New Zealand Mental Health Inequalities: Concentration Index and Ethnic Disparities

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Attestation of Authorship

I hereby declare that this submission is my own work and that, to the best of my knowledge and belief, it contains no material previously published or written by another person (except where explicitly defined in the acknowledgements), nor material to which a substantial extent has been submitted for the award of any other degree or diploma of a university or other institution of higher learning.

Student's signature: Eva Parker

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Abstract

The recent increase in the prevalence and awareness of mental health inequalities within New Zealand necessitates an understanding of the factors responsible for such disparities. The current study quantifies income-related and ethnic mental health inequalities in New Zealand and investigates their association with a range of demographic, socioeconomic, lifestyle, health care system, and racial discrimination factors. Using the Kessler 10-item Psychological Distress Scale survey, released as part of the 2016/17 New Zealand Health Survey, a concentration index is constructed and decomposed to identify the prevalence of income-related mental health inequalities, as well as the proportional contributions of the five factor domains. The concentration index confirms the presence of income-related mental health inequalities in New Zealand that are detrimental to low-income households, females, and Māori, relative to their respective counterparts. The concentration index decomposition suggests the factors considered collectively explain 88.97% of income-related mental health inequalities, where the largest contributions arise from differences in socioeconomic and health care system factors. Furthermore, Blinder-Oaxaca decomposition is applied to average ethnic mental health inequalities to understand the degree to which they can be explained when an ethnic minority group receives the observed factor endowments of the ethnic majority group. The Blinder-Oaxaca decomposition implies the mental health inequality between Māori and the European/other population is over-explained by differences in the observed factor endowments, particularly those related to unmet needs in the health care system, whereas the mental health inequality between Asian peoples and the European/other population is under-explained by differences in the observed factor endowments, and is likely a result of unobserved, cultural-specific factors. The Blinder-Oaxaca decomposition results for Pacific peoples and the European/other population are not statistically significant. Policy-makers are encouraged to target a range of alterable factors that contribute substantially to income-related mental health inequalities, support the development of joint social and health policies to appeal to Māori norms and culture, and instigate further research to understand the factors that nurture strong reported mental health among Asian peoples.

Chapter 1: Introduction

Nobel Prize winner, Amartya Sen (2002), proposes that "health is among the most important conditions of human life and a critically significant constituent of human capabilities which we have reason to value" (p. 660). He argues that health inequalities are, therefore, more detrimental than the inequalities present in other domains (Sen, 2002). The eradication of health inequalities remains a vital yet elusive goal and should receive attention from all parts of government and the wider economy in order to implement coherent policies that improve health equality (Commission on Social Determinants of Health, 2008). At the aggregate level, two of the United Nations Sustainable Development Goals relate to improving health and wellbeing and reducing inequalities (United Nations Development Programme, 2018). More specific targets under these broad goals include the achievement of universal health coverage and ensuring access to quality health care services and products. Despite these objectives, the health outcomes within populations continue to differ (Chin et al., 2018). It is widely accepted that these health inequalities reflect disparities in constraints rather than preferences, implying health inequalities can also be viewed as inequities (see Alleyne, Casas, & Castillo-Salgado, 2000; Braveman, Starfield, & Geiger, 2001; Wagstaff, 2001). It is imperative to distinguish between these two terms. The World Health Organisation (WHO) (2018a) defines health inequalities as "differences in health status or in the distribution of health determinants between different population groups". Unavoidable health inequalities are a result of differences in the biological makeup or free choice among individuals, where it may be impossible or unethical to alter the underlying health determinants (World Health Organisation, 2018a). Conversely, unnecessary and avoidable health inequalities, or inequities, are attributable to any unfair or unjust external environment or conditions faced by individuals (World Health Organisation, 2018a). Assessing the extent to which health inequalities are also inequities not only requires insight into the causes of health inequalities but an informed judgement as to whether these causes are fair and just (Mackenbach & Kunst, 1997). In this way, health inequalities can be directly and accurately measured, whereas health inequities cannot. For the purpose of the current study, health inequalities are largely used in a descriptive sense, and little judgement is conveyed regarding the fairness of the differences in health between groups within New Zealand.

The current study is motivated by the increasing awareness of mental health, as well as its associated inequalities, in New Zealand. Projections from the 2006 to 2016 New Zealand Burden of Diseases, Injuries and Risk Factors Study estimate that mental disorders are

responsible for 11.10% of health loss for New Zealanders, behind only cancers and vascular and blood disorders (Ministry of Health, 2013). At some point in their lives, one in six adults have been diagnosed with a mental disorder, and 8.60% of adults experience psychological distress on a regular basis (Ministry of Health, 2018a). These figures have climbed steadily since 2008, and the demand for mental health services has increased accordingly by nearly 60.00%, predominantly driven by those with mild to moderate mental health needs (Williams, Haarhoff, & Vertongen, 2017). This surge is consistent with international trends and stimulated by transparent reporting, growing social awareness, and the open discussion of mental health challenges (Ministry of Health, 2017a). Some of the most deep-rooted and persistent mental health inequalities are those that exist between ethnic groups. For example, Māori and Pacific peoples are more likely to report higher levels of psychological stress (Ministry of Health, 2018a), experience under-diagnosis of depression or anxiety disorders (Lee, Duck, & Sibley, 2017), and commit suicide (23.72 and 13.94 suicides per 100,000 people, respectively) (Ministry of Justice, 2018) than non-Māori, non-Pacific peoples. Beyond these dire statistics, strong economic arguments support the pursuit of ethnic health equality. For example, the economic costs of health inequalities between Māori and non-Māori children are estimated to be between $NZ62 million and $NZ200 million (Mills, Reid, & Vaithianathan, 2012). Furthermore, mental health inequalities can be magnified by the intersectionality of detrimental factors, which is frequently associated with worse outcomes than any one dimension of disadvantage (Keith & Brown, 2018).

