implement in terms of time/cost	Criteria three: Conceptual soundness	Other pros and cons	Ability to be transformed into a distributional measure
<i>Aggregated student measures</i>					
A univariate indicator	Low risk of incorrect use as a measure of school quality. Relative to indices made from combining multiple variables (such as the current decile index), the index is quite clear what variables the index is constructed from and therefore what the indicator is measuring.	Depends on the measure selected, but all else equal given it involves less variables it may be cheaper and quicker to construct than multivariate indices.	Low. This assessment is based on the premise that socio-economic status is unobserved with multiple facets therefore, all else equal, more variables are advantageous. If a service-based indicator (i.e. measured by parents or student accessing a particular service), the measure could miss families who are eligible but don't access the service.		No immediately obvious way

	Criteria one: Addresses known issues with current decile index (confused use as a measure of school quality)	Criteria two: Practical to develop/implement in terms of time/cost	Criteria three: Conceptual soundness	Other pros and cons	Ability to be transformed into a distributional measure
The PISA index of economic, social and cultural status	Low risk of incorrect use as a measure of school quality. The name is very clear on what it measures and the Ministry of Education can point to its use internationally to empathise what its purpose is.	High administrative cost to the Ministry to implement and process etc. The time schools and early childhood services spend administering the survey is time taken from other activities.		Pro: Allow internationally comparable analysis of educational outcomes. Con: Potential problems with accuracy of answers and non-response (particularly when compared to indices derived from administrative data sources).	The OECD ⁴⁵ classify socio-economic advantaged children and socio-economic disadvantaged children as the top and bottom 25 per cent of students according to the PISA index in the country respectively.

⁴⁵ PISA 2012 results: Ready to learn, see chapter 7, figure 7.5 for example.

	Criteria one: Addresses known issues with current decile index (confused use as a measure of school quality)	Criteria two: Practical to develop/implement in terms of time/cost	Criteria three: Conceptual soundness	Other pros and cons	Ability to be transformed into a distributional measure
An adaptation of the 'risk index'	Unknown. As a Ministry of Education created index there is this risk given the experience with the current decile index. However a well-developed communications plan may be able to mitigate the risk.	Low cost. The Ministry is already producing the underlying data for funding proposes.	<p>Pro: Based on a range of variables from administrative sources (less prone to measurement error).</p> <p>Con: Not an independent measure of socio-economic status (variables weighted in the measure based on their ability to predict NCEA level two achievement).</p>	Con: Challenging for non-specialists to understand how it is constructed (i.e. based on 'risk scores' from predictive limited dependent models).	For a given school, the percentage of children in each population risk quartile could be reported.

	Criteria one: Addresses known issues with current decile index (confused use as a measure of school quality)	Criteria two: Practical to develop/implement in terms of time/cost	Criteria three: Conceptual soundness	Other pros and cons	Ability to be transformed into a distributional measure
The Oranga Tamarika/Ministry of Children's well-being index	Low risk of incorrect use as a measure of school quality given it is produced by another agency.	Low cost given the underlying data is produced by another agency.	<p>Pro: Based on a range of variables from administrative sources and is child centric.</p> <p>Cons: The measure clearly focuses on detriment. This means high socio-economic status is defined in its negative sense. Further the categorical nature of the domain scores and the fact the measure focuses on detrimental events means the indicator cannot differentiate a large proportion of the population.</p> <p>Currently there is no method for aggregation of the various 'domains' into one overall measure.</p>		Potentially. The percent of students in each school/ early childhood service with scores of '0_0_0_0' and '1_1_2_1' (lowest and highest well-being scores respectively)

	Criteria one: Addresses known issues with current decile index (confused use as a measure of school quality)	Criteria two: Practical to develop/implement in terms of time/cost	Criteria three: Conceptual soundness	Other pros and cons	Ability to be transformed into a distributional measure
<i>Individual or area based measure</i>					
New Zealand Socio-economic Index	Low risk of incorrect use as a measure of school quality. Comes from an “independent source”. But less well known than New Zealand Index of Deprivation.	Individual version: Moderate cost to link parents and children (and potentially to construct the index from first principals in the IDI). Area version: Moderate cost to derive area based measure and then aggregate up to school level.	Pros: Has its genesis in the Elley-Irving scale which has a long history as a measure of socio-economic status in New Zealand education research. Significant research has gone into development, refinement and validation of the measure. Better, relative to other measures, at ranking the socio-economic status of those in the high socio-economic status group. Con: Its sole reliance on occupational status as a measure of socio-economic status may be seen as a weakness by some.		Individual version: As it's an index it could be divided up into quartiles at a population level and the percentage of children at a school in each quartile reported. Area version: Proportion of children who come from mesh blocks with scores in the bottom 25 per cent and the top 25 per cent could be reported.

	Criteria one: Addresses known issues with current decile index (confused use as a measure of school quality)	Criteria two: Practical to develop/implement in terms of time/cost	Criteria three: Conceptual soundness	Other pros and cons	Ability to be transformed into a distributional measure
A bespoke Ministry of Education created measure	Unknown. as a Ministry of Education created index there is this risk given the experience with the current decile index. However a well-developed communications plan may be able to mitigate the risk.	There will be significant development cost in terms of time in creating and validating the index.	Hard to judge as the index has not been created but there is the potential the index could be very conceptually sound for its application in the education sector given it is being created for this purpose.		
<i>Area based measures</i>					
New Zealand Index of Deprivation	Low risk of incorrect use as a measure of school quality as it is well-known and understood as a measure of deprivation.	Low cost given the underlying data is produced by other researchers. The Ministry of Education will only need to do the aggregation to school and service level.	<p>Pro: Significant research has gone into development, validation and refinement of the measure.</p> <p>Con: Lack of deprivation is not the same as being affluent. A low score on the New Zealand Index of Deprivation, and therefore the Ministry of Education equating this with high socio-economic status defines socio-economic status as distance from being deprived (i.e. it defines high socio-economic status in its negative sense, what it is not).</p>		Small areas could be ranked lowest to highest in terms of chosen socio-economic measures and divided in quartiles. Then, for each school and service, the percentage of students from each quartile could be recorded.

	Criteria one: Addresses known issues with current decile index (confused use as a measure of school quality)	Criteria two: Practical to develop/implement in terms of time/cost	Criteria three: Conceptual soundness	Other pros and cons	Ability to be transformed into a distributional measure
New Zealand Index of Multiple Deprivation	Less well known (but this may change) than the New Zealand Index of Deprivation.	Low cost given the underlying data is produced by other researchers. The Ministry of Education will only need to do the aggregation to school and service level.	<p>Pros: Relative to other measures more variables are used to infer deprivation, which fits more closely with thinking that socio-economic status has many variables.</p> <p>Significant research has gone into development and refinement of the measure.</p>	<p>Cons: Same comment applies as was made when discussing New Zealand Index of Deprivation regarding low probability of being in deprivation is not necessarily the same as high socio-economic status.</p> <p>Less well known than the New Zealand Index of Deprivation as being affluent.</p>	Data zones could be ranked lowest to highest in terms of chosen socio-economic measures and divided in quartiles. Then, for each school and service, the percentage of students from each quartile could be recorded.

Source: Sapere

5. Conclusions and Recommendations

5.1 Conclusions

This paper surveys a set of options to use as a measure of socio-economic status in educational research and analysis. The overarching finding of the paper is that no sole option is ideally suited to the task and adopting any single measure would have both positive and negative aspects. A broad summary is that:

- A survey-based measure, and any new measure developed by the Ministry of Education, would have significant development/running cost for the Ministry.
- Area based measures (the New Zealand Index of Deprivation and the Index of Multiple Deprivation) will suffer from ‘selection bias’ meaning the socio-economic status of schools from localities where there is choice will be mismeasured.
- Area-based measures suffer from the ‘ecological fallacy’ – a situation where a student’s socio-economic status is incorrectly equated with either the socio-economic status of the locality they come from.
- Reflecting its construction, the current risk index cannot always be thought of as a sufficiently independent measure of socio-economic status.
- All measures (all except NZSEI, the PISA survey and potentially a Ministry of Education developed measure) define high socio-economic status in the negative sense (unlikely to be deprived or in conditions deemed detrimental to well-being).
- Some measures are well-known and have been extensively researched and validated (the New Zealand Index of Deprivation for example), others less so. Our conjecture is well-known measures are less likely to be confused for a measure of school quality.

- Some measures, correctly in our view, consider socio-economic status using a range of dimensions (this is a particular strength of the Index of Multiple Deprivation).

An earlier draft on this paper was presented to Ministry of Education officials to discuss which measure could be adopted. Discussions with Ministry of Education officials on the paper revealed that people place different weights on the importance of the various issues and this leads them to different preferred options. Subjectivity is to be expected, given peoples’ experiences and job descriptions will bring different perspectives.

The discussions with officials were constructive. Emerging from these discussions we sensed that, rather than adopting one of the existing options, there was a desire to work with the social sector to develop a credible and robust socio-economic status measure (i.e. a bespoke measure). Ideally this ideal measure would:

- be based on the student’s home circumstances (rather than the area or the neighbourhood they are from),
- not define high socio-economic status in its ‘negative sense’ (i.e. not defined as having a low probability of being in deprivation),
- be child centric and be used uniformly in research on children across the public sector, and
- be able to be transformed into measures of the distribution or variation of socio-economic status within a school or early childhood service.

