

KŌTĀTĀ

INSIGHT

BEHAVIOURAL ECONOMIC & SOCIAL ANALYSIS

**The impact of multiple disadvantage
on subjective wellbeing:**

New Zealand Families

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December 2019

Disclaimer

Access to the data used in this study was provided by Statistics New Zealand under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The results presented in this study are the work of the authors, not Statistics NZ or the Ministry of Social Development.

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1. Introduction

Social policy is primarily targeted at the wellbeing of citizens. In Aotearoa New Zealand this can be seen formally through government documents and analytical frameworks such as Treasury's Living Standards Framework or the Ministry of Social Development's (MSD) Families and Whānau Wellbeing Research Programme, and also in practice through the services delivered by government agencies.

Disadvantage, with respect to wellbeing outcomes such as poor health, low incomes, unemployment, and low levels of educational attainment, has traditionally been among the main targets for social sector agencies. In fact, the central government social sector agencies are, to a large degree, each built around one of these outcome areas (ie, health, education, low incomes).

Wellbeing outcomes, however, are not independent of each other. People and families can experience poor outcomes with respect to more than one area of wellbeing, and the interactions between disadvantage in different areas of wellbeing potentially have a large impact on peoples' lives. This issue was noted by the Commission on the Measurement of Social Progress and Economic Performance (Sen, Stiglitz, Fitoussi, 2009) when they recommended that:

indicators pertaining to different quality-of-life dimensions should be considered jointly to address the interactions between dimensions and the needs of people who are disadvantaged in several domains.

In 2016, to better understand the co-occurrence of poor wellbeing outcomes and their effects on New Zealand families¹, Superu began a multi-year research programme on multiple disadvantage. The primary aim of that work was to develop a way to measure multiple disadvantage and use it to explore:

- the prevalence of multiple disadvantage across New Zealand families,
- the types and combinations of disadvantage most commonly experienced, and
- the disadvantages with the greatest impact on family wellbeing.

Following Superu's disestablishment in 2018, this research was transferred to MSD as part of the Families and Whānau Wellbeing Research programme. This paper builds on significant foundational work published in the *2017 and 2018 Families and Whānau Status Report* (Superu, 2017a; Superu 2018; see also Superu, 2017b).

While we present some of the key highlights of that work below, we urge any reader coming to this work for the first time to consult these previous publications for a fulsome discussion of our multiple disadvantage measure and the initial findings.

The *2017 Status Report* presented our (and New Zealand's) first measure of multiple disadvantage, and the findings from our analysis of the *2014 New Zealand General Social Survey* (NZGSS). This original measure uses 17 indicators from the GSS to assess whether someone is experiencing disadvantage in any of eight life domains: Income, Material Wellbeing, Employment, Education, Health, Housing, Safety, and Connectedness².

Although the primary policy focus for Superu was family wellbeing, the NZGSS is a survey of individuals and as a result, Superu's multiple disadvantage analysis largely measured multiple disadvantage in terms of outcomes for individuals. We describe someone as experiencing multiple disadvantage if they have *three or more life domains in disadvantage*.

¹ For an in-depth discussion of how Superu, and this work, defines family, please see pgs 181-182 in Superu (2018).

² A detailed discussion of how this measure was created and the descriptive statistics around it is included in Superu, 2017b.

Some key findings from our work in the 2017 Report include:

- more than one in six, or 17.6 percent, of New Zealand adults face multiple disadvantage (three or more life domains in disadvantage).
- of all the disadvantage observed, half takes the form of multiple disadvantage (co-occurring with disadvantage in two or more other life domains).
- the rate of multiple disadvantage varies greatly across family type, from 8 percent of young couples without children to 50 percent of sole parents with young children.
- The mean life satisfaction varied a full three points (on a ten point scale) between those with no domains in disadvantage (8.2) and those with seven domains (5.2). For perspective, the mean life satisfaction between countries globally is five points, meaning a three point difference is equivalent to 60% of the difference in mean life satisfaction scores between a country like Denmark with one of the highest scores and a country with one of the lowest such as Togo or Benin.³

The 2018 Report built on the foundational work of the 2017 report with two chapters that included:

- an examination of differences in the rate and type of multiple disadvantage faced by families across region and ethnic grouping using combined data from the 2014 and 2016 NZGSS.
- an exploratory project using NZGSS data linked to the Integrated Data Infrastructure (IDI)⁴ to investigate how government expenditure maps to individuals with different levels of disadvantage.

While the research over the last two years has covered almost all the original aims of the multiple disadvantage work programme, we have yet to formally examine the relationship between multiple disadvantage across the different dimensions of wellbeing and how this impacts on people's overall sense of wellbeing.

To close this gap, this report investigates the relationship between multiple disadvantage and life satisfaction and aims to characterise the nature of that relationship.

In particular, we examine whether additional disadvantages simply affect wellbeing in an additive fashion, or whether the relationship is more complex. Using an analytical approach developed by Berthoud (2003), the paper formally tests the nature of the relationship between life satisfaction and the different dimensions of wellbeing. The report is organised as follows:

- Section 1 of the paper sets out the theoretical frameworks used, including wellbeing and the general approach to categorising the different possible relationships between multiple disadvantage and life satisfaction.
- Section 2 describes the data used in this analysis and how multiple disadvantage will be measured. It also sets out the formal tests used to investigate the relationship between multiple disadvantage and life satisfaction.
- Section 3 discusses the main results of the paper and discusses some possible interpretations of the results.
- Sections 4 and 5 conclude and discuss next steps

³ See OECD (2013), *OECD Guidelines on Measuring Subjective Well-being*, OECD Publishing.

⁴ The IDI is a large research database containing Microdata about businesses, people, and households from governmental agencies, non-governmental organisations, and Statistics New Zealand surveys.

Wellbeing and Multiple Disadvantage

Wellbeing refers to a person's welfare, quality of life, or what an economist might think of as 'utility'. Often framed with reference to Sen's capabilities theory (Sen, 1993), the wellbeing of a person is taken to be 'the ability of that person to live the sort of life they have reason to value, as measured across a vector of capabilities describing what the person is able to do.' Although a wide range of different capabilities could potentially be identified, there is broad consensus around the range of dimensions of wellbeing visible in most attempts to measure wellbeing empirically (eg MSD, 2003; Sen, Stiglitz, and Fitoussi, 2009; OECD, 2011; UNECE, 2014; Smith, 2018).

Despite a relatively wide consensus that wellbeing is multi-dimensional and fairly robust agreement on the relevant dimensions of wellbeing, the literature on multiple disadvantage and wellbeing is relatively thin. There is a fairly well developed literature on multidimensional poverty (eg Alkire and Foster, 2009) that is similar to multiple disadvantage in that it considers disadvantage across a range of different domains based explicitly on Sen's capabilities. The method for counting multidimensional poverty used by Alkire and Foster (2009) is conceptually similar to the classification of multiple disadvantage adopted by Superu in their analysis of *Patterns of multiple disadvantage across New Zealand families* (2017). Specifically, a threshold is set with respect to each dimension of wellbeing and then a poverty/disadvantage measure is set with reference to the number of dimensions in which disadvantage is experienced.

While multidimensional poverty literature takes a similar approach to that adopted by Superu, there have been other attempts to consider the distribution of disadvantage across people and different dimensions of wellbeing and how these relate to a single uni-dimensional construct. Decancq and Lugo (2012) consider the technical issues involved in measuring the inequality of wellbeing across dimensions and between people (see also Decancq, Decoster, & Schokkaert), and have applied multidimensional inequality indices to a number of datasets. To date, however, the use of this approach remains limited due to the complex nature of the indices used and the strong assumptions regarding social preference functions.

Although there is extensive literature on the relationship between life satisfaction and the different dimensions of wellbeing (eg Boarini et al, 2012; Brown, Smith, and Wolff, 2012; Jia and Smith, 2016; Helliwell et al, 2018), there is comparatively little analysis on the relationship between multiple disadvantage across the different dimensions of wellbeing and subjective wellbeing. Morrone and Piscitelli (2016) provide an interesting analysis of the relationship between multiple disadvantage in the different dimensions of wellbeing and life satisfaction using regression tree analysis on Italian data. They find evidence of a linear effect on life satisfaction from the different dimensions of disadvantage, but also evidence that different specific combinations of disadvantage matter to peoples' subjective outcomes.

Since this paper is an extension of Superu's previous work on multiple disadvantage, we have used the multiple disadvantage measure outlined in Superu, 2017b as our starting point for exploring the relationship between multiple disadvantage and subjective wellbeing. As discussed in that paper, there is no consensus or best-practice approach to measuring multiple disadvantage. Therefore, the domains and indicators used in any particular measure will depend on the conceptual framework being used, the intended use of the measure, and the data sources available to the researchers (Superu, 2017b). Since one of the key objectives of the Superu measure is to assess the prevalence and type of multiple disadvantage for people in different family types, indicators of disadvantage that apply to all family members were used where possible. While this means that indicators in some domains will differ from traditional life satisfaction modelling⁵, including them allows us to consider their relationship to family wellbeing.