The current study aims to address the following questions, where self-assessed psychological distress is used as a proxy for mental health:

1. What is the extent of income-related mental health inequalities in New Zealand?
2. What is the proportional contribution of differences in various demographic, socioeconomic, lifestyle, health care system, and racial discrimination factors towards income-related mental health inequalities in New Zealand?
3. What is the extent of ethnic mental health inequalities in New Zealand?
4. To what extent does controlling for various demographic, socioeconomic, lifestyle, health care system, and racial discrimination factors reduce ethnic mental health inequalities in New Zealand, specifically, those that exist between Māori, Pacific peoples, and Asian peoples versus European/other populations?

To answer these questions, the current study constructs a concentration index (CI), which quantifies the overall level of mental health inequality that exists between individuals across various income brackets. By decomposing the CI, the percentage contribution from each of the factors hypothesised to be associated with income-related mental health inequalities is identified. Additionally, Blinder-Oaxaca decomposition is applied to average ethnic mental health inequalities to understand the degree to which they can be explained when an ethnic minority group receives the observed factor endowments of the ethnic majority group. Although decomposition is unable to infer causal relationships between income-related or ethnic mental health inequalities and the various factors, it provides a means of describing such inequalities and offers explanations for any observations (Wildman, 2003).

While prior research has investigated the extent of New Zealand's income-related health inequalities, such studies either employ physical or general health as the dependent variable, focus on a single factor, construct a CI using now-outdated or less inclusive data, or exclude ethnicity indicators from their analyses. The current study is likely to produce a more accurate reflection of income-related health inequalities as it utilises the latest New Zealand Health Survey (NZHS) data, which yields an impressive 80.00% response rate. Further contributions are made through the exploration of a range of historical health factors – most notably an ethnicity indicator – and their respective associations with topical mental health inequalities.

The current study is organised as follows: Chapter 2 provides a critical review of existing literature which pertains to the measurement of income-related health inequalities, as well as prior research concerning the ethnic health disparities in New Zealand. These studies provide motivation for the inclusion of various factors that are expected to be associated with mental health. The constraints of such literature are recognised and offer support for the argued contribution of the current study. Chapter 3 describes the mental health outcome and the associated factors under investigation, as well as the analytical methods employed by the current study. Chapter 4 describes the results from the empirical analyses and discusses any relevant policy implications. Chapter 5 summarises the key findings, limitations, and areas for future research, which concludes the current study.

Chapter 2: Literature Review

Chapter 2 provides a critical review of relevant literature, through which the contributions of the current study are established. Chapter 2 is organised as follows: Section 2.1 compares the various approaches available to measure health inequalities and outlines the considerations surrounding the choice of health outcome variable. Sections 2.2 and 2.3 provide critical examinations of international and New Zealand empirical studies, respectively. Section 2.4 summarises the findings from studies which have investigated the determinants of New Zealand's ethnic health inequalities, as this will provide an initial indication regarding the variables to be included as factors in the current study. The literature presented in Chapter 2 is narrowed to heavily cited academic research and national survey reports, and targets work published from the year 2000 onwards. The exception to this date criteria is the literature included in Section 2.1, which largely relate to the theoretical models and findings from earlier years. Where possible, Sections 2.2, 2.3, and 2.4 place emphasis on literature that investigates mental health and ethnic mental health inequalities, as this is the focus of the current study.

2.1 Measuring Health Inequalities

There are several approaches commonly adopted in empirical analysis to measure health inequalities. These include the range (Lahelma & Valkonen, 1990), the Gini coefficient (Le Grand, 1989), the index of dissimilarity (Mackenbach & Kunst, 1997), the slope index of inequality (Pamuk, 1985), and the CI (Kakwani, 1980; Wagstaff, Van Doorslaer, & Paci, 1989). Some of these measures have been heavily criticised, and their defects are summarised by Wagstaff, Paci, and Van Doorslaer (1991). For instance, the range compares the health status of the highest and lowest socioeconomic groups to produce a ratio of the two extreme values. However, it does not account for the intermediate group, nor does it regulate the size of the highest and lowest classes, resulting in unreliable intertemporal and cross-country comparisons. The Gini coefficient is derived from the Lorenz curve, which plots the cumulative proportions of the population against the cumulative proportions of health. Unfortunately, the Gini coefficient does not consider socioeconomic status, despite evidence which suggests health inequalities are closely linked to income (Truesdale & Jencks, 2016). The index of dissimilarity measures how a socioeconomic group's share of the population's health compares with its population share. Although it stratifies the population according to socioeconomic

status, the index of dissimilarity does not compare a population's health in relation to the differences in socioeconomic status.