5.2 Other recommendations

We have a further four recommendations reflecting what we heard in interviews:

- Whatever option is adopted (including a new one if developed), the Ministry of Education provides both an overall summary metric of the socio-economic status and a measure of the distribution of student socio-economic status for school or early childhood service.⁴⁹ Most of the options can be turned into distributional measures, as we described in Table 3.
- The student level data used in the construction of the preferred measure is available to researchers (perhaps in the Integrated Data Infrastructure) so that when a student's socio-economic status is a variable of interest in the analysis, a direct measure is available rather than proxy variables (such as the socio-economic status of the school the student attends) having to be used.
- The point(s) in the year the measure/index will be calculated is agreed and documented. This may be as simple as adopting the current protocol used for school decile and the equity indices.
- The measure of socio-economic status (whatever one is agreed) needs to be clearly labelled as such. For example the 'index of school' Socio-Economic Status'' (and an equivalent name for the measure of early childhood services' socio-economic status). Further when the indices are published on the Ministry of Education's website, links to the ERO website (and other performance measures) should be set next to them, asking the reader to go to these sources for performance measures.

⁴⁹ For some early childhood services and very small schools there may be issues with confidentiality. Perhaps for schools and early childhood services with fewer than 25 students, measures of distribution may not be reported.

6. References

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- Superu, 2017. Patterns of multiple disadvantage across New Zealand families, Social Policy Evaluation and Research Unit, Wellington.

Appendix 1 People we interviewed

The following people were interviewed for this project and we thank them for their time:

- Cathy Wylie, Heleen Visser, Rachel Felgate from the NZ Council for Educational Research
- Hamsa Lilley and Kay Wilson from NZQA
- Martine Udahemuka and Eric Crampton from the NZ Initiative
- Dean Alexander, Charolette Harris-Miller, Megan Moffet and Chris Casey from the Ministry of Education
- Diana Anderson and Nicolas Pole from NZQA
- Emily Mason from the Social Investment Agency
- Gail Pacheco from the Auckland University of Technology
- Rebecca Jesson from the University of Auckland
- Stacey Connor from the Ministry of Health
- Daniel Stoner and Jeffrey Azzato from the Ministry for Social Development
- Craig Davis from Oranga Tamariki /Ministry of Children

Appendix 2 Scan of the grey literature

The summary of where decile⁵⁰ is currently used in research and analysis is organised into four parts. The first and second parts look at its use in research and analysis by the Ministry of Education and government agencies respectively. The third part looks at its use by non-government agencies.

6.1.1 Research and Analysis by the Ministry of Education

It is clear the Ministry makes extensive use of the decile index. Cataloguing a complete list of its previous use around the Ministry does little to help achieve the real aim of this project – to find a replacement – so in Table 4 we give a favour of the type of work done by the Ministry using decile and equity index, without being exhaustive.

Table 4 Summary of Ministry of Education outputs

Type of research and analysis	Topic	Examples
Statistics	ECE	-Annual ECE data summary report 2015 (e.g. Fig. 5.10 of the 2015 report splits equity funding by service type). - <i>Idem.</i> Fig. 1.3 shows ECE prior participation
	Schooling	-Number of schools -Teaching staff -School rolls
	International education	Prevalence of international students by decile
	Special Education (ORS)	Prevalence of ORS students by decile

⁵⁰ The use of the ECE equity index is less prominent with the trend being to make more use of the University of Otago's NZDep score. For example the Ministry of Education reports statistics relating to public expenditure on ECE by New Zealand Index of Deprivation.

Type of research and analysis	Topic	Examples
Indicators		<p><i>Indicator: Education and learning outcomes</i></p> <p>e.g. school leavers with NCEA level one or above; Maori language in education</p> <p><i>Indicator: Student, engagement and participation</i></p> <p>e.g. Early leaving exemptions</p> <p><i>Indicator: Quality education provider</i></p> <p>e.g. Maori representation on the Board of Trustees</p>
Publications	Understanding our TIMSS, PISA and other results international comparator tests	<p>Research Division (2009), A focus on science achievement.</p> <p>Robyn Caygill, Vafa Hanlar, and Sunita Singh TIMSS 2014/15 Mathematics year 9, Comparative Research Unit</p>
	Tertiary	Engler, R. (2010), Academic achievement of first-year bachelors at University.

Type of research and analysis	Topic	Examples
	Best Evidence Synthesis	Alton-Lee, A. (2015), Ka Hikitia Demonstration Report: Effectiveness of Te Kotahitanga Phase 5 2010–12, EDK.
Annual reporting		The Ministry of Education, <i>Annual report 2015-16</i> makes extensive use of indicators by decile.

Source: Sapere

6.1.2 Other government departments

Other departments in education sector (NZQA, ERO, TEC)

The Education Review Office (ERO) made the decision several years ago to scrap decile ratings from its school reports in an effort to “correct the stereotype that a school’s decile equals performance” – a decision supported by the Ministry of Education.⁵¹ Whilst their school reports no longer contain decile many of their publications still contain references to decile. Table 5 gives some examples how the decile index is used by ERO.

⁵¹ As reported at: <http://www.educationreview.co.nz/magazine/april-2016/the-sequel-to-deciles/>

Table 5 ERO: examples

Types of studies	Examples
Case studies	<p><i>Towards equitable outcomes in schools: Good practice</i></p> <p>This report presents examples of good practice in student engagement and achievement. The examples come from a sample of secondary schools, rated decile 5 or below with rolls of 200 students or more, who had better outcomes for students than other similar schools. ERO visited seven of these schools to find out the secret to their success.</p>
Evaluation – as an explanatory variable	<p><i>Food, nutrition and physical activity in New Zealand schools and early learning services: Key findings</i></p> <p>Schools’ decile, location, size, type or the level of childhood overweight or obesity in the community did not have a statistically significant effect on how well they promoted positive attitudes to food, nutrition and physical activity</p>

Types of studies	Examples
Evaluation – understanding sampling bias	<p>Working with schools to promote students’ progress and achievement</p> <p>This report is part of a series published by the Education Review Office, over three years, about the implementation of the National Standards in English-medium schools with students in Years 1 to 8. In 2011, ERO’s focus shifted from evaluating schools’ preparedness to work with the National Standards, to evaluating the extent to which they were working with the standards. Schools were required to include in their charters targets to raise student achievement in relation to the National Standards, and to have reported twice to parents and whānau about their child’s progress and achievement in relation to the standards in 2010.</p> <p>... shows that low decile schools in the sample were slightly under-represented, and middle decile schools slightly over-represented, in comparison to national figures. The differences were not statistically significant.</p>

Source: Sapere

NZQA use the decile index for reporting purposes. Their annual report notes pupil retention, Achievement in NCEA and University Entrance (on various metrics) by decile (as well as ethnicity and gender). NZQA also releases

associated data files⁵² with achievement, endorsement and attainment all broken down at a national level by decile.

A search “Tertiary Education Commission” and “decile” only found one report: Maths Technology Limited for the Commission on “Alignment of Literacy and Numeracy Measures”.

Health and social sector departments/ agencies.

The departments in this sector are generally not heavy users of the decile index for the purposes of measuring socio-economic circumstance; usually they rely on NZDep score. However we did find instances of use of the decile score, particularly when evaluating programmes in schools.

Table 6 Health and social sector reports (government departments)

Authors or commissioning agencies	
Ministry of Health	Evaluation of projects relating to Health Promoting Schools e.g. Dingle, R., Hodgen, E., Boyd, S., Shapleski, J., King, J., & Moss, M. (2009). The changing face of Fruit in Schools: Technical report. Final Healthy Futures evaluation report. Wellington: Ministry of Health. [there are numerous editions of this report]

⁵² See <http://www.nzqa.govt.nz/assets/Studying-in-NZ/Secondary-school-and-NCEA/stats-reports/NZQA-Secondary-Statistics-Consolidated-Data-Files-Short-Guide.pdf>

Authors or commissioning agencies	
District Health Boards	NZ Child and Youth Epidemiology Service, <i>The Determinants of Health for Children and Young People in the Northern District Health Boards, prepared for the Northern DHBs</i> . Report for Northern DHBs. South Island Alliance (2014), <i>Determinants of health: Early childhood education</i>
Health Promotion Agency	Surveys on smoking e.g. <i>Young people’s desires and attempts to stop smoking</i> and <i>Young people’s use of electronic cigarettes and tobacco products other than cigarettes</i>

Authors or commissioning agencies	
Ministry of Social Development	<p><i>MSD and Centre for Social Research and Evaluation, Evaluation of Project K.</i></p> <p><i>MSD (2002), Social Workers in Schools Expansion Evaluation Report.</i></p> <p><i>MSD (2004) Children and Young People: Indicators of Wellbeing in New Zealand</i></p>
Social Policy Evaluation and Research Unit ⁵³	<p>Evaluations of the Prime Minister’s Youth Mental Health Project e.g. <i>Improving youth mental health: What has worked, what else could be done.</i> There are numerous other reports available here http://www.superu.govt.nz/ymh</p>
Oranga Tamarika Ministry for Children	Briefing to the incoming Minister 7 April 2017.
Office of the Children’s Commissioner	School safety: An inquiry into the safety of students at school

⁵³ Interestingly Superu looks at measures of disadvantage in Superu (2017), Patterns of multiple disadvantage across New Zealand families, Social Policy Evaluation and Research Unit, Wellington. It might therefore be interesting to talk to the authors of this work.

Authors or commissioning agencies	
Human Rights Commissioner	Human rights in New Zealand: The right to education.

Source: Sapere

Although the Treasury will (probably) make frequent use of the decile index for policy purposes (e.g. those relating to the Budget process), references to it on the ‘Research and Policy’ section of their website are few.⁵⁴ Similarly we couldn’t find anything by the Social Investment Unit referencing decile.