⁵ For example, employment disadvantage in Superu's multiple disadvantage measure is determined by whether there was at least one adult of working age in a household that received income from wages,

Superu's multiple disadvantage measure was constructed using Superu's *Family Wellbeing Framework* (Superu, 2015) as a starting point. This framework is broadly comparable in scope to the individual wellbeing frameworks discussed above but is constructed around family outcomes. Key dimensions of wellbeing to be considered include:

- Health
- Relationships and connections
- Economic security and housing
- Safety and environment
- Skills, learning and employment
- Identity and sense of belonging.

For the purposes of this paper we explore multiple disadvantage in families in Aotearoa New Zealand using a slightly adapted version of this *Family Wellbeing Framework*. It is possible to create indicators of disadvantage in the different dimensions of the *Family Wellbeing Framework* (Superu, 2017b), and this paper follows a generally similar methodology⁶. However, to investigate the relationship between multiple disadvantage and overall wellbeing (of either the individual or the family) we need one single measure that captures the net impact of disadvantage in different areas on overall wellbeing.

Ideally, we would like a robust single measure of overall family wellbeing to use as the reference point for the analysis in the paper. However, in practice the choice is between a robust well-understood measure of individual subjective wellbeing and a difficult-to-interpret subjective evaluation of family wellbeing (see Box 1). On the basis of existing evidence, *individual life satisfaction* is the best understood subjective measure of overall wellbeing and is therefore used as the primary measure of overall wellbeing in the rest of this paper. However, a measure of satisfaction with family wellbeing is also tested for comparison.

salary, or self-employment in the past 12 months. While this measure still captures information about the employment status of the respondent, it is a more stringent threshold than whether the survey respondent was unemployed at the time of the survey, a more commonly used indicator in subjective wellbeing studies.

⁶ Due to the limitations of the available NZGSS data, the measures of disadvantage used by Superu largely relate to individual outcomes. While this represents a significant limitation from the perspective of measuring family wellbeing, the NZGSS is essentially the only large-scale high-quality dataset available in New Zealand that allows for the analysis of disadvantage across multiple different dimensions of wellbeing at the same time.

Box 1. Subjective approaches to measuring wellbeing

The primary purpose of this paper is to test the relationship between multiple disadvantage and subjective wellbeing for New Zealand families. The *Family Wellbeing Framework* provides a basis for organising indicators of disadvantage, but it is also necessary to select a measure of subjective wellbeing. An ideal subjective wellbeing measure would have a strong body of evidence supporting its reliability and validity, and would focus on family wellbeing specifically. With that in mind, the NZGSS offers two potential questions that could serve as a measure of subjective wellbeing for our aims: one assessing individual life satisfaction, and assessing subjective family wellbeing from the perspective of a single family member. The pros and cons of these measures are discussed below.

Individual life satisfaction is the most widely used measure of subjective wellbeing and is supported by an extensive body of evidence (OECD, 2013). It captures information on peoples' evaluative view of how their life is going. Although primarily an individual measure, overall life satisfaction is affected by the circumstances of the respondent's family members and is thus a candidate measure for examining the impact of multiple disadvantage on family wellbeing (Powdthavee, 2009; Heady, Muffels, and Wagner, 2012). The question contained in the NZGSS is a variant of the standard international question:

I am going to ask you a very general question about your life as a whole these days. This includes all areas of your life.

Looking at showcard 17, where zero is completely dissatisfied, and ten is completely satisfied, how do you feel about your life as a whole?

In addition to life satisfaction, the NZGSS has another measure of subjective wellbeing that could be used. The NZGSS family wellbeing question is focused much more closely on the family as the unit of measurement than overall life satisfaction. However, the question lacks a significant body of evidence on its validity and reliability, making the results of analysis using the question more difficult to interpret. The question wording from the NZGSS is:

I now have some questions about your family.

First of all, I'd like you to think, in general, about how your family is doing.

Looking at showcard 65, where zero means extremely badly and ten means extremely well, how would you rate how your family is doing these days?

While the family wellbeing question is conceptually more closely related to the focus of this paper, the lack of a sound evidential basis for it is a significant issue. Although life satisfaction is not as closely related to the concept of family wellbeing, there is evidence of significant correlation in the life-satisfaction scores of family members (Winkelmann, 2004) and that life satisfaction captures meaningful information on the wellbeing outcomes of other family members (eg Heady, Muffels, and Wagner, 2012). For the main analysis in this paper, therefore, life satisfaction is used to test the impact of multiple disadvantage. However, because no evidence base for the NZGSS subjective question on family wellbeing will ever be developed if it is not used, the analysis is also replicated using the NZGSS family wellbeing question. This analysis is reported separately (in Box 2) from the primary analysis.

A taxonomy of multiple disadvantage

In the context of family wellbeing, multiple disadvantage refers to the situation where members of a family experience poor outcomes in more than one dimension of wellbeing. For example, a family that had both a low income and a family member with poor health outcomes might be said to experience multiple disadvantage.

In some studies (eg Superu, 2017b) a threshold is set for the minimum number of dimensions of wellbeing in which a family must experience disadvantage to be counted as facing multiple disadvantage. Here, because the focus of the paper is on the relationship between increasing numbers of disadvantages and life satisfaction, no threshold is set. Instead, the paper examines how life satisfaction decreases as the number and type of disadvantages experienced increases.

The general approach for our analysis is provided by Berthoud (2003) in his examination of multiple disadvantage in the labour market. Berthoud presents a model for thinking about the relationship between multiple disadvantage and a single outcome that might be affected by the level of disadvantage. Specifically, Berthoud identifies six hypothetical possibilities for how disadvantages might combine to impact the likelihood of non-employment. The labels he uses for these hypotheses are: **additive**, **combinations**, **independent**, **exponential**, **logarithmic**, and **class**. We can apply these broad classifications to the relationship between life satisfaction and the different dimensions of multiple disadvantage as follows:

Additive

This presumes each disadvantage reduces a person's subjective wellbeing independently of any other disadvantage such that the overall impact of multiple disadvantage on life satisfaction is simply equal to the sum of the independent effects of each domain of disadvantage. For example, if the additive hypothesis is correct, the average impact of experiencing disadvantage in both health and employment would be the same as what we would expect from looking at the impact of disadvantage in health and disadvantage in employment in isolation from each other and then adding up the results. Further, if it were the case that health and employment disadvantage had equal impacts on subjective wellbeing, experiencing both at the same time would be twice as bad as just experiencing one of them.

Combinations

Specific combinations of disadvantage might have an impact on life satisfaction over and above the sum of their independent effects. This would occur where interactions between two types of disadvantage made the combined effect better or worse than one would anticipate from looking at either in isolation. For example, if a lack of social contact made the experience of poor health worse than otherwise because of the lack of anyone to provide care, the effect of experiencing poor health and lacking social connections might be worse than one would anticipate simply from summing the individual effects of poor health and of having no social connections.

Independent

The independent hypothesis is an extension of the view that combinations matter. The idea here is that rather than specific combinations of disadvantage having an effect over and above the sum of their individual effects, it is only *specific combinations of disadvantage* that matter. In this case we would find no additive effect from individual disadvantages once the important combinations had been identified. For example, an independent relationship would occur if the combination of a lack of both safety and social connectedness was associated with lower life satisfaction but neither lack of safety or lack of social connectedness were associated with lower life satisfaction on their own.

Exponential

It may be that it is the *number of disadvantages* rather than specific combinations of them that drives any additional impact on life satisfaction over and above the individual effects. If this relationship is such that the more disadvantages a person experiences, the lower their life satisfaction is, over and above the sum of individual effects, then the impact of multiple disadvantage is said to be exponential. This might occur because an increasing number of disadvantages exhausts people's cognitive bandwidth and ability to cope, making increasing degrees of multiple disadvantage much worse than would be anticipated by looking at the effects of each type of disadvantage on its own.

Logarithmic

If the effect of the number of additional disadvantages is to reduce the impact of disadvantage over and above the sum of the individual effects then we can characterise the relationship as logarithmic. This is essentially the inverse of the exponential relationship. A logarithmic relationship might be expected if, after a given level of disadvantage, additional hardships simply lack the ability to make life much worse.

Class

Finally, it is possible that when all functional forms are considered there is only one relationship that really matters. This type of relationship is labelled "class" since in the original labour market context it captured the idea that social class might be the only thing that really mattered in the UK labour market.

For the purposes of this analysis we retain the first three of Berthoud's classifications (**additive, combinations, and independent**) but we drop **exponential, logarithmic, and class** from the investigation.

The **exponential** and **logarithmic** hypotheses present significant technical challenges (discussed in the following section) and **class**, while making sense in the context of British labour market research, is difficult to interpret meaningfully with respect to multiple disadvantage.