Effective measures are, therefore, expected to incorporate a socioeconomic indicator in the evaluation of health status, which is distributed across various socioeconomic brackets (Van Doorslaer et al., 1997). The inclusion of a socioeconomic indicator allows for the differentiation between the level of health experienced among individuals belonging to the highest income bracket and that experienced among the lowest income bracket. Both the slope index of inequality and the CI satisfy these requirements. Developed by Kakwani (1980) and Wagstaff et al. (1989), CIs are favoured over the slope index of inequality due to their intuitive concentration curves. A concentration curve graphs the population's health or ill-health (on the vertical axis) against the population ranked according to their socioeconomic status (on the horizontal axis), where the axes are ordered from low to high values (Wagstaff et al., 1991). CIs range between negative and positive one and, in the absence of income-related health inequalities, all individuals are expected to experience the same level of health and collectively produce a CI equal to zero. If the continuous health variable is an increasing function of health, a negative CI value indicates high-income individuals suffer worse health than low-income individuals, whereas a positive CI value indicates low-income individuals suffer worse health than high-income individuals. Alternatively, if the continuous health variable is an increasing function of ill-health, a negative CI value indicates low-income individuals suffer worse health than high-income individuals, whereas a positive CI value indicates high-income individuals suffer worse health than low-income individuals. The CI can be decomposed into individual health elasticities which identify a single factor's contribution to the overall level of income-related health inequality (Wagstaff, Van Doorslaer, & Watanabe, 2003). Positive contributions imply the factor is associated with increases in income-related health inequalities, favouring high-income individuals, whereas negative contributions imply the factor is associated with decreases in income-related health inequalities, favouring low-income individuals. Decomposition also allows for the distinction between unalterable (e.g., demographic) and alterable (e.g., socioeconomic status) factors, where the latter is more likely to respond to policy, funding, and provision interventions.

Not only are there several approaches to quantifying health inequalities, but there are also various indicators available to represent health status. Health indicators can be classified as medical (e.g., diseases or conditions), functional (e.g., the ability to perform 'normal' tasks), or subjective (e.g., self-perceived health) (O'Donnell, Van Doorslaer, Wagstaff, & Lindelow,

2007). While the former two are typically dichotomous, self-assessed health (SAH) indicators are usually categorical and include at least three response options. This allows for the employment of previously-validated scoring algorithms and the subsequent conversion of the categorical SAH indicator into a usable continuous variable (Wagstaff & Van Doorslaer, 1994). Given that the CI computation requires a continuous health indicator, SAH has been used extensively in the investigation of income-related health inequalities (see Gunasekara, Carter, & McKenzie, 2013; Kakwani, 1980; Van Doorslaer et al., 1997; Wildman, 2003). The indicator does not rely on the same definition restrictions as objective indicators; rather, it provides insight into an individual's own health perceptions (Wagstaff et al., 1991). As a result, SAH displays a high level of predictive validity in terms of health outcomes (e.g., mortality) (DeSalvo, Bloser, Reynolds, He, & Muntner, 2006) and is sometimes more accurate than objective indicators (Mirowsky & Ross, 2003). Additionally, SAH data is often readily available, and the surveys that administer SAH questions tend to be altered only marginally over time to ensure intertemporal comparability (Wagstaff et al., 1991). Despite these benefits, there is concern surrounding the use of SAH to compare health status across different population groups. The discrepancies in the health inequalities detected from SAH and medical or functional data suggests there can be systematic variation in the reporting behaviour of respondents (O'Donnell et al., 2007). For example, Mathers and Douglas (1998) find ethnic minority groups can deem themselves to be of 'excellent' health, or of better health than that reported by the ethnic majority group, despite suffering a relatively higher mortality rate. The limitations associated with using SAH as a mental health outcome are addressed further in Chapter 5. Even though individuals within a given ethnic group can hold different health views, it is useful to make generalisations based on the ethnic groups' traditional health views (Scott, Sarfati, Tobias, & Haslett, 2000). In the context of New Zealand, the European population tends to share health views that are similar to those held by individuals in other Western countries, where mental and physical health are deemed to be separate entities (Scott et al., 2000). Alternatively, Māori and Pacific peoples do not recognise this same separation. Although these populations differentiate between physical, mental, spiritual, family, environmental, and language health, these six concepts are considered to be strongly interrelated aspects (Durie, 1985).

2.2 International Application of the Concentration Index

Due to their multifaceted nature, income-related health inequalities are more complicated than they first appear. While the CI measures the overall level of income-related health inequality, decomposition draws attention to these complications and provides policy-makers with a starting point to eradicate them (Wildman, 2003). Two approaches are available in the application of the CI and its decomposition: a within-country approach, where the CI and factor contributions of a single country are quantified (see Allanson, Gerdtham, & Petrie, 2010; McGrail, Van Doorslaer, Ross, & Sanmartin, 2009; Wildman, 2003), and a cross-country approach, where these results are compared across multiple countries (see Devaux, 2015; Van Doorslaer & Koolman, 2004; Van Doorslaer et al., 1997).

Wildman (2003) conducts a within-country analysis to ascertain the factors related to Great Britain's income-related mental health inequalities. A CI is constructed using both objective (e.g., marital status) and subjective factors (e.g., perceived financial status). McGrail et al. (2009) undertake a similar study of income-related general health inequalities in the United States (US) and Canada, analysing the two countries separately. These studies group factors according to four domains; demographic characteristics, socioeconomic status, lifestyle factors, and health care access and utilisation. Given the use of continuous health variables that are increasing functions of health, both studies produce positive CI values, suggesting income-related health inequalities in these countries are most harmful to low-income individuals. Results from the decomposition allow policy-makers to direct efforts to the factors that contribute the most towards income-related health inequalities, but also draw attention to the factors that are beyond their control and are not necessarily avoidable. Wildman (2003) advises that, in order to make substantial progress in the elimination of income-related health inequalities, policy-makers should target income redistribution and other social or health policies towards the population groups that are affected most by these factors (e.g., those who are older, unemployed, single, living in deprived communities, display adverse health behaviour, or experience health care barriers). This will ensure the policies have a larger impact than general income redistribution policies.