The Productivity Commission has recently conducted a ‘New models of tertiary education’ inquiry. In one paper written as part of that inquiry, Meehan *et al.* (2017)⁵⁵ looks at explaining ethnic differences in university enrolment, completion and achievement. In motivating their use of IDI data they note:

In terms of available information on socio-economic status in NZ, much of the prior literature (Earle, 2007; Engler, 2010; Jubong & Maloney, 2006) uses school decile as a proxy. The school decile system in NZ is used to allocate school funding. School deciles are based on the catchment area of a school. A decile rating of 1 is assigned to the 10% of schools with the highest proportion of students from low socio-economic

⁵⁴ One of the few recent studies we found was <http://www.treasury.govt.nz/publications/research-policy/wp/2015/15-07/twp15-07.pdf>, which looks at the impact of tertiary education on the labour market outcomes of low qualified school leavers.

⁵⁵ Meehan, L., et al. (2017). Explaining ethnic disparities in bachelor’s qualifications: participation, retention and completion in NZ. New Zealand Productivity Commission Working Paper, New Zealand Productivity Commission; AUT.

communities. However, it is widely acknowledged that school decile may not be the best source of socio-economic information, as the catchment area for schools, particularly high schools, can be quite large and encompass a range of different communities. As will be evident in the data section, the use of linked administrative data in this study allows us to replace decile with a more refined measure of socio-economic status - the deprivation index. This index is calculated for each mesh block in NZ and is based on nine variables from the Census, reflecting eight dimensions of deprivation (pg. 8).

Given they have thought about the issue, it might be worth talking to them about why they did not use decile and any other alternative measures of socio-economic status they considered.

6.1.3 Other (non-government) organisations using decile in their research and analysis

The focus on this section is the use of the decile or equity index by non-government organisations in the so-called ‘grey literature’. We leave the academic literature to the next section.

Education-focused organisations

The New Zealand Centre for Education Research makes heavy use of the decile index in their various research reports and many of the reports we found using decile had their employees as authors. Table 4 sets out a list on educationally focussed organisations we found using the decile index.

Table 7 Non-government organisations (education focus) using decile

Organisation	Examples
New Zealand Centre for Education Research	Cushman, P., & Clelland, T. (2011). A health promoting schools approach to bullying. <i>SET (Research Information for Teachers) 2011: No. 3, 17–25.</i> NZCER’s survey of secondary schools ...any many other studies
PPTA	<i>Equipping schools to fight poverty: a community hub approach</i> <i>Research Report on Professional Learning and Development</i>
Woolf Fisher Research Centre	Summer journey learning research programme <i>Picking up the pace: Effective literacy interventions for accelerated progress over the transition into decile 1 schools.</i> Final report to the Ministry of Education.
Centre for Educational Research and the School of Psychology, Victoria University of Wellington	<i>Motivation and achievement at secondary school</i>

Organisation	Examples
Educational Assessment Research Unit, University of Otago. They administer the National Monitoring Study of Student Achievement [formerly the National Education Monitoring Project]	See http://nemp.otago.ac.nz/keyfeatures.htm

Source: Sapere

Outside these educationally focussed organisations, there were several other organisations with a diverse focus using the decile and equity indices as set out in table 5.

Table 8 Non-government organisations (non-education focus) using decile

Organisation	Examples
Sport New Zealand	Young People’s Survey Series - Sport and Recreation and the Links with Socio-economic Background
Child Poverty Action Group	Hunger for learning: Nutritional barriers to children’s education
Centre for Social Research and Evaluation	Evaluation of Project K

Organisation	Examples
The New Zealand Initiative	<p>Currently have two IDI projects, where decile is mentioned in their project brief:</p> <p>MAA2017-29 Evaluating school performance with contextualised attainment measures using linked administrative data</p> <p><i>Parents’ use of decile rankings as indicators of school quality has had detrimental effects for the school system... This project aims to calculate a better measure of school performance that accounts for the students and families each school serves.</i></p> <p>MAA2014-28 New Zealand maths performance and maths education</p> <p><i>...The third research question concerns socio-economic inequalities in the opportunity to attain mathematical competence: is there a difference in teacher numerical ability by school decile?</i></p>

Appendix 3 Academic articles using decile

Theses/dissertations

Massey University

Crawford, M. E. (2016). Acceleration and Gifted Girls, Massey University.
A thesis presented in partial fulfilment of the requirements for the degree of Doctor of Education.
Analyses decile data.
<https://mro.massey.ac.nz/handle/10179/9879>

University of Auckland

Highfield, C. (2012). The impact of middle leadership practices on student academic outcomes in New Zealand secondary schools, University of Auckland.
A thesis submitted in fulfilment of the requirements for the degree of Doctor of Education.
Analyses decile data and uses for comparison purposes.
<https://researchspace.auckland.ac.nz/bitstream/handle/2292/19796/whole.pdf?sequence=2>

Tuarere, M. M. (2010). Advocates for Māori students: The role of careers advisors?, University of Auckland.
A thesis presented in partial fulfilment of the requirements for the degree of Doctor of Education.
Uses decile data in analysis.
<https://researchspace.auckland.ac.nz/bitstream/handle/2292/6351/whole.pdf?sequence=2>

University of Canterbury

Devonport, A. (2017). The impact of secondary school enrolment schemes on school desirability, academic achievement and transport. Department of

Geography, University of Canterbury.

A thesis submitted in fulfilment of the requirement for the Degree of Masters of Geographic Information Science (MGIS).

Uses decile ratings in analysis.

https://ir.canterbury.ac.nz/bitstream/handle/10092/13361/Devonport_Andrew_MGIS.pdf?sequence=1&isAllowed=y

King, J. M. (2007). Eke ki runga i te waka: The use of dominant metaphors by newly-fluent Māori speakers in historical perspective, University of Canterbury.
A thesis submitted in partial fulfilment of the requirements for the Degree of Doctor of Philosophy in Linguistics in the University of Canterbury.
Analysis uses the equity index value.

University of Otago

Armstrong, J. (2015). Evaluation of a Self-Directed E-Learning Resource: Integrating Hauora Māori and Clinical Content for Undergraduate Medical Students. Department of the Dean, University of Otago.
Thesis, Master of Health Sciences.

Darling, H. M. (2005). School and personal factors associated with being a smoker. Dunedin School of Medicine, University of Otago.
Thesis, Doctor of Philosophy

Victoria University of Wellington

Gerritsen, S. (2005). Children, Food and Poverty: Food Insecurity Among Primary School Students in the Wellington Region, Victoria University of Wellington.

A thesis submitted in partial fulfilment of the requirements for the degree of M.A. (Applied) in Social Science Research.

Uses decile data in analysis.

<http://researcharchive.vuw.ac.nz/bitstream/handle/10063/593/thesis.pdf?sequence=1>

Hamilton White, R. (2014). Lexical richness in adolescent writing, Insights from the Classroom: An L1 vocabulary development study, Victoria University of Wellington.

A thesis submitted to Victoria University of Wellington in partial fulfilment of the requirements for the degree of Master of Arts in Applied Linguistics.

Uses decile data in analysis.

<http://researcharchive.vuw.ac.nz/bitstream/handle/10063/3394/thesis.pdf?sequence=2>

Ngan, E. M.-X. (2011). Unlocking the potential of school libraries: What actions are New Zealand primary school principals taking to integrate the school library in information literacy initiatives? School of Information Management, Victoria University of Wellington.

Submitted to the School of Information Management, Victoria University of Wellington in partial fulfilment of the requirements for the degree of Master of Information Studies.

Literature

(2001). "Student interest in science : analysis of data from the Assessment Resource Banks." Set : research information for teachers.

(2003). "What tools and strategies do teachers use to assess year 5, 7, and 9 students in English and mathematics?"

How useful do teachers find the tools and strategies they use for assessing English and mathematics at years 5, 7, and 9?" Set : research information for teachers.

Collects base-line data on teachers' assessment practices, focusing on the

assessment tools and strategies used by teachers to assess English and maths. Reports the responses from 676 teachers of year 5, 7, or 9 students at 311 schools. Identifies significant differences in the use of the tools and strategies by decile, by full primary versus intermediate schools, area, management responsibility, or number of years teaching. Asks teachers to rate the usefulness of tools and strategies for providing information for teaching and learning. Sets out those resources deemed to be useful for teachers, students, and school management in either English or maths.

Agnew, S. (2010). "What is happening to girls studying economics in low decile schools? / by Stephen Agnew." New Zealand journal of applied business research.

Attempts to show that establishing a correlation between gender and socio-economic group with respect to academic performance across a subject can provide helpful data. Uses ordinary least squares regression to show whether there is an interaction between gender and school deciles in NCEA externally assessed economics standards. Presents findings on the performance of girls versus boys in low decile schools in the subject of economics relative to their counterparts in high decile schools.

Agnew, S. (2011). "The Impact Of School Socio-economic Status On Student-Generated Teacher Ratings." Journal of College Teaching and Learning 8(1): 39-46.

This paper uses ordinary least squares, logit and probit regressions, along with chi-square analysis applied to nationwide data from the New Zealand ratemyteacher website to establish if there is any correlation between student ratings of their teachers and the socio-economic status of the school the students attend. The results show that students from mid socio-economic status schools score their teachers significantly higher than students from other socio-economic status schools. This has implications for the national measurement of teacher performance, as well as implications for individual teachers working in different socio-economic status schools. [PUBLICATION ABSTRACT]

Albon, H. M., et al. (2010). "Secular trends and distributional changes in health and fitness performance variables of 10-14-year-old children in New Zealand between 1991 and 2003." British Journal of Sports Medicine 44(4): 263.