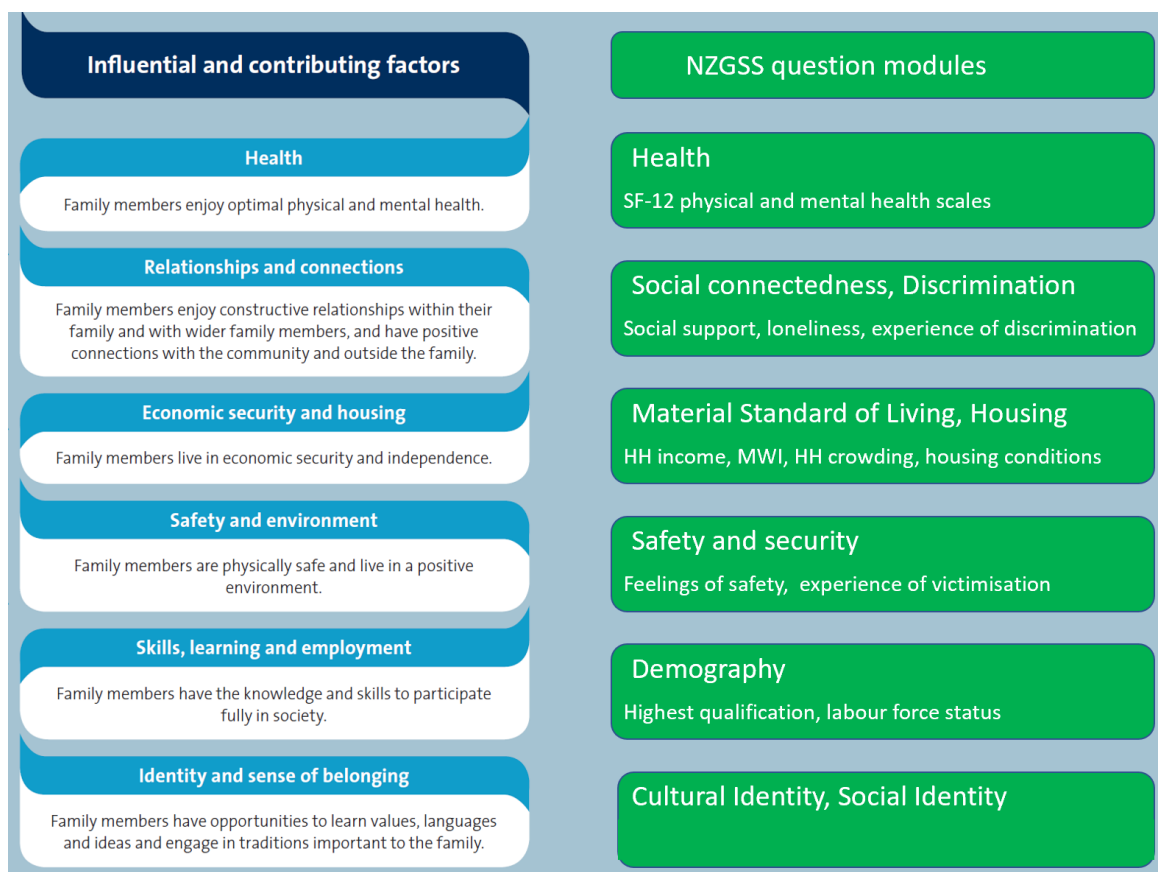
2. Data and method

Data

Two datasets are used in this analysis. These are the 2014 and 2016 waves of the *New Zealand General Social Survey* (NZGSS). During the early stages of the project consideration was given to including *Te Kupenga 2013* and the *2013 Disability Survey* in the analysis to achieve a larger total sample size. However, initial exploratory analysis identified that there was not a sufficient range of wellbeing measures in common between *Te Kupenga*, the *Disability Survey* and the NZGSS for this to be feasible. While some of the key measures were collected consistently across all surveys (eg life satisfaction), a number of important measures of specific dimensions of disadvantage were available only in the NZGSS.

The NZGSS is carried out by Statistics New Zealand every two years and is constructed explicitly around a wellbeing framework. This makes it a particularly useful survey for investigating multiple disadvantage as it has measures for most of the different dimensions of wellbeing included in Superu's *Family Wellbeing Framework* for the same individual at the same time. Figure 1 below illustrates the "influencing and contributing factors" in the *Family Wellbeing Framework* and the structure of the NZGSS.

Figure 1: The Family Wellbeing Framework and the NZGSS



It can be readily seen that the NZGSS question modules cover the range of outcomes represented in the Family Wellbeing Framework well with no obvious gaps. The 2017 report *Patterns of multiple disadvantage across New Zealand Families* (Superu, 2017) sets out the methodology used to construct specific indicators of disadvantage across each of eight domains modified from those outlined in Figure 1. These were: income, material wellbeing, employment, education, health, housing, safety, and connectedness.

Compared to the framework in Figure 1, economic security and housing was teased out into three separate domains (income, material wellbeing, housing), while skills, learning and employment became two distinct domains (education and employment).

For the analysis in this paper the same broad approach adopted in the 2017 report is repeated: several important wellbeing domains are selected, along with relevant indicators for identifying disadvantage in those domains. However, there have been some minor methodological changes in how the indicators are constructed. The most significant of these is to combine income and material wellbeing into one single domain for this report as the measures used (income and the material wellbeing index) are both intended to capture broadly the same content. Since both these domains in the 2017 measure use a single indicator to identify disadvantage (low equivalised household income and low scores on the material wellbeing index respectively) we included both indicators in the material wellbeing domain for this paper.

Selection of a disadvantage threshold for the new material wellbeing domain was done with the aid of Bryan Perry, whose annual *material wellbeing* reports extensively examine measurement and trends in this domain. Given the known mis-match between groups identified by income and non-income measures of material wellbeing⁷ (some people with low incomes are not materially deprived, and some people facing material deprivation have high incomes) we opted for a conservative approach that required *both* low income and low material wellbeing index scores to meet the threshold for material wellbeing disadvantage.

With such an approach, Bryan advocates that both groups (those with low income and those with low index scores) are roughly the same size (Perry, 2017, p69 Technical Note). To achieve this, we shifted the score range of the material wellbeing index indicator from 0-7 to 0-10, giving roughly similar proportions with low equivalised household income and low material wellbeing index scores.

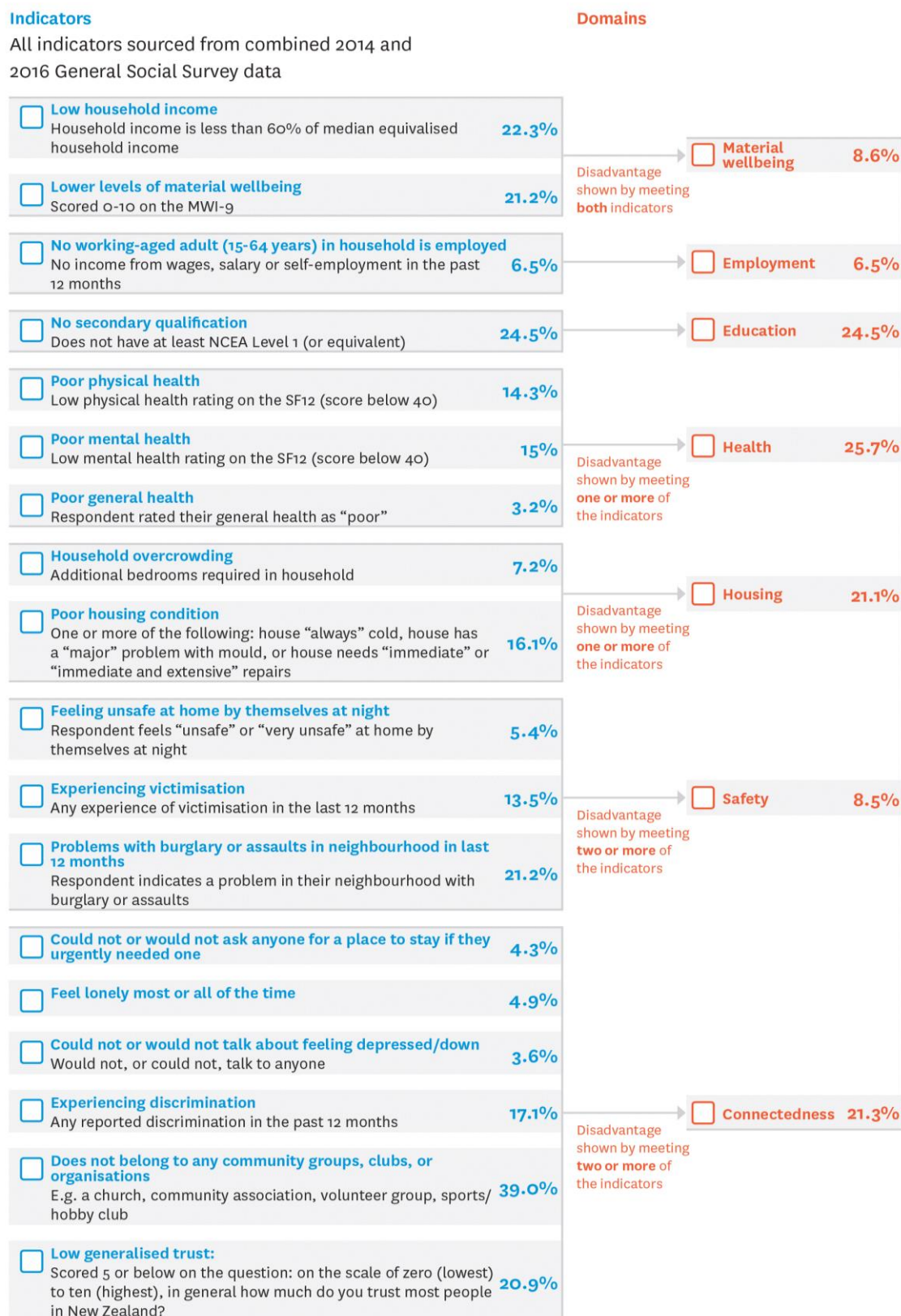
Figure 2 below illustrates the domains of wellbeing used in this analysis and the specific indicators used to measure disadvantage in each domain.