Allanson et al. (2010) suggest within-country analyses can be enhanced through intertemporal considerations. Specifically, they advocate the construction of a CI that highlights whether reductions in income-related health inequalities benefit individuals who were initially low-income or high-income individuals. The traditional CI is augmented to allow for this

consideration and the study observes a decline in income-related health inequalities over the period examined. This improvement is largely attributed to changes in income-related health and is only slightly offset by the movement of individuals among income ranks – where those whose incomes increased were typically healthier than those whose incomes decreased. The study draws on the 1991 to 1999 waves of the British Household Panel Survey, which follows the same individuals over time. This is particularly valuable to policy-makers, as the augmented CI conveys the persistence of income-related health inequalities. By implication, any long-term or chronic issues are viewed as more severe than when they are identified by cross-sectional studies, which purely allow for the measurement of the income-related health inequalities that exist within a sample at a single point in time. Allanson et al. (2010) suggest policy-makers design initiatives that remove the structural issues which create a cycle of poor health, rather than solely handling temporary episodes of illness. Unfortunately, this methodology enhancement cannot be adopted by the current study, as longitudinal health surveys are not currently undertaken in New Zealand.

Van Doorslaer et al. (1997) conduct a cross-country study of the differences in income-related health inequalities across the US and Europe and are the first to employ a SAH measure as the health outcome of interest. For reasons outlined in Section 2.1, this is also the health indicator employed by the current study. Van Doorslaer et al. (1997) use a SAH variable that is an increasing function of ill-health and find that all countries produce negative CIs of varying degrees, suggesting income-related health inequalities favour high-income individuals. However, the study's main contribution is an investigation concerning the ability of income inequality to explain income-related health inequalities. It is often presumed a nation will suffer higher levels of income-related health inequalities alongside higher levels of income inequalities (Blaxter, 1989; Wilkinson, 1989). This implies a decrease in income inequalities should automatically result in a similar decrease in income-related health inequalities (Van Doorslaer et al., 1997). Alternatively, it has been suggested there will be close movement between the two only if there is a linear relationship between them (Lambert & Pfähler, 1992). It is possible a concave relationship exists between income and health, given the well-documented, concave relationship between income and life expectancy (Preston, 1975; World Bank, 1993). Van Doorslaer et al. (1997) consider an income transfer from a high-income individual to a low-income individual which leaves total income unchanged and income inequality lower. In the presence of a non-linear relationship, the increase in the low-income individual's health is expected to be greater than the decrease in that of the high-income

individual. Overall health rises, though by less than the low-income individual's health improvement, and all other individuals experience a relatively smaller share of total health after the income redistribution. In this way, it is not always true there is a particularly close relationship between income and health inequalities, especially when average income and the relationship between health and income are unequal (Van Doorslaer et al., 1997). Interestingly, the study provides evidence in support of a close link between income-related health inequalities and income inequalities, however, the two are not perfectly correlated.

In subsequent research, Van Doorslaer and Koolman (2004) consider the same countries as Van Doorslaer et al. (1997) but use decomposition to identify the factors responsible for the remainder of these health inequalities. In all but one country, income is the largest contributor (between 25.00% and 40.00%), followed by demographic characteristics, education, and employment status. Furthermore, each country's results are compared to the country with the smallest recorded income-related health inequalities; the Netherlands. This enables for a cross-country comparison of income-related health inequalities, which can be split into the proportion explained by excess health elasticities (or the association between the factor and health) and the proportion explained by excess income inequalities (Van Doorslaer & Koolman, 2004). From a policy perspective, this is an important distinction as often health policies cannot directly change a factor's distribution by income, however, they can influence a factor's health elasticity (Van Doorslaer & Koolman, 2004). On average, the study deems health elasticities to be more detrimental than income inequalities, also providing support for the notion that health policies may be more effective in reducing income-related health disparities than simple income redistribution. In summary, Van Doorslaer and Koolman (2004) suggest policy-makers target three areas in order to reduce income-related health inequalities. First, policies should aim to minimise the health deterioration that ensues following a loss of income, or conversely, the loss of income that occurs following health deterioration, through income replacement initiatives. Second, policies should aim to remove any systematic regional health and income differences, to narrow overall levels of income-related health inequalities. Lastly, policies should target the relationship between health and income rank, particularly for individuals who are not active in the labour market. In these instances, income-related policies are most effective, as it is difficult to improve the health elasticities for inactive individuals (e.g., the elderly or disabled).

Equal access for equal need is one such health policy objective adopted by OECD countries. Devaux (2015) compares income-related health care access inequalities across 18 OECD

countries. Universal health coverage, lower levels of required private insurance or out-of-pocket payments, and co-payment exemptions for vulnerable populations are examples of initiatives which have proved to reduce income-related health inequalities. Policy-makers should continuously monitor income-related health inequalities to understand whether the objectives of such initiatives are achieved (Devaux, 2015). New Zealand produces the largest disparities in general practitioner visits, which is partly explained by country-specific health systems and survey questions, limiting the comparability of income-related health inequalities between countries. Health indicators are susceptible to such inconsistencies, as they can be proxied by a range of variables (e.g., mortality rates or SAH). Furthermore, Erreygers (2009) argues that the health indicator's often-qualitative nature and the use of population means in the computation of the CI restricts the comparability of findings across countries. As a result, the current study adopts a within-country analysis to avoid such comparisons.

2.3 New Zealand Application of the Concentration Index

Despite persistent income-related health inequalities, few studies construct a CI for New Zealand in order to quantify the proportional contributions of a range of income-related health inequality factors. This gap is perpetuated by content and phrasing inconsistencies between existing domestic and international health data (Gunasekara et al., 2013). A within-country approach mitigates this issue. There are two New Zealand studies which are at least partially aligned with the aims and methodology of the current study.