Background New Zealand children's health and fitness performance is declining over time, but whether this change is because of deterioration in all children's health and fitness performance or can be attributed to just a certain portion of the population, is unknown. Objectives In this study, secular trends and distributional changes in health-related and performance-related fitness components among New Zealand primary school children aged 10 to 14 years between 1991 and 2003 were tracked. Methods Health- and performance-related fitness parameters including height, weight, body mass index (BMI), flexibility, standing broad jump, 4x9-m agility run, abdominal curl-ups, and 550-m run were collected up to twice a year from 3306 children (10-14 years old) from a New Zealand school between 1991 and 2003. Results Over the 12-year period, the boys' weight increased by 4.5 kg (95% CL 2.7 to 6.2, or 0.8% per year) and girls' by 3.9 kg (95% CL 2.0 to 5.9, or 0.7% per year). Mean BMI increased by 0.12 kg m⁻² (0.6%) and 0.11 kg m⁻² (0.5%) per year for boys and girls, respectively. Children's 550-m run performance declined by 1.5% and 1.7% per year for boys and girls, respectively. Little difference existed between children located in the highest performing and leanest percentiles in 1991 and 2003, but for children in the poorest performing and fattest percentiles, their results were substantially worse in 2003. Conclusions These results suggest that the deterioration in the health-related and performance-related fitness components of New Zealand 10-14-year-olds is not homogeneous but skewed towards those children who are the heaviest and perform worst in fitness tests. Previous research on health-related fitness parameters among children in New Zealand is limited but shows secular trends of increasing body mass 1 2 in conjunction with deteriorating aerobic fitness performance, muscular endurance and explosive muscular power. 3 Internationally, similar increases in body mass have been observed in children since the 1980s. 1 4 5 Secular trends of deteriorating health-related fitness performance have also been reported among children around the world, 1 5 6 with the most significant decreases observed in aerobic performance. However,

trends in health-related variables reported as changes in mean body mass index (BMI) and mean aerobic fitness performance do not reveal possible changes in the distribution of BMI or aerobic performance within the population. Changes in such measures may come about because of a shift in the entire population under investigation or a change in a portion of the population. It is not clear whether New Zealand's entire childhood population is becoming heavier and less aerobically fit or whether only a portion of the children are becoming even heavier and more unfit, with the remaining children showing little secular change. The aim of this study was to track secular trends and distributional changes in body weight and physical fitness parameters among New Zealand primary school children aged 10 to 14 years.

Alcorn, N. and M. Thrupp (2012). "Uncovering meanings: The discourses of New Zealand secondary teachers in context." New Zealand Journal of Educational Studies 47(1): 107-121.

Recent official policy discourses on student achievement have stressed the importance of teachers and the impact that effective teaching can have on student life chances and on national economic performance. There is also a body of research on the way teaching and learning are affected by school context. This article discusses research designed to investigate how and to what extent the contextual features of schools impacted on the beliefs New Zealand secondary teachers and principals held about teaching and learning, the extent to which they believed their agency could influence outcomes for their students, and the aspirations and goals they pursued. We interviewed principals and teachers in six secondary schools, two each in high, mid and low socio-economic areas. The findings show considerable commonality in teachers' pedagogical discourses and that the rhetoric of formal policy discourses is pervasive and normalized in schools. All the teachers believed they could make a difference to student achievement and life chances, tried to address diversity among their student bodies, and saw success as much wider than academic achievement. Concurrently we found that the institutional habitus of each school largely determined how discourses were enacted and that relationships, confidence, student-centredness and success were

interpreted differently between schools. We argue that these differences must be taken into account if school policies and interventions are to be successful. [PUBLICATION ABSTRACT]\

Alexander, R. and M. Jaforullah (2005). Scale and pure efficiencies of New Zealand secondary schools. University of Otago Economics Discussion Papers No. 0501.

The scale efficiency of schools is a controversial matter. Government quite naturally wants to capture such scale efficiencies as are available, while parents and educators often favour smaller schools because of their perceived quality advantages that are not easily measurable. We use data envelopment analysis to calculate three different measures of the efficiency with which New Zealand secondary schools transform basic inputs into outputs. There is considerable variation across schools on all three measures: scale, pure and overall efficiencies. We more closely examine our sample broken down by ownership type, by single-sex/co-educational and by location. All of these factors influence the efficiency measures, with scale disadvantages evident in rural versus urban schools, Integrated schools generally outperforming State schools and single-sex schools outperforming co-educational ones, especially in pure efficiency terms. We then present evidence that higher socio-economic status of a school's community confers both scale and pure efficiency advantages and use regression analysis to quantify the effects at work.

Bibbee, A. (2013). Improving School-to-work Transitions in New Zealand. OECD Economic Department Working Papers. Paris, Organisation for Economic Cooperation and Development (OECD). 57: 0_1,2,5-59.

The NZ labour market is among the most flexible in the OECD, and outcomes for its young people have been among the best. However, labour-market opportunities are heavily determined by initial education, where New Zealand's system is also successful and innovative in many ways. Average PISA results are among the OECD's highest, but the dispersion of performance is also high, indicating a sizable group of underachievers. Those in disadvantaged groups tend to have poor scholastic outcomes. These initial educational handicaps show up in

higher drop-out rates and youth joblessness, greatly limiting these youths' future life chances. Indeed, intergenerational persistence in educational and employment outcomes appears very high. From both a social and economic point of view, it will be essential to develop more fully the human capital of the fast growing demographic group of ethnic minorities. Better teaching quality is needed, with more attention devoted to diversity of student needs and learning approaches to keep children in school. A related problem is the apparently large divergence between the nature of skills supplied by the education sector and the skills demanded by employers. A greater role for youth apprenticeships could help to raise skill levels while aligning them better to the economy's needs. All this has an important bearing on the government's ambition to secure strong and sustainable growth with rising living standards and equal opportunities for all. This Working Paper relates to the 2013 OECD Economic Survey of New Zealand (www.oecd.org/eco/surveys/new-zealand-2013.htm). [PUBLICATION ABSTRACT]

Bourke, R. and J. Loveridge (2014). "Exposing the divide between assessment and the point of learning through student voice." New Zealand Journal of Educational Studies 49(2): 149-161.

National Standards were introduced in New Zealand primary schools in 2009 heralding a new focus for teachers on the assessment of year 4 and year 8 students' achievements in reading, writing and mathematics with the potential to link these assessments to judgments about the performativity of schools. This research set out to explore year 4 and year 8 students' views about their learning in the early mandatory introduction of National Standards in Aotearoa/New Zealand, and the findings showed that after three years of its introduction the students had little awareness and understanding of National Standards. However, the young participants attended to something more pertinent to them, and the research broadened to include their accounts of the point of learning rather than the assessment of their learning. Five inter-related themes emerged around the point of learning and combined, they highlight an important distinction made by the children between learning as it is assessed and learning as they experience it. The findings show that if

National Standards focus on a narrow aspect of the curriculum children will continue to see a gap between their perceived point of learning and the assessment of their learning; an important distinction for these children. However, if teachers focus on students' perceptions of the "point of learning" and listen to student voice more intentionally, the assessment or "measurement" agenda that has less meaning to students may be countered and an achievement agenda supported.

Britnell, S. and J. Koziol-McLain (2015). "Weight estimation in paediatric resuscitation: A hefty issue in New Zealand." *Emergency Medicine Australasia* 27(3): 251-256.

Objective To test the accuracy of weight estimation methods currently used in New Zealand to predict a child's weight in emergency resuscitation. Methods A prospective, observational study. Data were collected in July 2013 at five Auckland schools among children aged 5-10 years. Collected demographic information included age, ethnicity, sex and school decile. Standardised measures included weight, height and Broselow-Luten tape (2011 version, limited to children 43-143 cm) weight. Age-based weight estimates were calculated for APLS, Shann and Theron formulae. Mean bias (actual weight - estimated weight) and clinical accuracy (proportion of estimates within 10% of actual weight) are reported. Bland-Altman plots illustrate agreement and 95% limits of agreement. Results The 376 participants weighed between 14.2 and 93.1 kg. The proportion of weight estimates within 10% of actual weight were 28.7%, 39.1% and 45.7% for the age-based formula (Theron, APLS and Shann, respectively). The mean bias was negative for Theron (-6.5) and positive for APLS (7.8) and Shann (7.7). For the length-based Broselow-Luten tape method (n = 305), the proportion of weight estimates within 10% of actual weight was 73.4% and mean bias was 1.1. Conclusion For children under 143 cm in height, the Broselow-Luten tape outperforms other weight estimation methods, accurately estimating weight in approximately three out of four children. The age-based estimation methods performed poorly overall, with variation by age and ethnicity. [ABSTRACT FROM AUTHOR]

Brooker, B., et al. (2010). "Maori Achievement in Literacy and Numeracy in a Sample of Canterbury Schools." *New Zealand Journal of Educational Studies* 45(1): 49-65.