The 2014 NZGSS had an 80 percent response rate and an achieved sample size of 8,795 responses. For 2016, the relevant figures are 84 percent and 8,493 responses. After combining the two datasets and eliminating observations for which there was not a complete response for all the relevant variables, the resulting combined dataset has 16,371 observations. The core descriptive statistics for the variables used in this paper are included in Annex 1 as Table A1.

⁷ Some people with low incomes are not materially deprived, while some people facing material deprivation have high incomes. For a larger discussion, see Perry 2017, pgs 63-69.

Figure 2: Indicators and wellbeing domains used to identify multiple disadvantage

Percentages show the proportion of the total population aged 15 and above



Source: NZGSS 2014-2016. Results are weighted to represent the New Zealand adult population.

Method

To investigate the relationship between multiple disadvantage and life satisfaction we estimate a series of regression models. The left-hand side variable for the models is the life satisfaction measure used in the NZGSS from 2014 and 2016. This collects information on the respondent's overall satisfaction with their life on an eleven-point (0-10) scale and is consistent with international best practice (OECD, 2013). On the right hand side we introduce a series of demographic control variables and measures of disadvantage.

Prior evidence suggests that life satisfaction measures can be treated as though they are a continuous variable (Ferrer-i-Carbonell and Frijters, 2004), even though they should, in principle, be considered an ordinal variable. With a continuous variable it is possible to use an ordinary least squares (OLS) regression which is easy to implement and interpret and should generally produce meaningful results. For this reason, the primary analysis uses an OLS⁸, but the results have been replicated using an ordered PROBIT model and there are no important qualitative changes.

The core of the analysis is built around five equations. Equation 1, below, captures the linear relationship between disadvantage and life satisfaction. It tests the **additive** hypothesis of the relationship between multiple disadvantage and life satisfaction. In other words, it captures the effect of each type of disadvantage independently from the experience of other disadvantages.

Equation 1

$$L = \alpha_0 + \delta D + \beta W + \varepsilon$$

Where L = life satisfaction, D is a vector of demographic control variables (age, age², dummy variables for Māori, Pacific, Asian, or other ethnicity, sex, family type, and survey wave)⁹, and W is a vector of wellbeing outcome measures composed of dummy variables for disadvantage in each of the following wellbeing domains: material living standards, employment, education, health, housing, safety, connectedness, and governance.

The main aim here will be to test the effect of each wellbeing domain on life satisfaction. We expect negative and significant coefficients on each β term reflecting an expected negative impact from disadvantage in any one domain of wellbeing on overall life satisfaction. If this expectation holds then the model is consistent with the **additive** model of multiple disadvantage as outlined in section 1.

The second equation moves on to test the **combinations** and **independent** hypotheses by incorporating interaction terms for specific combinations of disadvantage. Equation 2 essentially repeats Equation 1 with the introduction of X , which captures a vector of interaction terms between the different measures of disadvantage.

Equation 2

$$L = \alpha_0 + \delta D + \beta W + \gamma X + \varepsilon$$

The interaction terms will allow us to test whether there are specific **combinations** of disadvantage that drive life satisfaction. If interactions matter over and above the linear impact of disadvantage implied by the **additive** hypothesis, then the coefficient γ_n (where n refers to the n^{th} combination of disadvantage measures) will be significant. Similarly, if specific combinations of disadvantage are sufficiently important that disadvantage is **independent** of the various other combinations of disadvantage γ_n will be significant and no β term will be significant.

⁸ In fact, the regressions were estimated in SAS using PROC SURVEYREG to take into account the stratified nature of the NZGSS sample.

⁹ These represent a fairly standard set of demographic controls used in the analysis of life satisfaction data. See, for example, (Brown, Smith, and Woolf, 2012; Boarini et al, 2012; and Helliwell et al, 2009).

Implementing Equation 2 represents a more significant challenge for this piece of work than was the case in the labour market study on which it is modelled (Berthoud, 2003). Where Berthoud used only five dimensions to explain poor labour market outcomes, there are eight indicators of disadvantage Family Wellbeing Framework. The effect of this is that where Berthoud needed to deal with only 21 interaction terms, considering all possible interactions from eight indicators would result in a total of 246 interaction terms for the model. Such a large number of independent variables raises issues over degrees of freedom, over-identification, and the near certainty of false positives at conventional levels of significance.

To address this issue we make three adjustments in implementing Model 2. First, we drop the education domain from the analysis of disadvantage. The impact of education on life satisfaction is largely mediated via other domains of disadvantage (Boarini et al, 2013) that are already captured in the model, so the inclusion of education adds little value. We also combine income and material wellbeing into a single domain as these two indicators from the 2017 Superu report are actually alternative measures of the same concept (material living standards). This reduces the number of domains to 6. We then focus only on two-way and three-way interaction terms when looking for **combinations** of disadvantage, giving a manageable total of 35 interaction terms to deal with.

Having tested for combinations and independent effects, we would have liked to then test the **exponential** or **logarithmic** hypotheses discussed in section 1. Conceptually this might be represented by Equation 3, where N is the count of disadvantages for each individual.

Equation 3

$$L = \alpha_0 + \delta D + \beta W + \gamma X + \eta N + \varepsilon$$

Equation 3 is, however, impossible to implement. Because N is simply the sum of the terms in W (which are all binary dummy variables)¹⁰ we cannot estimate Equation 3 directly. Given these difficulties, we have decided not to further explore the **exponential** or **logarithmic** hypotheses in this paper.

3. Findings

Before undertaking the more detailed analysis of multiple disadvantage, it is helpful to look at the univariate relationships between the different dimensions of disadvantage and life satisfaction. Table 1 below lists the coefficients for disadvantage measures from a series of regressions on life satisfaction each consisting of a single disadvantage measure, plus demographic controls. All six of the measures used show the expected significant and negative relationship between disadvantage and life satisfaction. The coefficients are relatively large in absolute terms, ranging from -0.483 (disadvantaged with respect to safety and experience of crime) through to -1.331 (disadvantage in health). For comparison purposes, the gap in mean life satisfaction between the most and least satisfied countries in the world is approximately 4.7 points using the same scale as the coefficient estimate (Helliwell et al, 2018). The total proportion of variance accounted for by each of the variables on its own is relatively low (between 5.5% and 15.6%), but this is typical of cross-sectional regressions and is not of major concern.

¹⁰ More formally, $N = \sum_{i=1}^6 W_i$

Table 1: Univariate relationships

Variable	Estimate	Standard Error	R ²
Material wellbeing	-0.995 **	0.069	0.073
Employment	-0.57 **	0.068	0.055
Health	-1.331 **	0.04	0.156
Housing	-0.579 **	0.047	0.066
Safety	-0.483 **	0.068	0.055
Connectedness	-0.849 **	0.045	0.088

N = 16,320. Controls for region, survey wave, and demographics were also included in each regression, but not reported in this table. Results are weighted to represent the NZ usual resident adult population with jackknife estimation used to account for the complex GSS sample design.

** = Significant at the 0.01 level, * = Significant at the 0.05 level

As is commonly found in other studies (eg Boarini et al, 2013; Helliwell et al, 2018), material living standards, health, and social connections have the largest impact on life satisfaction.

Housing, safety, and employment have smaller effects (although still non-trivial). The overall picture provided by the univariate analysis is reassuring in that each of the measures of disadvantage has a negative impact on life satisfaction, but also in that the range of coefficients is not too large. While it is expected that some domains of disadvantage will have a larger impact on life satisfaction than others, the idea that the various measures of disadvantage are, to some degree, of the same order of magnitude is central to multiple disadvantage being a meaningful concept.