Peacock, Devlin, and McGee (1999) construct a CI to measure public health care service utilisation within various income brackets. Roughly equal access exists for equal need, where low-income individuals are registered as inpatients in public hospitals only slightly more than anticipated, relative to their health care need. The comparative under-utilisation of public hospitals by high-income individuals is not necessarily inequitable, given that high-income individuals are more likely to visit private hospitals in order to receive treatment. In this way, the health care service system itself may influence whether health care service use that favours the poor is inequitable or not. If the New Zealand public health care system offers a minimum level of health care, then overuse by the poor should be expected. The study uses 1992/3 New Zealand Household Health Survey data, which was one of many surveys conducted to capture health indicator information and, on its own, was limited in scope (Ministry of Health, 2017b). Additionally, the dataset yields only a 70.00% response rate, where omitted participants belong

to groups that tend to earn less income and/or experience worse health than their respective counterparts (e.g., women, single or widowed people, or those with poor SAH) (Peacock, Devlin, & McGee, 1999).

Gunasekara et al. (2013) compare income-related physical and mental health inequalities between working-age individuals in New Zealand and Australia using 2008/9 New Zealand Survey of Family Income and Employment and Australian data. The CI and its decomposition identify key income-related health inequality contributors consistent with the international literature presented in Section 2.2. The largest contributors to income-related physical health inequalities include unemployment (51.40%), low income (23.00%), and high area-level deprivation (16.30%). The largest contributors to income-related mental health inequalities include unemployment (41.10%), low income (19.70%), and identifying as either divorced, widowed, separated, or never married (19.00%). Gunasekara et al. (2013) argue that, given that differences in employment status and, subsequently, income, produce substantial adverse effects on income-related health inequalities, any policy implemented to reduce such inequalities should involve some income redistribution. Although it was not the purpose of the study to investigate the non-working age population, the exclusion of youth and elderly populations mean any income-related health inequalities experienced among the most vulnerable groups in society (Ministry of Health, 2002) are not considered.

Due to the limitations associated with the respective samples employed in these studies (e.g., the absence of responses belonging to vulnerable population groups, and the use of responses derived from now-outdated questionnaires, among others), the current study is likely to produce a more accurate reflection of income-related health inequalities. Specifically, an adult sample with an 80.00% response rate is used, and a number of factors, not solely the utilisation of health care service, as seen in Peacock et al. (1999), have been assessed. Additionally, it is important to note the exclusion of an ethnicity indicator from these studies, despite an abundance of evidence which supports the consideration of ethnicity during the decomposition of income-related health inequalities (Ministry of Health, 2002). The current study does not face this limitation.

2.4 Ethnic Health Inequalities

Non-random health inequalities can be attributed to a combination of individual, social, community and economic factors, as modelled by the popular Dahlgren-Whitehead ‘rainbow’

model (1991). This section presents studies in New Zealand which support the inclusion of such factors in the construction of a CI. This discussion focusses on factors that have historically persistent contributions to the unfavourable ethnic health inequalities in New Zealand: socioeconomic, lifestyle, health care system, and racial discrimination factors (Ministry of Health, 2014). A brief outline of the current initiatives employed in New Zealand to achieve health equality is also provided for context.

2.4.1 Socioeconomic Factors

The literature concerning New Zealand ethnic health inequalities has predominantly centred on the discrepancies between Māori and non-Māori and have prioritised socioeconomic status as the main contributor to such inequalities. Māori suffered a loss of resources during the colonisation of New Zealand, which appears to have impaired their acquisition of socioeconomic resources; compared to non-Māori, Māori experience lower levels of educational achievement, higher unemployment rates and lower household incomes (Ellison-Loschmann & Pearce, 2006). This impacts their ability to obtain health-improving resources and better health outcomes. For example, Blakely, Fawcett, Hunt, and Wilson (2006) investigate the contribution of smoking and various measures of socioeconomic status (i.e., income, education, car access, employment, and neighbourhood deprivation) to ethnic mortality disparities between Māori, Pacific peoples, and non-Māori, non-Pacific peoples. Consistent with other studies (Lotoala, Breheny, Alpass, & Henricksen, 2014; Ryan, Southwick, Teevale, & Kenealy, 2011), the Pacific peoples results are statistically insignificant due to a small sample size. Smoking and socioeconomic status both account for approximately 10.00% and 50.00% of ethnic health inequalities, respectively, which favours the non-Māori, non-Pacific peoples population. However, the researchers expect these contributions are underestimated; not only have Māori not been smoking heavily for long enough for this risk to be fully reflected in mortality rates, socioeconomic status is a complex construct that is challenging to measure accurately and completely at any given point in an individual's life course (Blakely et al., 2006). Similarly, Sporle, Pearce, and Davis (2002) analyse 1996/97 mortality data to compare amenable, non-amenable and all-cause death rates for Māori and non-Māori men in different social classes, which is proxied by occupation. The study finds mortality rates for Māori to be higher than non-Māori mortality rates in all cases. As both studies control for socioeconomic status, these results highlight that health inequalities between

the two ethnic groups cannot solely be explained by socioeconomic status. There must be other determinants that intersect and perpetuate the varying degree of negative health outcomes experienced by different ethnic groups.