Maori achievement in key learning areas has been an area of national focus with underachievement as a challenge for all educators in New Zealand. The perception of a group of school leaders in Canterbury refuted this claim by suggesting that Maori in their schools were achieving at a comparable level to non-Maori. This paper investigates the achievement in literacy and numeracy of 551 Maori and Non-Maori Year 6 students in a sample of 14 Canterbury schools. An engagement in school survey (NZCER) was also administered to students in 12 of these schools. Findings indicated that achievement using stanine levels was lower for Maori compared to Non-Maori. However, this pattern could not be explained by the students' self-reported level of engagement in school, because no significant difference relative to this variable emerged between Maori and non-Maori students. [PUBLICATION ABSTRACT]

Clauder, N. (2013). Calder, N. S. (2005). I type what I think and try it": Children's initial approaches to investigation through spreadsheets. In *Building connections: Theory, research and practice. Proceedings of the 28th annual conference of the Mathematics Education Research Group of Australasia, Melbourne*

How do children make initial sense of an investigative situation when approaching it through the pedagogical medium of the spreadsheet? This paper examines the ways groups of ten-year-old children made sense of number investigations explored in a spreadsheet environment, and how their preliminary responses were shaped, and their sub-goals framed, by the features of that setting. It also explores the manner in which this might filter their understanding and conjectures.

Chaudhury, M., et al. (2017). "Using the Public Open Space Attributable Index tool to assess children's public open space use and access by independent mobility." *Children's Geographies* 15(2): 193-206.

Coxhead, A. (2011). "Exploring specialised vocabulary in secondary schools: What difference might subject, experience, year level, and school decile make? ." TESOLANZ Journal 19: 27-52.

Deane, K. L., et al. (2017). "The Impact of the Project K Youth Development Program on Self-Efficacy: A Randomized Controlled Trial." Journal of Youth and Adolescence 46(3): 516-537.

A key issue for youth development programs is whether the learning they provide is transferred to participants' daily lives. It is also important that they are effective for the diverse range of participants they attract. This study used a randomized controlled trial design to measure the impact of Project K, a New Zealand-based youth development program, on academic and social self-efficacy. Project K combines a 3-week wilderness adventure, a 10 day community service component, and 1 year of mentoring to promote positive growth in 14-15 year olds with low self-efficacy. At baseline, the evaluation included 600 Project K (46 % female) and 577 Control participants (48 % female) and revealed that Project K was effective in improving both social and academic self-efficacy from pre- to post-program with effects being sustained 1 year later. Parents' perceptions of changes in the participants' interpersonal skills supported these findings. Differential program effects were found across participant subgroups, particularly 1 year after program completion. The implications of these differences are discussed.

Denny, S. P. M. P. H., et al. (2012). "Association Between Availability and Quality of Health Services in Schools and Reproductive Health Outcomes Among Students: A Multilevel Observational Study." American Journal of Public Health 102(10): e14-20.

We determined the association between availability and quality of school health services and reproductive health outcomes among sexually active students. We used a 2-stage random sampling cluster design to collect nationally representative data from 9107 students from 96 New Zealand high schools. Students self-reported whether they were sexually active, how often they used condoms or contraception, and their involvement in pregnancy. School administrators completed questionnaires on their

school-based health services, including doctor and nursing hours per week, team-based services, and health screening. We conducted analyses using multilevel models controlling for individual variables, with schools treated as random effects. There was an inverse association between hours of nursing and doctor time and pregnancy involvement among sexually active students, with fewer pregnancies among students in schools with more than 10 hours of nursing and doctor time per 100 students. There was no association between doctor visits, team-based services, health screening, and reproductive health outcomes. There was an inverse association between hours of nursing and doctor time and pregnancy involvement among sexually active students, with fewer pregnancies among students in schools with more than 10 hours of nursing and doctor time per 100 students. There was no association between doctor visits, team-based services, health screening, and reproductive health outcomes.

Graham, D. (2008). "Increasing activity and improving nutrition through a schools-based programme: Project Energize. 1. Design, programme, randomisation and evaluation methodology." Public Health Nutrition 11(10): 1076-1084.

Abstract: Project Energize is a through-school nutrition and activity programme that is being evaluated in a 2-year, cluster-randomised, longitudinal study. The present paper describes the background of the programme and study, the programme development and delivery, the study methodology including randomisation, measurement and analysis tools and techniques, and the mix of the study population. The programme is being delivered to sixty-two primary schools with sixty-two control schools, each limb containing about 11 000 students. The children in the evaluation cohort are 5 or 10 years old at enrolment; the randomisation protocol has achieved post-consent enrolment of 3000 evaluation participants, who are comparable by age, sex and school decile. End-point measures include body composition and associated physical characteristics, fitness, home and school environment and practice. [ABSTRACT FROM AUTHOR]

Guevara, A. (1998). "Student movement between schools at the year 7 and year 9 transition points and school choice." Research bulletin (Ministry of Education)(8): 23-32.

Provides a breakdown of the numbers of students who moved into each year 7 and year 9 at the beginning of 1997 and compares the characteristics (such as decile rating, location, school gender) of the students previous schools with those of the schools they moved to. Discusses data in light of various factors which seem to influence school choice among parents and students. Points out implications for such matters as school property requirements, teacher training and recruitment, schools transport needs, and the growth and decline in different schools' rolls.

Guo, H. J., et al. (2010). "Smoking behaviours and contextual influences on adolescent nicotine dependence." Australian and New Zealand Journal of Public Health 34(5): 502-507.

Objective: The objectives of the study were to analyse nicotine-dependence patterns among secondary school students in New Zealand (NZ), and identify factors associated with levels of nicotine dependence. Method: This study uses data from the 2004 Youth Lifestyle Study, a survey of Year 10 and 12 students from randomly selected schools in NZ. The analysis included 625 current adolescent smokers. Nicotine dependence was measured with the Hooked on Nicotine Checklist (HONC). Potential dependence-associated factors studied include: socio-demographic factors; smoking behaviours; and smoking contexts. Results: A large percentage (87.9%) of the current adolescent smokers reported at least one HONC symptom, with a mean HONC score of 4.9 out of a possible 10. Multivariate analyses identified: school decile; age at which started smoking monthly; lifetime cigarette consumption; and peers smoking as statistically significant predictors of nicotine dependence. Conclusions: Adolescent smokers are very likely to become dependent on nicotine. Students from the highest school decile had markedly lower HONC scores. Earlier onset of monthly smoking, heavier overall consumption and peers smoking were associated with higher HONC scores. These findings provide important insights into

factors that may need to be modified to help reduce nicotine dependence among adolescents.

Howe, A. S., et al. (2013). "Dieting status influences associations between dietary patterns and body composition in adolescents: a cross-sectional study." Nutrition Journal 12: 51.

Background: Associations between food choice and body composition in previous studies of adolescents have been inconsistent. This may be due to the body composition measures used, or these associations may be affected by the dieting status of adolescents. The objective of this study was to investigate the association between dietary patterns and body composition in adolescents, and determine if these associations are moderated by dieting status. Methods: Information on food consumption and current dieting status was collected, using a web-based survey, in 681 adolescents (mean age 15.8 (SD 0.9) years) from schools in Otago, New Zealand. Non-dieters were defined as those reporting not being on a diet as they were "happy with their weight". Principal components analysis (PCA) was used to determine dietary patterns. Body mass index (BMI), waist circumference (WC), waist-to-height ratio (WHtR), fat mass index (FMI), and fat-free mass index (FFMI) were examined as outcomes. Generalized estimating equations were used to examine associations between dietary patterns and body composition. Results: PCA produced three dietary patterns: 'Treat Foods', 'Fruits and Vegetables', and 'Basic Foods'. A standard deviation increase in 'Basic Foods' was associated with a 3.58% decrease in FMI (95%CI -6.14, -0.94) in the total sample. When separate sex analysis was undertaken significant negative associations were found in boys only, between the 'Basic Food' score and WC, WHtR, FMI, and FFMI, while the 'Fruits and Vegetables' pattern was negatively associated with FMI. Associations between 'Treat Foods' and BMI, WC, and WHtR in non-dieters were positive, while these associations were negative for all other participants. Conclusions: Significant associations were found between dietary patterns and indices of both central and total adiposity, but not BMI. Therefore using only BMI measures may not be useful in this age group. Since our results were significant for boys and not girls, nutrition messages designed to prevent

obesity may be particularly important for adolescent boys. As an interaction between dieting status and 'Treat Foods' existed, future studies should also explore the role of dieting when investigating food choice and body composition.

Jia, P. and T. Maloney (2015). "Using predictive modelling to identify students at risk of poor university outcomes." Higher Education 70(1): 127-149.

Predictive modelling is used to identify students at risk of failing their first-year courses and not returning to university in the second year. Our aim is twofold. Firstly, we want to understand the factors that lead to poor first-year experiences at university. Secondly, we want to develop simple, low-cost tools that would allow universities to identify and intervene on vulnerable students when they first arrive on campus. This is why we base our analysis on administrative data routinely collected as part of the enrollment process from a New Zealand university. We assess the 'target effectiveness' of our model from a number of perspectives. This approach is found to be substantially more predictive than a previously developed risk tool at this university. For example, observations from validation samples in the top decile of risk scores account for nearly 28 % of first-year course non-completions and 22 % of second-year student non-retentions at this university.

Kanagaratnam, S., et al. (2009). "Enamel defects and dental caries in 9-year-old children living in fluoridated and nonfluoridated areas of Auckland, New Zealand." Community Dentistry & Oral Epidemiology 37(3): 250-259.