If any single dimension of disadvantage were too important relative to the others there would be little point in including the others in the analysis. It would therefore be of concern if any of the coefficients were too far apart in magnitude.

The impact of multiple types of disadvantage

Although each dimension of disadvantage is associated, on its own, with lower life satisfaction, our key research question relates to the relationship between multiple disadvantage and life satisfaction.

The first model in Table 2 below shows the results of estimating Equation 1 from the method section with the NZGSS. It captures the **additive** effect of different dimensions of disadvantage. All six dimensions of disadvantage have a significant negative relationship with life satisfaction. As in Table 1, health, material living standards, and social connections have the largest coefficients. The R2 for the Equation increases from 0.156 (Table 1, health) to 0.189 once all the variables are included simultaneously.

However, in contrast with the univariate correlations presented in Table 1, the multivariate model in Table 2 (model 1) shows a high degree of variation between the coefficients for different dimensions of disadvantage. At one extreme, the coefficient for health is only slightly lower than in Table 1 while, at the other extreme, the coefficient on employment has decreased in absolute magnitude from -0.57 to -0.035 and is no longer statistically significant. This suggests that the

impact of health on life satisfaction is largely independent of the other dimensions of disadvantage, while the effect of employment on life satisfaction is mediated partly by other factors such as the impact of employment on material living standards.

In terms of the hypotheses discussed in section 2, the baseline picture above is consistent with the **additive** hypothesis. There is a clear linear effect of the different dimensions of disadvantage on life satisfaction. However, the fact that employment is not significant when the other dimensions of disadvantage are considered alongside it suggests that employment itself is not one of the dimensions of disadvantage that contributes directly to multiple disadvantage in families when other poor outcomes are accounted for. This is in contrast to measures of individual access to employment which are universally associated strongly with lower levels of life satisfaction after controlling for other effects (Boarini et al, 2013).

It is interesting to consider the implied magnitude of the linear impact of the different dimensions of disadvantage. Someone disadvantaged in all 6 domains would be expected to have a life satisfaction 2.7 points lower than someone without any disadvantages on the 0-10 measure of life satisfaction. In terms of international comparisons, this is the same size as the difference in mean life satisfaction between New Zealand or Costa Rica on one hand, and Burkina Faso or Mali on the other.

Another feature to consider on the first model in Table 2 is the impact of the different demographic controls on life satisfaction. These capture the combined impact of any sex, age, or cultural differences in response styles as well as any substantive omitted variables that are correlated with demographics. The table shows the “u-shaped” relationship between age and life satisfaction widely found in other studies (eg Boarini et al, 2013). Similarly, the result that women report higher average life satisfaction than men after controlling for disadvantage seen in Table 2 is also found in the wider literature (Jia and Smith, 2016; Boarini et al, 2013; Brown, Smith, and Wolff, 2012; OECD, 2011). Differences between family type seen in the descriptive statistics are also reflected in this model. Compared with respondents in couple families with young children, respondents in couple families without children had statistically similar responses, while sole parents, couple families with adult children, those living alone, and those not in a family nucleus (eg flatmates) tended to have lower reported life satisfaction scores.

The coefficients for Māori, Pacific, and Asian ethnic groups are more unusual. Most are positive in Table 2, suggesting that people of these ethnic groups either tend to report their circumstances slightly more positively than New Zealand Europeans or that, after controlling for measured disadvantage, there is some unmeasured positive aspect of life that is correlated with these ethnicities. Interestingly, this is the opposite picture to that found with earlier waves of the NZGSS¹¹ (Jia and Smith, 2016; Brown, Smith and Wolff, 2012). One factor that might contribute to this difference is the focus in this paper on indicators of family disadvantage as opposed to earlier work which focused on individual outcomes. Overall, the effect sizes associated with ethnicity and gender are not large compared to the impact of any individual disadvantages.

Combinations of disadvantage

In examining whether **combinations** of disadvantage matter for life satisfaction over and above the sum of individual disadvantages, a total of 35 interaction terms were tested in a multi-stage progression. We first estimate Equation 2, as described in the methodology section, using the two-way interaction terms but excluding three-way interactions. We then run a simple F-test on the null hypothesis that the coefficients of the interacted terms are equal to 0. Able to reject the null hypothesis for the two-way interactions, we then estimate Equation 2 again with the

¹¹ One possible explanation for this is that, while Brown et al (2012) and Jia and Smith (2016) use a similar set of outcome domains in their analysis, they control for the full range of outcomes from high to low, rather than focusing on disadvantage only as is the case here.

significant two-way interactions and all the three-way interactions. Another F-test is then run for the three-way interactions. Table 2 below reports the results of this process. Only 2 out of 35 interaction terms were significant in the final model (model 3). Both of these involved health.

While the inclusion of interaction terms has some impact on the coefficients of the individual indicators, this is relatively modest for the six domains of disadvantage. Similarly, there is relatively little impact on the coefficients for the demographic controls. While we were able to reject the null hypothesis for the F-test of joint significance for the two-way interactions, we failed to reject the null in the subsequent model for the three-way interactions suggesting they are not adding anything to our modelling. The proportion of total variance accounted for by the analysis set out in the models 2 and 3 of Table 2 ($R^2 = 0.193$ for both) is only marginally greater than was the case for the linear model shown as model 1 in Table 2 ($R^2 = 0.189$).

Table 2: Multivariate regression models

Model Variable	(1) Multivariate with controls		(2) Multivariate with two-way interactions		(3) Multivariate with sig two-ways, plus three-way interactions	
	β	SE	β	SE	β	SE
Intercept	8.85 **	0.107	8.804 **	0.108	8.802 **	0.108
Material wellbeing	-0.494 **	0.067	-0.523 **	0.105	-0.502 **	0.077
Employment	-0.035	0.063	0.038	0.082	0.053	0.08
Health	-1.137 **	0.04	-0.96 **	0.047	-0.948 **	0.051
Housing	-0.31 **	0.044	-0.318 **	0.049	-0.258 **	0.045
Safety	-0.188 **	0.059	-0.146	0.083	-0.181 *	0.073
Connectedness	-0.531 **	0.044	-0.413 **	0.052	-0.392 **	0.048
Employment + Connectedness			-0.362 *	0.162	-0.211	0.244
Health + Housing			-0.231 *	0.114	-0.383 **	0.142
Health + Connectedness			-0.4 **	0.094	-0.409 **	0.112
Material wellbeing + Employment			-0.256	0.135		
Material wellbeing + Health			-0.181	0.163		
Material wellbeing + Housing			0.218	0.162		
Material wellbeing + Safety			-0.102	0.204		
Material wellbeing + Connectedness			0.252	0.15		
Employment + Health			0.118	0.138		
Employment + Housing			0.223	0.2		
Employment + Safety			0.201	0.251		
Health + Safety			0.042	0.165		
Housing + Safety			-0.041	0.142		
Housing + Connectedness			0.145	0.118		
Safety + Connectedness			-0.105	0.142		
Material wellbeing + Employment + Health					0.081	0.203
Material wellbeing + Employment + Housing					-0.126	0.246
Material wellbeing + Employment + Safety					-0.126	0.571
Material wellbeing + Employment + Connectedness					-0.066	0.257
Material wellbeing + Health + Housing					0.063	0.366
Material wellbeing + Health + Safety					-0.247	0.396
Material wellbeing + Health + Connectedness					-0.156	0.249
Material wellbeing + Housing + Safety					-0.139	0.445
Material wellbeing + Housing + Connectedness					0.38	0.246
Material wellbeing + Safety + Connectedness					0.299	0.368
Employment + Health + Housing					0.337	0.366
Employment + Health + Safety					-0.361	0.605
Employment + Health + Connectedness					-0.197	0.28
Employment + Housing + Safety					0.303	0.447
Employment + Housing + Connectedness					-0.05	0.359
Employment + Safety + Connectedness					0.226	0.45
Health + Housing + Safety					0.269	0.295
Health + Housing + Connectedness					0.214	0.264
Health + Safety + Connectedness					-0.065	0.216
Housing + Safety + Connectedness					-0.098	0.238
Female	0.184 **	0.032	0.181 **	0.032	0.181 **	0.032
Age	-0.042 **	0.004	-0.041 **	0.004	-0.041 **	0.004
Age squared	0.586 **	0.042	0.566 **	0.044	0.565 **	0.043
Maori	0.121 **	0.045	0.121 **	0.046	0.122 **	0.045
Pacific	0.252 **	0.065	0.239 **	0.066	0.239 **	0.065
Asian	0.051	0.053	0.044	0.054	0.043	0.054
Other ethnicity	-0.118	0.094	-0.118	0.094	-0.119	0.096
Northland	0.128	0.089	0.121	0.089	0.121	0.089
Waikato	0.124 *	0.054	0.121 *	0.054	0.116 *	0.054
Bay of Plenty	0.083	0.053	0.076	0.054	0.077	0.055
Gisborne	0.307 *	0.131	0.3 *	0.134	0.305 *	0.134
Hawkes Bay	0.158 *	0.079	0.16 *	0.079	0.159 *	0.078
Taranaki	0.077	0.106	0.074	0.105	0.074	0.105
Manawatu-Wanganui	0.125	0.074	0.126	0.074	0.125	0.074
Wellington	-0.032	0.051	-0.034	0.051	-0.035	0.052
West Coast-Tasman	0.067	0.207	0.075	0.218	0.076	0.219
Nelson-Marlborough	-0.01	0.093	-0.014	0.094	-0.015	0.094
Canterbury	-0.032	0.053	-0.035	0.054	-0.036	0.053
Otago	0.119	0.063	0.117	0.064	0.116	0.064
Southland	-0.129	0.102	-0.128	0.102	-0.132	0.102
GSS14	-0.045	0.028	-0.047	0.028	-0.048	0.028
Couple both under 50 years	0.055	0.056	0.058	0.056	0.056	0.056
Couple one or both 50 plus	-0.076	0.057	-0.066	0.058	-0.068	0.058
Sole parent, at least one child <18 years	-0.247 **	0.087	-0.249 **	0.091	-0.245 **	0.09
Couple parents, all children 18 or older	-0.224 **	0.059	-0.209 **	0.059	-0.213 **	0.059
Sole parent, all children 18 plus	-0.536 **	0.088	-0.513 **	0.087	-0.516 **	0.087
Living alone, aged 50 plus	-0.462 **	0.068	-0.441 **	0.068	-0.445 **	0.068
Living alone, aged under 50	-0.534 **	0.064	-0.528 **	0.064	-0.535 **	0.065
Living with others (residual group)	-0.349 **	0.069	-0.344 **	0.067	-0.349 **	0.068
R=squared	0.189		0.193		0.193	
F test - Two-way interactions			F	p	F	p
F test - Three-way interactions			5.06	<.0001	1.3	0.1962