2.4.2 Lifestyle Factors

Pearce (1996) postulates that lifestyle factors initially received greater attention than socioeconomic status because the former necessitates significantly less social and political change. However, he warns undertaking a lifestyle approach during social policy-making can decontextualise behaviour, which can encourage victim blaming. Instead, Blakely et al. (2005) suggest lifestyle factors should be interpreted as a product of various distal social determinants of health (e.g., culture). Tobacco consumption (Blakely et al., 2006), hazardous drinking (Law Commission, 2010), obesity (Rodriguez, George, & McDonald, 2017), and poor nutrition (Laws et al., 2006) rates have been consistently higher among New Zealand's ethnic minority groups, relative to the ethnic majority group. Despite a range of public health initiatives employed to reduce the inequalities between these groups, ethnic minority groups continue to display trends that diverge from policy targets. Rodriguez et al. (2017) argue this could be due to a combination of cultural, class, and structural factors. Their study finds individuals with adequate levels of health literacy and income tend to be responsive to moderation or healthy lifestyle recommendations, but such messages do not have the same effect among Māori. The government is encouraged to protect Māori through evidence-based policies, such as reducing the presence of unhealthy food outlets in areas with a high concentration of Māori (Rodriguez et al., 2017). Makowharemahihi et al. (2016) present further support for this argument within the context of oral health care. The government funds such services for those under 19 years of age, whereas adults must attend private dental centres and pay unsubsidised fees. Compared to non-Māori, Māori are more likely to avoid dental care due to high costs. As a result, significant health disparities exist between ethnic groups, despite the presence of independent Māori health providers, which only offset some of this difference (Makowharemahihi et al., 2016).

2.4.3 Health Care System Factors

In comparison to other ethnic groups, a relatively larger portion of treatable deaths among Māori and Pacific peoples occur even when relevant health care services are available (Tobias & Yeh, 2009). This hints at the presence of ethnic health inequalities in the form of barriers to health care access and utilisation (Ellison-Loschmann & Pearce, 2006). Westbrooke, Baxter, and Hogan (2001) explore whether Māori have unmet needs for health care when faced with heart-related diseases. Hospitalisation and intervention rates show that despite a relatively higher number of Māori being hospitalised due to heart disease, they receive lower levels of intervention care, in comparison to non-Māori. Concerns are also raised over the uptake and provision of elective surgery (e.g., bypass grafts), which would reduce these negative outcomes (Westbrooke et al., 2001). Similarly, although Māori and Pacific peoples suffer lower cancer survival rates in comparison to other ethnic groups, the stage of diagnosis explains only a small share of such ethnic health inequalities (Jeffreys et al., 2005). The remaining share can be attributed to discrepancies in health care service access (e.g., rurality or the ability to obtain secondary health care). In addition, cultural safety and norms are identified as contributing factors, particularly the attitudes of health care professionals towards ethnic minority groups and the acceptability of visiting health care providers to ethnic minority groups (Baxter, 2002). The study by Jeffreys et al. (2005) is limited in that it does not account for the level of co-morbidity among each of the ethnic groups, which may have prevented treatment and, therefore, account for part of the observed health disparities. Schoen and Doty (2004) also examine ethnic health inequalities in health care access and quality. Their findings suggest that compared to non-Māori, Māori are twice as likely to forgo health care services due to high costs or remote locations. It is hypothesised that access and utilisation inequalities could be high due to New Zealand's universal health system, which provides free basic health care, as waiting lists can be avoided by those willing and able to pay for private health care (Schoen & Doty, 2004).

2.4.4 Racial Discrimination Factors

Racial discrimination impacts several areas of an individual's functioning to fuel adverse health outcomes; most notably, poor mental health through higher experienced psychological distress and/or depression (Paradies, 2006). Since the NZHS introduced questions relating to racial discrimination within the health care system, the impacts of racial

discrimination on ethnic health inequalities have received increasing levels of attention. Such information allows for the investigation of both institutionalised (e.g., biased policies) and overt discrimination (Ellison-Loschmann & Pearce, 2006) and the associated effects on the victim's health. Harris et al. (2006a, 2006b, 2012a) use logistic regression to explore the impact of self-assessed racial discrimination on health disparities between Māori and non-Māori. These studies analyse NZHS data pertaining to verbal or physical discrimination and unfair treatment by health professionals, at work or when purchasing real estate due to ethnicity. Māori are more likely to experience all forms of discrimination, with verbal attacks being the most common. Ethnic health inequalities, which favour non-Māori, are present among three broad health outcomes; physical health (e.g., diagnosed conditions, physical functioning, and self-rated physical health), mental health (e.g., diagnosed conditions, psychological distress, and self-rated mental health), and health risks (e.g., excess body fat, smoking, and hazardous drinking). Literature considering the relationships between racial discrimination and health care utilisation (Harris et al., 2012b), and racial discrimination, socially-assigned ethnicity, and health (Harris, Cormack, & Stanley, 2013), provide additional evidence in support of the detrimental impact of this factor.

2.4.5 Policies, Regulations, and Incentives

New Zealand has relatively few effective national policies, regulations, and incentives explicitly designed to achieve mental health equality (Chin et al., 2018). While the Mental Health (Compulsory Assessment and Treatment) Act 1992 is applied in situations where an individual urgently requires mental health services, voluntarily or not, when an individual experiences mental health issues they are typically able to seek their own treatment (Parliamentary Council Office, 1992). Established by the New Zealand Public Health and Disability Act 2000, District Health Boards (DHBs) are funded by the Ministry of Health to provide, plan and purchase up to 80.00% of health services (Ministry of Health, 2018b). DHBs are statutorily obligated to reduce health inequalities between ethnic groups and, as a result, have employed various programmes and incentives (Ministry of Health, 2018b). For example, in view of evidence suggesting ethnic minority physicians are relatively more likely to tend to ethnic minority populations than ethnic majority physicians, DHBs have implemented workforce development programs which aim to increase the number of, and support for, Māori and Pacific peoples enrolled in New Zealand medical schools (Marrast, Zallman, Woolhandler,

Bor, & McCormick, 2014). In addition to such initiatives, the tendency for the New Zealand government to target expenditure towards social services, as opposed to health care services, continues to improve the social determinants of health, which are associated with mental health (see the above sections) (Chin et al., 2018). For example, the Whānau Ora programme recognises the importance of consulting with whānau (extended family) as part of the decision-making process to achieve an individual's aspirations, and the associated importance of assimilating health, education, and social services to achieve these goals (Te Puni Kōkiri, 2018).