Objectives: This epidemiological study aims to investigate the developmental enamel defects and dental caries among 9-year-old children resident in fluoridated and nonfluoridated regions in Auckland, New Zealand. Methods: A stratified, two-stage random selection design where strata were defined by fluoridation status, school size, and school decile. After informed consent was obtained, parents completed oral health questionnaires and children underwent dental examinations at school clinics. Results: 612 children from 38 schools participated in the study. Overall, 175 (29%) children had lived continuously in fluoridated areas, 149 (24%) had lived continuously in nonfluoridated areas, and 288

(47%) had resided intermittently in fluoridated areas. Diffuse opacities were present in 117 (19%) children and deciduous teeth dental caries was seen in 370 (60%) children. After adjustment for covariates, a strong dose-response relationship between diffuse opacity and fluoridation status was found, with children who lived continuously in fluoridated areas being 4.17 times as likely to have diffuse opacities as children who lived continuously in nonfluoridated areas ($P < 0.001$). Conversely, a strong protective dose-response relationship between caries experience and fluoridation status was seen, with children who lived continuously in fluoridated areas being 0.42 times as likely to have dental caries as children who lived continuously in nonfluoridated areas ($P < 0.001$). Conclusions: Reticulated water fluoridation in Auckland reduces the risk of dental caries but increases the risk of diffuse opacities in 9-year-old children. Guidelines and health-promotion strategies that enable children to minimize their risk to diffuse opacities yet reduce their risk of dental caries should be reviewed. [ABSTRACT FROM AUTHOR]

Kilmister, P. and B. Baxter (2002). "Tracking truants in Wanganui." Social work now(21): 4-9.

Investigates the correlation of recidivist truancy of intermediate school-age children and youth offending in the Wanganui area from 1999 to 2001. Backgrounds the work of the Wanganui Truancy Service (WTS) and gives a profile of the Wanganui community, including information on schools' decile ratings. Outlines the relationship between schools and the WTS, and the link between family situations and truancy. Discusses data collected by the WTS, looking at reasons for truancy, patterns of absenteeism and recidivism. Presents three case studies to look at risk factors for youth offending.

Mandic, S., et al. (2012). "Getting kids active by participating in sport and doing It more often: focusing on what matters." International Journal of Behavioral Nutrition and Physical Activity 9: 86.

Background: Reduced time dedicated to physical education and free play in recent decades emphasizes the need to promote opportunities for sport participation in adolescents in order to increase physical activity

levels. The purpose of this study was to examine the association of sociodemographic and biological characteristics, behavioural patterns, and school-related and sport-specific variables with time spent participating in sport. Methods: A total of 1837 secondary school students (age: 14.6 ± 1.2 years; 50.9 % boys) from 19 of 23 schools in the Otago Region (New Zealand) completed an online sport survey and Youth Physical Activity Questionnaire in 2009. Using multilevel modeling, we examined the association of individual-, school- and sport-related variables on sport participation and the amount of time spent in sports. Results: Higher rates of sport participation were associated with lower neighbourhood deprivation scores (OR (95%CI): 0.75 (0.49-1.14), 0.57 (0.38-0.86), 0.48 (0.28-0.81)), higher quintiles of physical activity (2.89 (2.10-3.96), 2.81 (1.68-4.70), 3.54 (2.24-5.57), 3.97 (1.99-7.95)), highest quintiles of screen time (1.58 (0.94-2.65), 1.99 (1.42-2.80), 2.17 (1.43-3.30), 1.88 (1.37-2.57)) and boys only school status (2.21 (1.57-3.10)). Greater amount of time spent in sports was associated with male gender (0.56 (0.43-0.74), lower neighbourhood deprivation scores (0.72 (0.59-0.93), 0.78 (0.58-1.04), 0.62 (0.39-1.00)), higher quintiles of physical activity (3.18 (2.29-4.41), 4.25 (2.91-6.20), 8.33 (5.58-12.44), 6.58 (4.07-10.64)), highest quintile of screen time (1.83 (1.31-2.56), greater availability of sports outside school (1.68 (1.22-2.32)), better sport management (2.57 (1.63-4.07)) and provision of sport courts at school (0.57 (0.40-0.81)). Conversely, obesity was associated with less time spent participating in sport (0.50 (0.31-0.80)). Conclusion: Results support the use of sport participation as an effective strategy to increase physical activity levels and identify target groups and areas for interventions, program design and policy development. Interventions should focus on improving accessibility to sport programs for all adolescents, providing adequate sport grounds at school, and promoting good sport management practices. Programs and policies encouraging sport participation should address in particular the needs of adolescents living in deprived neighborhoods, those attending coeducational and girls-only schools, and those who are obese.

Mandic, S., et al. (2015). "Personal, social and environmental correlates of active transport to school among adolescents in Otago, New Zealand." Journal of

Science and Medicine in Sport 18(4): 432-437.

With increasingly sedentary lifestyles, opportunities for physical activity such as active transport to school need to be promoted in adolescents. This study examines personal, social and environmental correlates of active transport to school among adolescents including sociodemographics, behavioural patterns, motivational factors, perceived barriers, peer support, family resources, school characteristics, urban/rural setting, distance to school and neighbourhood safety perceptions. Cross-sectional study. In 2009 and 2011, 2018 secondary school students (age: 14.8 ± 1.3 years; 73% urban; 53% boys) from 22 out of 24 schools from Otago, New Zealand completed the Otago School Students Lifestyle Survey. Multivariate binary logistic regression models were used to compare active transport to school correlates in students using active transport to school versus bus and car users (motorised transport). Overall, 37% of students used active transport to school, 24% bus, and 39% car. Compared to motorised transport users, active transport to school users were more likely to live closer to school (1.4 ± 1.4 active transport to school vs. 8.3 ± 8.4 km motorised transport; $p < 0.001$). In a multivariate analysis, shorter distance to school (OR (95%CI) (0.03 (0.01-0.05)), younger age (0.85 (0.78-0.92)), fewer vehicles (0.66 (0.49-0.89)) and fewer screens (0.53 (0.35-0.82)) per household, meeting screen time guidelines (1.74 (1.22-2.50)), opportunity to chat with friends (2.26 (1.58-3.23)), nice scenery (1.69 (1.14-2.50)), and parental perceptions of active transport to school safety (2.32 (1.25-4.30)) were positively associated with active transport to school, while perceived time constraints (0.46 (0.29-0.72)) and attending girls-only school (0.51 (0.35-0.75)) had a negative association with active transport to school. Future active transport to school interventions in adolescents should focus on encouraging active transport to school, reiterating its social benefits, and addressing parental safety concerns around active transport to school.

Matheson, D. P. and R. S. Hoskins (1992). "The general practice contract scheme : was it targeted?"

." New Zealand medical journal 105(927): 35-36.

Evaluates the general practice contract scheme to determine whether the contracted general practices were situated in areas of greatest health need. Uses the health and equity index to determine the level of health need of the geographical location of the contracted practices.

McNaughton, S., Phillips, G. and MacDonald, S., 2003. Profiling teaching and learning needs in beginning literacy instruction: The case of children in "low decile" schools in New Zealand. Journal of Literacy Research, 35(2), pp.703-730.

Children in low decile schools in New Zealand, most of whom are from Maori and Pacific Islands families achieve significantly lower levels in school reading and writing than other children... This paper examines the rates and levels of learning particular components of reading and writing over the first year of literacy instruction.

McDowall, S. (2008). "How Well is Reading Recovery Really Working in New Zealand? Reply to Chapman, Greaney and Tunmer." New Zealand Journal of Educational Studies 43(2): 121-125.

[...] the study includes a substantial literature review which summarises the large body of evidence that suggests RR is a robust approach for improving the reading of at-risk readers - not for every student, in every situation, but on average see, for example, the following meta-analyses and overviews of research literature: [...] in the light of Chapman et al 's (2007) concern about the 'independence' of the qualitative data overall and the 'vested interest' of those who responded it is important to remember the range of participants' views we canvassed.

McGee, R., et al. (2002). "Purchasing of cigarettes by New Zealand secondary students in 2000." Australian and New Zealand Journal of Public Health 26(5): 485-488.

A study examines the prevalence of under-age sales of cigarettes to New Zealand secondary school students in 2000 and to identify correlates of buying cigarettes. A randomly selected sample of 53 secondary schools from 5 geographic regions took part in the study, and 2,896 Year 10 and

Year 12 students completed a self-report questionnaire. Some 30% reported smoking during the past 30 days, and 61.8% of these students usually obtained cigarettes by purchasing from shops, from other students or from someone else buying them on their behalf. Local corner stores and service stations were the most popular source. Buying cigarettes was associated with more frequent smoking, more money to spend, a higher school decile rating and higher proportion of schoolmates also purchasing. Prohibition of cigarettes sales to minors needs much greater attention in New Zealand than it is receiving at present if smoking among young people is to be reduced.

McNeill, B. and C. Kirk (2014). "Theoretical beliefs and instructional practices used for teaching spelling in elementary classrooms." Reading and Writing 27(3): 535-554.

The current study aimed to examine teachers' reported spelling assessment and instruction practices. Analysis of the match between teachers' theoretical beliefs about spelling and their reported pedagogy was conducted to elucidate factors that may support or impede the use of evidence-based teaching strategies in the classroom. An electronic survey was completed by 405 randomly selected (stratified by region and socio-economic status) elementary school teachers in New Zealand. The survey examined the following areas: spelling assessment, spelling instruction, beliefs about spelling, preparing teachers to teach spelling, and teachers' perceived strengths and weaknesses of their spelling program. There was large variability in spelling assessment and instructional practices across teachers. Most respondents reported implementing some aspects of a developmental approach to spelling instruction through analysis of children's spelling errors (64 %) and/or individualization of the spelling program (60 %). There was a large dissociation between teachers' beliefs about spelling and their frequency of use of specific instructional practices associated with those beliefs (e.g., phonological awareness, orthographic knowledge). The mismatch between beliefs and reported practice appeared to be due to lack of professional knowledge regarding implementing explicit spelling instruction and finding time to teach spelling within the curriculum. Increasing teachers' knowledge about

language structure, practical implementation of key assessment and instruction activities, and the links between spelling and other areas of the curriculum are important factors in improving spelling pedagogical practices.[PUBLICATION ABSTRACT]

Nikula, P.-T. (2017). "Socio-economic inequalities in higher education: a meta-method analysis of twenty-first century studies in Finland and New Zealand." Studies in Higher Education: 1-16.