Source: New Zealand General Social Survey 2014 and 2016 iterations

Note: N=16,320. Results are weighted to represent the NZ usual resident adult population with jackknife estimation used to account for the complex GSS sample design.

** = Significant at the 0.01 level, * = Significant at the 0.05 level

The specific combinations of disadvantage that have a significant impact on life satisfaction over and above the sum of their linear effects are of interest. The combined impact of poor health and poor housing as well as poor health and social isolation are both associated with increased disadvantage compared to the sum of their independent effects. The effects are noticeable, although not large, with someone suffering from poor health and poor housing having an expected life satisfaction 1.589 points lower (-0.948 from poor health, -0.258 from poor housing, and -0.383 from the additional impact of having both poor health and housing together) than those without these disadvantages (Model 3, Table 2) rather than the 1.447 points (-1.137 from poor health and -0.31 from poor housing) one would expect from the combined independent effects (Model 1, Table 2).

At the most basic level, the size and significance of the coefficients on these interaction terms provides some support for the **combinations** hypothesis. There are two specific combinations of disadvantage that are associated with lower levels of life satisfaction than what would be expected from the **additive** effect on its own. However, adding the **combinations** still leaves most of the individual dimensions of disadvantage significant, ruling out the **independent** hypothesis (that only combinations matter).

The very specificity of the significant combinations raises the question as to whether the coefficients in models 2 and 3 in Table 2 are picking up the combined impact of disadvantage or are simply acting as proxies for specific population sub-groups. Table 3 below examines this possibility by showing selected demographic breakdowns for groups experiencing disadvantage in each of the six disadvantage domains and those experiencing disadvantage in both Health and Housing or Health and social connectedness.

Table 3: Selected characteristics of those facing different types of disadvantage (% of group disadvantaged)

	Material living standards	Employment	Health	Housing	Safety	Social Connections	Health and housing	Health and social connectedness
Auckland	33.1%	32.1%	30.6%	36.7%	29.9%	33.7%	34.2%	31.4%
Northland	6.2%	8%	4.6%	4.3%	6.6%	4.5%	5.6%	4.9%
Gisborne	1.4%	0.9%	1.2%	1.2%	1.1%	1.2%	1.4%	1.3%
Family Māori	32.5%	30%	20.7%	27.4%	23.3%	24.3%	31.8%	28.4%
Family Pasifika	18.6%	13.1%	7.7%	17.8%	10%	9.4%	14.2%	8.8%
Age, less than 30	27.8%	23%	19.2%	33.8%	32.4%	28.7%	28%	27.2%
Age, 50 or older	34.4%	50.1%	51.9%	29.8%	31.6%	36.7%	39.3%	41.6%
Female	63.6%	56.5%	59.1%	55.3%	55%	53.2%	60.4%	58.5%

Source: New Zealand General Social Survey 2014 and 2016 iterations

There is little evidence that the population experiencing multiple disadvantage in terms of health and housing or health and social connectedness are very different from the base populations experiencing one of these disadvantages on its own. Interestingly, there is also very little difference in the coefficients on the demographic control variables between models 1-3 in Table 2. Taken together, these factors suggest that the significant interaction terms in model 3 are not simply proxying for demographics but actually capture a meaningful difference between the experience of poor health and poor housing or poor health and social isolation than what we might anticipate from considering only the independent effects of each type of disadvantage.

Box 2. Perceived Family wellbeing and multiple disadvantage

In addition to looking at the impact of multiple disadvantage on life satisfaction, we repeated the analysis replacing life satisfaction with a measure of perceived family wellbeing from the NZGSS 2016 wave. As discussed in Box 1, this measure is conceptually better aligned with the Family Wellbeing Framework than is individual life satisfaction but is less well understood. This means that there is less evidence for the validity of the perceived family wellbeing measure and consequently it is more difficult to have a high degree of confidence in any unusual results. In addition, because the perceived family wellbeing measure is available only in the NZGSS 2016, the sample size is half that for the primary analysis using life satisfaction. This results in significantly higher standard errors for the interaction terms.

Despite the limitations of the perceived family wellbeing measure, the results are still interesting to consider as a complement to the more traditional life satisfaction data. Table 4 below replicates the analysis from Table 2 but substitutes perceived family wellbeing for life satisfaction. Progressing from the linear model (model 1) to those including the two and three-way interactions (models 2 and 3), we can see that very few of the interacted terms were statistically significant (one two-way, and one three-way interaction in models 2 and 3 respectively). Also, for both F-tests of joint significance on the two and three-way terms, we fail to reject the null hypothesis that the coefficients of the interacted terms are equal to 0. This suggests that including the interactions is not adding anything to the results from model 1 (the linear model).

We therefore focus our observations on model 1 of Table 4 where several points can be made. First, the impacts of housing and social connections do not differ much whether the focus is individual life satisfaction or perceived family wellbeing. In each of these cases the coefficients are significant in both Tables 2 and 4 and of roughly the same magnitude. The coefficient for employment is negative and larger in the case of perceived family wellbeing than for individual life satisfaction but is still not statistically significant.

For health, material wellbeing, and safety, however, the picture presented by these metrics is more different. The impact of health and material wellbeing on perceived family wellbeing is lower than it is for life satisfaction and particularly so in the case of health (-0.622 compared to -0.95). Health remains the largest coefficient in the analysis of both life satisfaction and perceived family wellbeing but the gap between the impact of health and the other disadvantages is much smaller for perceived family wellbeing. This result possibly reflects the limitations of the measure of health disadvantage used here, which captures only the health of the respondent rather than that of other family members. Hence it is relatively easy to imagine a situation in which a respondent in poor health themselves but with healthy family members reports a low life satisfaction but a higher level of perceived family wellbeing.

The coefficient on safety is also interesting in that it is higher in absolute terms (-0.401) for

perceived family wellbeing than is the case for individual life satisfaction (-0.181). The reason for this difference is more difficult to identify, but might be linked to the fact that two of the three indicators used to create the measure of crime and safety disadvantage relate to safety in the general environment rather than the respondent's personal experience of harm. Environmental conditions such as safety walking in the neighbourhood and risk of burglaries in the local area might reasonably be expected to be more strongly associated with the respondent's views about how their family is doing than with their own overall life satisfaction which has a more personal focus.

Finally, the demographic controls for perceived family wellbeing are generally similar to those for individual life satisfaction with a couple exceptions. Asian respondents reported a significantly higher level of perceived family wellbeing after controlling for disadvantage whereas there was no significant impact of Asian ethnicity associated with individual life satisfaction. The reverse was true for Maori respondents such that the higher level of individual life satisfaction controlling for disadvantage was not reflected in perceived family wellbeing.