These policies, regulations, and incentives are constrained by the underfunding and under-resourcing issues that hinder the mental health services sector and weaken the ability of the Ministry of Health and DHBs to reduce mental health inequalities among ethnic groups (Chin et al., 2018). Both the workforce and the wider health care system are not immune to these issues. There is a large shortage of ethnic minority mental health workers who could work effectively with ethnic minority populations, and mental health services are only as efficient, effective, and equal as the workforce is educated, utilised, and supported (Te Rau Matatini, n.d.). Furthermore, the two-tiered health care system results in queues and rationing for both urgent and nonurgent services, which are avoided by the wealthy or those with private insurance (Chin et al., 2018).

A second limitation within the mental health services sector concerns the quality and quantity of ethnic health inequality data. The allocation of funding is determined using respective DHB population-based funding formulae which adjust for socioeconomic status, age, and ethnicity, among other factors (Ministry of Health, 2016). However, accounting for an individual's age has shown to redistribute resources towards ethnic groups with older populations – in New Zealand, this refers to the European ethnic majority group – resulting in adverse funding outcomes for ethnic minority groups (Chin et al., 2018). There is also a lack of quality Asian peoples, Pacific peoples, and other ethnic subgroup data. Aggregating these subgroups or combining them into an 'other' category leads to a lack of prioritisation of the health needs of these subgroups (Chin et al., 2018). A New Zealand mental health survey, Te Rau Hinengaro, was conducted in 2003/4 to collect information regarding the prevalence, severity, impairment, and treatment of mental health for the overall, Māori, and Pacific peoples populations (Ministry of Health, 2011). The study highlights that, at a descriptive level, Māori, Pacific peoples, disabled people, and refugees are overrepresented under the Mental Health Act and should,

therefore, be a priority area for both the Ministry of Health and DHBs (Browne, Wells, & Scott, 2006).

Chapter 3: Methodology

Chapter 3 details the methodology employed to conduct the current study. Chapter 3 is organised as follows: Section 3.1 describes the history, content, and sample design of the data used in the current study. Section 3.2 describes the dependent mental health outcome variable to be investigated, as well as the independent demographic, socioeconomic, lifestyle, health care system, and racial discrimination factors associated with income-related mental health inequalities. Section 3.3 outlines the analytical methods used in the current study.

3.1 Data

The current study draws on the 1 July 2016 to 30 June 2017 NZHS. With the intention of documenting the nation's health and informing future policy and strategic direction, the NZHS has reported the health status of New Zealand citizens since 1992 (Ministry of Health, 2017c). The NZHS was initially supplemented by numerous questionnaires centred on specific health topics (e.g., adult and child nutrition or tobacco, alcohol, and drug use). From 2011, the Ministry of Health integrated these narrow surveys into the NZHS to create a single, inclusive, continuous questionnaire.

The sample design employs a dual-frame method, where participants are selected from both area-based and electoral roll samples (Ministry of Health, 2017b). This involves three steps; selecting areas from DHBs, selecting households from each area, and selecting a maximum of one adult and child from each household to minimise the impact on survey respondents (Ministry of Health, 2017b). This sample design is similar to that of the National Health Survey conducted by the Australian Bureau of Statistics (Australian Bureau of Statistics, 2019). The 2016/17 NZHS was administered by trained interviewers who visited participating households to conduct face-to-face interviews or, in instances where questions related to sensitive information, facilitated computer-assisted survey components (Ministry of Health, 2017b). The NZHS is restricted to New Zealand residents, with some non-private dwellings (e.g., student accommodation and aged-care facilities) included to ensure the adequate representation of both younger and older adults. Those living in other non-private dwellings (e.g., prisons or hospices) or off the North, South, and Waiheke Islands are excluded from the sample. As a result, 99.00% of New Zealand residents are eligible to participate in the NZHS. Additionally, stratified selection stages attach a heavier weight to areas with a higher concentration of Māori, Pacific peoples, and Asian peoples to ensure the adequate representation of ethnic minority groups.

SAH data was successfully collected from 13,598 adults aged over 15 years as well as the parents or primary caregivers of over 4,668 children aged under 15 years, yielding an overall response rate of 80.00%. Table 1 compares the target population against the survey sample (NZHS adult and children) across key demographic characteristics. The survey sample is reasonably representative of the target population.

Table 1: Target Population versus NZHS Survey Sample

Demographic Characteristic		New Zealand Residents (%) *	Survey (%) **
Age	0-4 years	6.88	9.45
	5-9 years	6.76	7.94
	10-14 years	6.76	8.16
	15-24 years	13.82	8.53
	25-34 years	12.13	12.00
	35-44 years	13.51	11.83
	45-54 years	14.18	11.69
	55-64 years	11.63	12.04
	65-74 years	8.16	10.14
	75+ years	6.15	8.21
Sex	Male	48.66	44.94
	Female	51.34	55.06
Ethnicity	Māori	14.11	24.05
	Pacific peoples	6.98	6.21
	Asian peoples	11.12	10.56
	European/other	71.43	59.18

* Based on the 2013 Census (Statistics New Zealand, 2013).