Oliver, M., et al. (2006). "An Integrated Curriculum Approach to Increasing Habitual Physical Activity in Children: A Feasibility Study." The Journal of School Health 76(2): 74-79.

A relatively new concept is that of "integrating" physical activity throughout the school curriculum, thereby teaching children about lifestyle physical activity in a variety of contexts. One method by which this may be achieved is by utilizing pedometers as a motivational and educational tool for measuring accumulated physical activity. No research is available that shows in-depth integration of physical activity into the curriculum or that investigates the efficacy of pedometer use for this purpose. The purposes of this study were to (1) design and implement a 4-week elementary school curriculum unit, based around pedometer walking and (2) quantify, using pedometry, the physical activity levels of children ($N = 78$) prior to, and during, the unit implementation. Results showed that more than one half of the participants were achieving >15,000 steps daily, and children were significantly more active on weekdays than weekends ($p = .0001$). Boys were more active than girls at baseline ($p = .01$) and during intervention weekdays ($p = .03$). Differences between baseline and intervention weekdays were nonsignificant for the complete sample; however, significant increases in step counts were observed when the children with low activity levels, especially females, were examined separately. Overall, the integration of physical activity using pedometer-based activities is feasible. However, any increases in activity may be restricted to children who are least active. [PUBLICATION ABSTRACT]

Ombler, K. (2016). "Every kid can achieve." Public sector 39(1): 5-8.

Overviews the performance of the government's Investing in Education Success policy aimed at helping raise achievement levels, particularly among under-performing Maori and Pasifika students. Talks to Ministry of Education chief executive Peter Hughes, Wellington College principal Roger Moses, and NZCER chief researcher Cathy Wylie about the following: the work of the Ministry's new Evidence Data and Knowledge (EDK) Group; Communities of Learning; the decile system; imbalances in subject teachers; and concerns around the current pace of change, and its funding.

Patterson, A. and A. Laxon (2013). Switched on to learning: International test results raise big questions for NZ. NZ Herald.

Spotlights Auckland's Pt England Primary School and its use of technology in the classroom. Speaks to Dorothy Burt, head of digital learning at the decile one school, about how the school has embraced technology. Explains how a digital learning environment has helped to improve literacy and numeracy skills at Tamaki College. Talks about the Manaiakalani Trust's Digital Teaching Academy, which will focus on teaching in decile one-three digital learning environments. Lists the schools involved in the initiative. Points to the recent drop in NZ's maths, science and reading scores in the OECD's Programme for International Study Assessment (PISA) report. Questions whether the test results can be trusted and what NZ can do about its decline.

Phillips, G., McNaughton, S. and MacDonald, S.D., 2001. Picking up the pace: Effective literacy interventions for accelerated progress over the transition into decile 1 schools. Child Literacy Foundation and Woolf Fisher Research Centre.

Pledger, M., et al. (2012). "Increases in support structures for healthy eating especially in low decile schools in New Zealand." Australian and New Zealand Journal of Public Health 36(6): 543-549.

The purpose of this paper is to compare two surveys conducted in 2007 and 2009, of the food and nutrition environment in New Zealand

primary schools. A sample of primary schools was asked about foods and beverages provided or sold to students or used for fundraising, and nutrition-related policies and procedures. Comparisons were made between school decile groups and between years. Of primary schools selling food or beverages, 34% sold everyday items once or more a day (39% in 2007) and 25% sold occasional items once or more a day (36% in 2007). Two-thirds of schools sold food or beverages for fundraising, generally once a term or less. About half the schools had written policies about food (increased from 2007). There have been some improvements in the food and nutrition environment, with primary schools from lower deciles more likely to be making changes. The reduction in funding for nutrition-related programs in primary schools may hinder the sustainability of the changes seen, especially in low decile schools.

Poole, T., et al. (2012). "Human papillomavirus vaccination in Auckland: Reducing ethnic and socio-economic inequities." *Vaccine* 31(1): 84-88.

Background The New Zealand HPV publicly funded immunisation programme commenced in September 2008. Delivery through a school based programme was anticipated to result in higher coverage rates and reduced inequalities compared to vaccination delivered through other settings. The programme provided for on-going vaccination of girls in year 8 with an initial catch-up programme through general practices for young women born after 1 January 1990 until the end of 2010. **Objective** To assess the uptake of the funded HPV vaccine through school based vaccination programmes in secondary schools and general practices in 2009, and the factors associated with coverage by database matching. **Methods** Retrospective quantitative analysis of secondary anonymised data School-Based Vaccination Service and National Immunisation Register databases of female students from secondary schools in Auckland District Health Board catchment area. Data included student and school demographic and other variables. Binary logistic regression was used to estimate odds ratios and significance for univariables. Multivariable logistic regression estimated strength of association between individual factors and initiation and completion, adjusted for all other factors. **Results** The programme achieved overall coverage of

71.5%, with Pacific girls highest at 88% and Maori at 78%. Girls higher socio-economic status were more likely to be vaccinated in general practice. **Conclusion** School-based vaccination service targeted at ethnic sub-populations provided equity for the Maori and Pacific student who achieved high levels of vaccination.

Purvis, D., et al. (2006). "Acne, anxiety, depression and suicide in teenagers: A cross-sectional survey of New Zealand secondary school students." *Journal of Paediatrics & Child Health* 42(12): 793-796.

Aim: To examine the associations between acne and depressive symptoms, anxiety and suicidal behaviours. **Methods:** This was a secondary analysis of a cross-sectional survey –'Youth2000' (New Zealand national survey of youth health). A total of 9567 secondary school students aged 12–18 years participated in the survey. The main outcome measures were self-reported acne, depressive symptoms (Reynolds Adolescent Depression Scale > 77), anxiety (Anxiety Disorder Index from Multidimensional Anxiety Scale for Children) and self-reported suicide attempts. **Results:** 'Problem acne' was associated with an increased probability of depressive symptoms, odds ratio 2.04 (95% confidence interval 1.70–2.45); anxiety, odds ratio 2.3 (1.74–3.00); and suicide attempts, odds ratio 1.83 (1.51–2.22) in a logistic model that included age, gender, ethnicity, school decile and socio-economic status. The association of acne with suicide attempts remained after controlling for depressive symptoms and anxiety, odds ratio 1.50 (1.21–1.86). **Conclusion:** Young people presenting with acne are at increased risk of depression, anxiety and suicide attempts. Attention should be paid to their mental health, and the importance of asking directly regarding suicide is emphasised. [ABSTRACT FROM AUTHOR]

Rush, E., et al. (2012). "A school-based obesity control programme: Project Energize. Two-year outcomes." *The British Journal of Nutrition* 107(4): 581-587. Through-school nutrition and physical activity interventions are designed to help reduce excess weight gain and risk of chronic disease. From 2004 to 2006, Project Energize was delivered in the Waikato Region of New Zealand as a longitudinal randomised controlled study of 124 schools

(year 1-6), stratified by rurality and social deprivation, and randomly assigned to intervention or control. Children (686 boys and 662 girls) aged 5 (1926) and 10 (1426) years (692 interventions and 660 controls) had height, weight, body fat (by bioimpedance) and resting blood pressure (BP) measured at baseline and 2 years later. Each intervention school was assigned an 'Energizer'; a trained physical activity and nutrition change agent, who worked with the school to achieve goals based on healthier eating and quality physical activity. After adjustment for baseline measures, rurality and social deprivation, the intervention was associated with a reduced accumulation of body fat in younger children and a reduced rate of rise in systolic BP in older children. There was some evidence that the pattern of change within an age group varied with rurality, ethnicity and sex. We conclude that the introduction of an 'Energizer led' through-school programme may be associated with health benefits over 2 years, but the trajectory of this change needs to be measured over a longer period. Attention should also be paid to the differing response by ethnicity, sex, age group and the effect of rurality and social deprivation. [PUBLICATION ABSTRACT]

Shulruf, B., et al. (2008). "Individual and school factors affecting students' participation and success in higher education." *Higher Education* 56(5): 613-632. The purpose of this study is to identify school factors that affect students' achievements at the secondary and tertiary levels of education. The analysis included data of 9,894 students who studied in Auckland regional secondary schools in 2004. The results indicate that, although student demographic characteristics are associated with students' pathways and achievements, schools' demographic composition did not affect student outcomes. It was found, however, that schools' organisational factors do have an effect. At the university level, none of the schools' characteristics was related to students' achievements at the higher end of the achievement scale ($GPA \geq 4$). However, students from private or state-integrated schools were found to be more likely to achieve low GPA (<2) than students who came from state schools. In conclusion, it is suggested that interventions targeting at-risk populations based on demographic factors should focus on individuals or groups rather than on institutions;

while school-based interventions should identify the schools by their structure and function rather than by their demographic characteristics. [PUBLICATION ABSTRACT]

Skidmore, P. M. L., et al. (2013). "Sleep duration and adiposity in older adolescents from Otago, New Zealand: relationships differ between boys and girls and are independent of food choice." *Nutrition Journal* 12(1): 128.