Table 4: Combinations of disadvantage and perceived family wellbeing

Model	(1)		(2)		(3)	
	Multivariate with controls		Multivariate with two-way interactions		Multivariate with sig two-ways, plus three-way interactions	
Variable	β	SE	β	SE	β	SE
Intercept	9.011 **	0.174	8.976 **	0.171	8.993 **	0.173
Material wellbeing	-0.354 **	0.091	-0.45 **	0.155	-0.51 **	0.115
Employment	-0.159	0.124	-0.126	0.168	-0.178	0.147
Health	-0.622 **	0.061	-0.483 **	0.073	-0.565 **	0.064
Housing	-0.254 **	0.062	-0.231 **	0.078	-0.262 **	0.066
Safety	-0.401 **	0.079	-0.31 **	0.113	-0.363 **	0.094
Connectedness	-0.444 **	0.069	-0.354 **	0.079	-0.385 **	0.071
Material wellbeing + Housing			0.367 *	0.182	0.486	0.257
Material wellbeing + Employment			-0.194	0.249		
Material wellbeing + Health			0.001	0.2		
Material wellbeing + Safety			-0.315	0.282		
Material wellbeing + Connectedness			0.063	0.182		
Employment + Health			-0.063	0.234		
Employment + Housing			0.244	0.253		
Employment + Safety			0.168	0.366		
Employment + Connectedness			-0.079	0.241		
Health + Housing			-0.232	0.144		
Health + Safety			-0.112	0.189		
Health + Connectedness			-0.196	0.13		
Housing + Safety			0	0.221		
Housing + Connectedness			-0.046	0.163		
Safety + Connectedness			-0.031	0.212		
Material wellbeing + Employment + Health					0.636 *	0.287
Material wellbeing + Employment + Housing					-0.468	0.383
Material wellbeing + Employment + Safety					-0.897	0.909
Material wellbeing + Employment + Connectedness					-0.258	0.294
Material wellbeing + Health + Housing					0.186	0.373
Material wellbeing + Health + Safety					-0.072	0.412
Material wellbeing + Health + Connectedness					-0.446	0.258
Material wellbeing + Housing + Safety					-0.232	0.468
Material wellbeing + Housing + Connectedness					-0.007	0.342
Material wellbeing + Safety + Connectedness					0.55	0.42
Employment + Health + Housing					-0.461	0.408
Employment + Health + Safety					0.314	0.912
Employment + Health + Connectedness					-0.24	0.317
Employment + Housing + Safety					0.402	0.708
Employment + Housing + Connectedness					0.874	0.467
Employment + Safety + Connectedness					0.016	0.619
Health + Housing + Safety					-0.163	0.282
Health + Housing + Connectedness					-0.325	0.242
Health + Safety + Connectedness					-0.003	0.256
Housing + Safety + Connectedness					-0.173	0.301
Female	0.14 **	0.042	0.144 **	0.042	0.149 **	0.042
Age	-0.045 **	0.007	-0.044 **	0.007	-0.045 **	0.007
Age squared	0.574 **	0.067	0.56 **	0.067	0.57 **	0.067
Maori	-0.037	0.056	-0.037	0.058	-0.038	0.058
Pacific	0.316 **	0.092	0.296 **	0.093	0.307 **	0.093
Asian	0.343 **	0.076	0.331 **	0.076	0.336 **	0.077
Other ethnicity	0.078	0.115	0.068	0.112	0.068	0.111
Northland	-0.385 *	0.159	-0.384 *	0.157	-0.384 *	0.155
Waikato	-0.068	0.08	-0.073	0.08	-0.077	0.081
Bay of Plenty	-0.125	0.09	-0.138	0.088	-0.125	0.086
Gisborne	-0.082	0.232	-0.067	0.232	-0.076	0.238
Hawkes Bay	0.093	0.134	0.1	0.131	0.102	0.134
Taranaki	-0.192	0.12	-0.195	0.122	-0.185	0.118
Manawatu-Whanganui	-0.163	0.108	-0.166	0.109	-0.162	0.108
Wellington	-0.225 **	0.078	-0.228 **	0.078	-0.227 **	0.078
West Coast-Tasman	-0.097	0.279	-0.078	0.296	-0.067	0.294
Nelson-Marlborough	-0.111	0.097	-0.118	0.097	-0.119	0.096
Canterbury	-0.042	0.081	-0.046	0.08	-0.037	0.081
Otago	0.044	0.103	0.053	0.103	0.052	0.103
Southland	-0.169	0.153	-0.167	0.154	-0.167	0.152
Couple both under 50 years	-0.236 **	0.087	-0.238 **	0.088	-0.237 **	0.088
Couple one or both 50 plus	-0.248 **	0.087	-0.243 **	0.087	-0.244 **	0.086
Sole parent, at least one child <18 years	-0.205 *	0.099	-0.208 *	0.101	-0.209 *	0.102
Couple parents, all children 18 or older	-0.162	0.097	-0.159	0.097	-0.166	0.097
Sole parent, all children 18 plus	-0.509 **	0.148	-0.498 **	0.149	-0.504 **	0.149
Living alone, aged 50 plus	-0.158	0.093	-0.146	0.092	-0.15	0.091
Living alone, aged under 50	-0.186 *	0.084	-0.187 *	0.084	-0.189 *	0.083
Living with others (residual group)	-0.367 **	0.089	-0.369 **	0.09	-0.365 **	0.09
R=squared	0.116		0.119		0.121	
			<i>F</i>	<i>p</i>	<i>F</i>	<i>p</i>
F test - Two-way interactions			1.08	0.386		
F test - Three-way interactions					1.61	0.0645

Source: New Zealand General Social Survey 2016

Note: N=7,929 ** = Significant at the 0.01 level, * = Significant at the 0.05 level

4. Conclusion

The idea that specific combinations or increasing levels of multiple disadvantage might be associated with particularly severe hardship is an intuitive one. It is easy to imagine how different types of disadvantage might compound each other, resulting in a situation where the total impact is greater than the sum of its parts.

Poor health, for example, might be compounded by social isolation if it prevented a person from seeking medical help or from obtaining support to help them manage their health condition. Similarly, it is easy to find reasons why an increasing number of disadvantages could have a greater-than-linear impact on peoples' ability to cope (eg Mani et al, 2013).

If the effects of multiple disadvantage were especially severe for particular combinations of disadvantage, this would have important policy implications (Box 3). Specific combinations of disadvantages associated with a larger-than-anticipated impact on peoples' lives would suggest areas for policy focus and may even provide some insight into the mechanisms contributing to low levels of wellbeing. There is clear evidence of an **additive** linear effect from each domain of disadvantage and from this perspective, multiple disadvantage is simply the sum of its parts.

Analysis of different **combinations** of disadvantage yielded some evidence that specific combinations might matter. In particular, poor health combined with either poor housing or a lack of social connection is associated with lower levels of life satisfaction than can be accounted for by the linear impact of the independent disadvantages.

Although the analysis in this paper cannot be considered definitive, these combinations of disadvantage present an intuitively appealing story. One important point to consider, however, is that the combined effect of all the combination variables only increases the adjusted R^2 from 0.189 to 0.193. The increase is less than 0.4 percent of total variance, indicating that, while it may be important for small groups, the impact of the **combinations** of disadvantage on life satisfaction should not distract from a primary focus on the **additive** impact.

Box 3. Policy implications

The question of the relationship between disadvantage and overall wellbeing does not simply reflect idle interest. How disadvantages in different life areas interact with each other to affect overall wellbeing has an important impact on where we should target policies to have the highest impact. Both the effectiveness and value for money of different forms of targeting social services ultimately depend on knowing which interventions will have the greatest impact on peoples' wellbeing.

Three different policy questions are informed by the analysis in this paper. First, looking at the relative sizes of the coefficients on different forms of disadvantage provides information about **which disadvantages have the largest impact on wellbeing**. This can help assess which social sector interventions will potentially have the largest impact on wellbeing. A second policy question concerns **the importance of targeting assistance towards families experiencing multiple disadvantage**, or whether policy can consider different areas of disadvantage in relative isolation. To the degree that multiple disadvantage has a disproportionate impact on wellbeing compared to the sum of individual disadvantages, this would strengthen the case for joined-up solutions. Finally, any evidence that **specific combinations of disadvantage** have a compounding impact on wellbeing would assist in directing attention to situations where effectively targeted social services might make a large difference to peoples' lives.

Which disadvantages have the largest impact on wellbeing?

In terms of the areas of disadvantage that have the largest impact on wellbeing, this paper largely confirms the wider literature on life satisfaction (eg Boarini et al, 2013). Health has the largest impact on life satisfaction, with both material wellbeing/incomes and social contact also having a relatively large effect. Crime/safety, poor housing, and employment all have smaller impacts, with the role of employment apparently largely mediated through its impact on incomes. However, in assessing policy proposals it will be necessary to supplement the coefficient size with additional information on the magnitude of the change that an intervention is associated with and the cost of the intervention (Fujiwara, 2013; OECD, 2013).

Of particular interest in this analysis is the difference between the relatively small direct impact of crime/safety on individual life satisfaction and the larger impact implied by the analysis of perceived family wellbeing (Box 2). This suggests that focusing narrowly on measures of individual life satisfaction may underestimate the impact of some social outcomes on wellbeing and points towards the potential value of Statistics New Zealand's question on perceived family wellbeing.

The importance of targeting assistance towards families experiencing multiple disadvantage

The paper provides little evidence that there is a compounding effect of multiple disadvantage over and above the additive sum of individual disadvantages. This suggests that there is no particular threshold at which multiple disadvantage suddenly becomes a significant problem. At one level, this might be taken to support treating different outcome areas independently. If improving health outcomes has the same impact on wellbeing regardless of whether the person being treated is disadvantaged only with respect to health or if they have many other disadvantages, there might seem to be no particular reason to target services on the basis of multiple disadvantage.

Two factors militate against the view that multiple disadvantage does not matter for policy. The first is simply the idea that policy should be targeted in the first instance at those in misery (Kahneman and Krueger, 2006) rather than more generally. Although there is no compounding effect of multiple disadvantage, this paper strongly confirms the additive effect implying that those people experiencing more disadvantages are worse off than those with fewer. Even if better housing might raise the living standards of two different people by the same amount, one might reasonably wish to target assistance towards the person who is also in poor health on the grounds that doing so will reduce extreme misery.

The second reason for targeting assistance towards those families with multiple disadvantage goes back to Superu's earlier research on the issue (Superu, 2017). Targeting multiple disadvantage may be an efficient way to reach disadvantage. The 17.6 percent of families found by Superu to have three or more disadvantages accounted for over half of all disadvantages in total. This paper does nothing to reverse this earlier finding and strengthens the argument for focusing attention on those experiencing multiple disadvantage.

Specific combinations of disadvantage

Overall this paper found relatively little evidence that specific combinations of disadvantage have an important impact on family wellbeing over and above the additive effect of the independent disadvantages. However, the significant negative impact of poor health combined with poor housing and poor health combined with a lack of social connections is of potential policy interest. In both cases it is easy to come up with an intuitive account of how poor housing or a lack of social connections could compound the effect of poor health on its own. This suggests that further examination of the interactions between poor health and other forms of disadvantage might be warranted and, if the findings from this initial exploratory research are confirmed elsewhere, the return to interventions that target these interactions would be high.

5. Next steps

The analysis in this paper represents both an end point to one programme of work and also suggests a number of areas for further research with significant potential for policy findings. As the end of a programme of work, this paper brings to a logical close the analysis of multiple disadvantage and family wellbeing commenced by Superu in 2016. In particular, the limitations of the NZGSS indicators with respect to measuring family wellbeing as opposed to individual wellbeing are increasingly obvious. Further, the primary conclusion of the analysis here is that looking at the relationship between life satisfaction and multiple disadvantage adds relatively little to the insight from 2017 that the majority of total instances of disadvantage is accounted for by the minority of families experiencing three or more disadvantages (Superu, 2017a). This remains the most compelling argument for targeting multiple disadvantage and looking at life satisfaction in addition does little to change this.

However, the analysis of multiple disadvantage and life satisfaction does raise some new issues. Two areas are particularly important. The first of these relates to the combinations of disadvantage associated with health and either housing or social connections. These have already been alluded to in the discussion on policy implications and, if the findings are robust would have potentially important implications for health and housing policy. However, the analysis here would need to be supported by additional findings before it could be considered persuasive. This, then, is a possible area for further research.

There would be value both in a review of the academic literature on the interaction between health, housing, and wellbeing on the one hand and health, social connections, and wellbeing on the other to establish whether there is a prima-facie case to support the quantitative findings reported here. If so, further work could either test whether the relationship identified here holds for earlier waves of the NZGSS (2008 to 2012) which would help establish whether the findings here are a quirk of the specific survey waves used, or represent a genuine feature of the experience of New Zealand families.

From the perspective of the Families and Whānau Wellbeing Research Programme perhaps the most important area for further exploration is analysis of the measure of subjective perceptions of family wellbeing included in the NZGSS 2016. This measure has, to date, been largely unanalysed. However, the exploratory results reported here are potentially interesting. They do not fully replicate the results from looking at individual life satisfaction, but neither do they appear to be random. Existing Statistics New Zealand Surveys such as the NZGSS tend to produce meaningful information for the individual and for the household. Neither level of analysis is ideal from a 'families' perspective. If the NZGSS measure of perceived family wellbeing works (in the sense of capturing useful information on family wellbeing over and above the situation of the responding individual) then this has important implications for the ability to look meaningfully at family wellbeing with survey data.

Further analysis of subjective perceptions of family wellbeing would have both methodological and substantive dimensions. The methodological analysis would focus on establishing the validity of the question used in the NZGSS. In particular, it would focus on construct validity (does the family wellbeing question behave as we would expect) and convergent validity (does the family wellbeing question correlate well with other proxies for overall family wellbeing). There is significant scope to explore this with existing NZGSS datasets.

The more substantive stream of work would focus on the differences between life satisfaction and perceived family wellbeing to see if this could be linked to the situation of other family members. While the NZGSS would be central to such analysis it would be worth investigating whether there was scope to identify outcomes for other family members in Statistics New Zealand's Integrated Data Infrastructure (IDI). The recent linking of all NZGSS household members to the IDI spine raises the prospect that it might be possible to identify negative health or justice outcomes through administrative data and then establish the impact of this on family wellbeing through the NZGSS subjective perceptions measure.

Additionally, the currently available data did not allow us to investigate the impact of four, five, and six-way interactions on life satisfaction nor important questions concerning how subjective wellbeing is affected by the persistence or re-occurrence of multiple disadvantage over time. Should data supporting such analyses become available in the future we would encourage its use to investigate these questions.

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ANNEX 1

All the results in shown are weighted to represent the NZ usual resident adult population with jackknife estimation used to account for the complex GSS sample design.

Table A1. Descriptive statistics

Item	Estimate (%)	Lower confidence interval (95%)	Upper confidence interval (95%)
Material wellbeing	8.6	8.1	9.2
Employment	6.5	6.1	6.9
Health	25.7	24.9	26.5
Housing	21.1	20.4	21.9
Safety	8.5	7.9	9
Connectedness	21.3	20.4	22.2
Material wellbeing + Employment	2.8	2.5	3.1
Material wellbeing + Health	4.5	4.1	4.8
Material wellbeing + Housing	4.5	4.1	4.8
Material wellbeing + Safety	1.4	1.2	1.6
Material wellbeing + Connectedness	3.7	3.4	4.1
Employment + Health	3.3	3	3.6
Employment + Housing	2.4	2.2	2.7
Employment + Safety	0.8	0.7	1
Employment + Connectedness	2.7	2.4	3
Health + Housing	7.4	6.9	8
Health + Safety	3.2	2.9	3.4
Health + Connectedness	9	8.4	9.6
Housing + Safety	3	2.6	3.3
Housing + Connectedness	6.8	6.3	7.4
Safety + Connectedness	3.1	2.8	3.4

Material wellbeing + Employment + Health	1.9	1.7	2.1
Material wellbeing + Employment + Housing	1.5	1.3	1.7
Material wellbeing + Employment + Safety	0.5	0.4	0.6
Material wellbeing + Employment + Connectedness	1.6	1.4	1.8
Material wellbeing + Health + Housing	2.4	2.1	2.6
Material wellbeing + Health + Housing	2.4	2.1	2.6
Material wellbeing + Health + Safety	0.9	0.8	1.1
Material wellbeing + Health + Connectedness	2.4	2.1	2.6
Material wellbeing + Housing + Safety	0.8	0.7	1
Material wellbeing + Housing + Connectedness	2.2	1.9	2.4
Material wellbeing + Safety + Connectedness	0.8	0.7	0.9
Employment + Health + Housing	1.5	1.3	1.7
Employment + Health + Safety	0.6	0.5	0.7
Employment + Health + Connectedness	1.7	1.4	1.9
Employment + Housing + Safety	0.5	0.3	0.6
Employment + Housing + Connectedness	1.4	1.2	1.6
Employment + Safety + Connectedness	0.5	0.4	0.6
Health + Housing + Safety	1.5	1.3	1.7
Health + Housing +	3.6	3.2	4.1

Connectedness			
Health + Safety + Connectedness	1.7	1.4	1.9
Housing + Safety + Connectedness	1.4	1.2	1.6
DVFemale	51.6	51.3	51.9
Family_European	77.6	76.7	78.5
Family_Maori	16.8	16.4	17.2
Family_Pacific	7.9	7.4	8.5
Family_Asian	13.8	13	14.6
Family_MELAA_Other	3.1	2.7	3.4
Northland	3.5	3.4	3.6
Auckland	34	33.7	34.3
Waikato	9.4	9.3	9.6
BayoPlenty	6.1	6	6.2
Gisborne	1	1	1
Hawkesbay	3.4	3.3	3.5
Taranaki	2.4	2.3	2.5
ManawatuWanganui	5	4.9	5.1
Wellington	11.1	10.9	11.2
WestCoast_Tasman	2	1.6	2.3
Nelson_Marlborough	2	1.7	2.4
Canterbury	13.2	13	13.3
Otago	4.8	4.7	4.9