Background: While relationships between sleep and BMI have been extensively studied in younger children the effect of sleep duration on adiposity in adolescents, who are undergoing rapid growth periods, is less well known. There is also a lack of consistent evidence on the role of sleep on other measures of adolescent body composition which may be more reflective of health than BMI in this age group. Previous research investigating whether these relationships differ between sexes is also inconsistent. Therefore the objective of this study was to investigate relationships between sleep duration and multiple body composition measures in older adolescents and to investigate if these relationships differ between boys and girls. Methods: A web-based cross-sectional survey and anthropometric measurement of 685 adolescents (mean age 15.8 years) from 11 schools in Otago, New Zealand. Height and weight were measured by trained researchers and fat mass and fat-free mass were estimated using bio-impedance. Generalised estimating equations were used to examine associations between sleep duration and the following body composition measures: BMI, waist circumference (WC), waist-to-height ratio (WHtR), fat mass index (FMI), and fat-free mass index (FFMI). Analyses were adjusted for ethnicity, deprivation, the number of screens in the bedroom and fruit and vegetable consumption. Results: When data from all participants were analysed together, no significant relationships were seen between sleep duration and any body composition measure but significant sex interactions were seen. An hour increase in average nightly sleep duration in boys only was associated with decreases of 1.2% for WC, 0.9% for WHtR, 4.5% for FMI and 1.4% for FFMI in multivariate models. Similar results were seen for weekday and weekend night sleep duration. Conclusions: Sex specific factors may play a role in relationships between sleep and body composition in older

adolescents. The results in boys were most pronounced for FMI, a measure of total adiposity, which suggests that insufficient sleep in adolescent boys may affect fat mass more than lean mass and that the use of measures such as BMI may result in an under-estimation of relationships.

Smith, S. and H. Timperley (2008). "Potential Chokepoints in the National Certificate of Educational Achievement for Attaining University Entrance." New Zealand Journal of Educational Studies 43(2): 63-72.

This article seeks to understand the potential impact of the complexity of the university entrance criteria on students' opportunities to qualify for entry through the National Certificate of Educational Achievement (NCEA). The exploration of this issue was undertaken through an analysis of 'chokepoints' experienced by students who potentially were in a position to meet university entrance criteria with the view to optimising their opportunities. The analysis was undertaken on the national dataset of students who had taken one or more Level 3 standards. The main chokepoint identified for all groups was the particular selection of subjects studied rather than the number of credits achieved.

[PUBLICATION ABSTRACT]

Tipler, K. S., et al. (2016). "New Zealand ShakeOut exercise: lessons learned by schools." Disaster Prevention and Management 25(4): 550-563.

Purpose - The purpose of this paper is to identify lessons learned by schools from their involvement in the 2012 New Zealand ShakeOut nationwide earthquake drill. Design/methodology/approach - The results from a survey conducted with 514 schools were collated to identify the emergency preparedness lessons learned by schools through their participation in the ShakeOut exercise. Findings - Key findings indicated that: schools were likely to do more than the minimum when presented with a range of specific emergency preparedness activities; drills for emergency events require specific achievement objectives to be identified in order to be most effective in preparing schools; and large-scale initiatives, such as the ShakeOut exercise, encourage schools and students to engage in emergency preparedness activities. Practical implications -

Based on the findings, six recommendations are made to assist schools to develop effective emergency response procedures. Originality/value - The present study contributes to the ongoing efforts of emergency management practitioners and academics to enhance the efficacy of school-based preparedness activities and to, ultimately, increase overall community resilience.

Upadhyay, V., et al. (2008). "Primary school children: access to toilets." Acta Paediatrica 97(11): 1546-1549.

Aim: Most children are continent of urine by the time they are in primary school. Balanced micturition and paradoxically dysfunctional voiding (DV) are acquired behaviour. Children need easy access to toilets at school, to comply with timed voiding which is part of the treatment for DV. This study investigated children's access to primary school toilets in Auckland. Methods: A questionnaire was sent to 97 primary schools listed on the New Zealand ministry of education (MoE) website for the Auckland region. Information regarding the school decile rating, population, rota, toilet facilities and toilet policy was requested. Six randomly selected schools were visited to verify the facilities available there. Results: Eighty-four percent of the schools in our sample complied with the prescribed statutory minimum for both boys and girls toilets. There was a median ratio of 11 children per facility. The median duration to use a facility during the first recess was 2 min. Conclusion: In general, the toilet facilities and utilization ratios in primary schools in the Auckland region appear to provide a healthy environment for urination. Schools must be encouraged to draft and adhere to a toilet policy to ensure a uniform toilet environment. [ABSTRACT FROM AUTHOR]

Wang, G. and B. Shulruf (2013). "Admission Model and Equity in Higher Education." The Asia - Pacific Education Researcher 22(1): 111-117.

Equity in higher education is mostly related to the context in which it is discussed. Most commonly, equity is sought for enhancing access to higher education for under-represented groups such as minorities, low income groups, or any other type of disadvantaged group of people. The plethora of research in this area mostly focuses on different types of

affirmative action aiming to enroll more under-represented groups in higher education, whereas in the research on equity, within the context of educational outcomes and quality, the interaction between equity and quality in higher education is scarce. This paper discusses the entangled issues of equity and quality in higher education and explores the possible solutions to promoting both. It concludes that admission models aiming to achieve equity in higher education should be more outcomes-based (e.g., increase success) rather than process-based (e.g., increase participation).

White, J., et al. (2015). "Exploring comorbid use of marijuana, tobacco, and alcohol among 14 to 15-year-olds: findings from a national survey on adolescent substance use." BMC Public Health 15(1): 1-9.

Background: Understanding the patterns of comorbid substance use, particularly among adolescents, is necessary to address resulting harm. This study investigated the prevalence of comorbid use of marijuana, tobacco and binge drinking among 14 to 15-year-olds. The study also examined the relationship between comorbid substance use and behaviour frequency and explored common underlying risk factors for comorbid substance use. Methods: A nationally representative sample of 3,017 New Zealand Year 10 students completed self-report measures of marijuana use, tobacco use, binge drinking and socio-demographic characteristics in the 2012 Youth Insights Survey (YIS). Weighted population estimates were calculated. Ordinal logistic regression models were constructed to a) investigate the relationship between comorbidity and substance use behaviour frequency, and b) profile those with the greatest degree of comorbid substance use. Results: In the past month, one-in-twenty (4.7%) students had engaged in all three substance use behaviours, 5.8% in two, and 11.9% in one. Around half of adolescents who had engaged in one had also engaged in another, with three-quarters of tobacco-users also using marijuana and/or binge drinking. Respondents who reported a greater degree of comorbidity were likely to engage in substance use behaviour more frequently. Comorbid substance use was significantly predicted by gender, ethnicity, school decile status, past week income, social connectedness, and parental monitoring and

rule enforcement. Conclusions: The results identify a core group of adolescents sharing common characteristics who frequently engage in comorbid substance use behaviours. More sophisticated and wider interventions addressing multiple substances are required, especially for marijuana and tobacco use. [ABSTRACT FROM AUTHOR]

Wikaire, E., et al. (2016). "Patterns of privilege: A total cohort analysis of admission and academic outcomes for Māori, Pacific and non-Māori non-Pacific health professional students." BMC medical education 16(1): 262.

Wilson, M., et al. (2011). "whina: a programme for Maori and Pacific tertiary science graduate and postgraduate success." Higher Education 62(6): 699-719.

In New Zealand, Maori (indigenous New Zealanders) and Pacific students tend not to attain the same levels of educational success as Pakeha (New Zealanders of European descent). Addressing this problem is a particular challenge in the sciences. The kaupapa (values-base) of Te Rpu whina (whina) is to produce Maori and Pacific professionals to contribute to Maori and Pacific development and leadership through the creation of an inclusive off- and on-campus whanau (extended family) environment where high expectations, aspirations and achievement, collective success, and reciprocity are normalised. This paper reviews theories and practices of recruitment and retention relevant to Maori and Pacific students at tertiary level, presents the rationale for whina in the Faculties of Science and Architecture and Design at Victoria University of Wellington, and assesses the impact of the whanau. Based on analyses of quantitative measures of student achievement, and biennial surveys of student responses from the first 6 years of whina, it is suggested that the results are consistent with improving Maori and Pacific graduate and postgraduate achievement and retention. Potential implications for efforts to reduce disparities in tertiary education in New Zealand and elsewhere are summarised.[PUBLICATION ABSTRACT]

Wood, B. E. (2014). "Researching the everyday: young people's experiences and expressions of citizenship." International Journal of Qualitative Studies in Education 27(2): 214-232.

This paper reports on a research study which drew attention to the constitutive nature of the everyday world in young people's subjectivities and practices of citizenship. Central to the aim of this research was a need for alignment between the focus of the research ('everyday' citizenship), with methods which could illuminate the day-to-day experiences of being a citizen. In this paper, I re-examine some of the 'everyday' data generated by two research methods which were initially discounted as rambling or divergent. This data characteristically had frequent interjections, incomplete sentences, questions and queries, or a sense of ambiguity and uncertainty. Through a re-analysis of this data, I consider the potential it offers to contribute conceptual and theoretical insights into young people's citizenship dispositions and practices. The research revealed the diverse, complex and contested understandings of citizenship that young people were forming in the context of day-to-day social and spatial interactions.

[NB: Paid full text access only - cannot check use of decile data]

Young-Loveridge, J. M. (2006). "Enhancing the mathematics achievement of Pasifika students : performance and progress on the Numeracy Development Project." Waikato journal of education 12: 101-115.

Analyses data from the Numeracy Development Project (NDP) carried out in New Zealand schools between 2002 and 2005. Observes the improvement in Pasifika student performance over the period. Notes that there are other factors influencing the outcomes including changes in the assessment tools used, and changes in the decile level of schools participating in the study.