** Based on the 2016/17 NZHS, compiled as part of the current study.

3.2 Measures

The NZHS features several internationally validated health surveys to aid in the measurement of an individual's perceived level of health from various dimensions. The current study concentrates on the Kessler 10-item Psychological Distress Scale (K10) survey to investigate income-related and ethnic mental health inequalities. The NZHS also encompasses a range of health indicators, such as long-term conditions, sociodemographics, anthropometry, patient experience, and health conditions, behaviours, and utilisation (Ministry of Health, 2017c). The potential mental health factors are selected from these modules.

3.2.1 Kessler 10-Item Psychological Distress Scale

Psychological distress is a state of emotional suffering which can present itself through a range of symptoms, from anxiety or depression to functional disabilities, personality or behavioural problems (Thelin et al., 2017). In 1992, the K10 was developed by Kessler and Mroczek to aid the US National Health Survey in understanding the reported level of non-specific psychological stress experienced by respondents over the past month (Kessler et al., 2003). Favoured for its accuracy and brevity, the K10 has been used extensively and is one of the most internationally validated psychological distress screening scales available. The reliability of the measure has been established across a variety of settings. The K10 has been adopted by health surveys in over 30 countries and is a key outcome measure in the WHO World Mental Health Survey (Kessler & Üstün, 2004). It has been successfully applied to both general population (Furukawa, Kessler, Slade, & Andrews, 2003; Kessler et al., 2005) and primary care samples (Kessler et al., 2002), as well as in epidemiological research (Andrews & Slade, 2001). Additionally, Baillie (2005) finds little evidence of sex or education bias, indicating the K10 is equally valid across different sociodemographic groups, such as those included in the NZHS sample employed by the current study.

The K10 contains ten questions to evaluate the frequency and intensity of psychological distress symptoms experienced by respondents. There are five available responses for each question; 'all the time' is coded as 4, 'most of the time' is coded as 3, 'some of the time' is coded as 2, 'a little of the time' is coded as 1 and 'none of the time' is coded as 0. Therefore, a participant can obtain a total minimum score of 0, suggesting they experience no distress, and a maximum total score of 40, suggesting they experience severe distress. Table 2 presents the interpretations of various scoring brackets (Kessler et al., 2003).

Table 2: K10 Interpretations

Score	Interpretation
0-5	None or low psychological distress
6-11	Moderate psychological distress
12-19	High psychological distress
20-40	Very high psychological distress

The NZHS publishes derived K10 scores as part of its adult questionnaire, which, after the removal of 124 non-response and 29 outlier observations, provides a final sample size of 13,445 respondents. The mean and standard error for each of the 10 items and the aggregate K10 scores by age, sex, and ethnicity are reported in Table 3.

Table 3: K10 and Descriptive Statistics

Item (in the past 30 days)	15-24 years	25-34 years	35-44 years	45-54 years	55-64 years	65-74 years	75+ years	Male	Female	Māori	Pacific peoples	Asian peoples	European /other
1. How often did you feel tired out for no good reason?	0.89 (0.03)	0.71 (0.02)	0.68 (0.02)	0.76 (0.02)	0.70 (0.02)	0.64 (0.02)	0.78 (0.03)	0.63 (0.01)	0.81 (0.01)	0.87 (0.02)	0.78 (0.04)	0.60 (0.03)	0.70 (0.01)
2. How often did you feel nervous?	0.77 (0.03)	0.59 (0.02)	0.51 (0.02)	0.45 (0.02)	0.41 (0.02)	0.30 (0.02)	0.25 (0.02)	0.40 (0.01)	0.52 (0.01)	0.53 (0.02)	0.54 (0.03)	0.41 (0.02)	0.46 (0.01)
3. How often did you feel so nervous that nothing could calm you down?	0.44 (0.03)	0.37 (0.03)	0.37 (0.03)	0.39 (0.03)	0.35 (0.03)	0.29 (0.03)	0.27 (0.04)	0.33 (0.02)	0.40 (0.02)	0.46 (0.03)	0.54 (0.06)	0.29 (0.03)	0.33 (0.01)
4. How often did you feel hopeless?	0.34 (0.02)	0.32 (0.02)	0.28 (0.01)	0.28 (0.02)	0.30 (0.02)	0.23 (0.01)	0.19 (0.02)	0.23 (0.01)	0.32 (0.01)	0.39 (0.02)	0.32 (0.03)	0.21 (0.02)	0.25 (0.01)
5. How often did you feel restless or fidgety?	0.73 (0.03)	0.62 (0.02)	0.57 (0.02)	0.58 (0.02)	0.53 (0.02)	0.40 (0.02)	0.30 (0.02)	0.55 (0.01)	0.53 (0.01)	0.63 (0.02)	0.49 (0.03)	0.33 (0.02)	0.54 (0.01)
6. How often did you feel so restless that you could not sit still?	0.88 (0.04)	0.79 (0.04)	0.79 (0.04)	0.81 (0.04)	0.82 (0.04)	0.69 (0.05)	0.46 (0.05)	0.76 (0.02)	0.80 (0.02)	0.99 (0.04)	0.95 (0.07)	0.55 (0.05)	0.72 (0.02)
7. How often did you feel depressed?	0.40 (0.02)	0.35 (0.02)	0.33 (0.02)	0.37 (0.02)	0.32 (0.02)	0.25 (0.01)	0.23 (0.02)	0.27 (0.01)	0.37 (0.01)	0.38 (0.02)	0.31 (0.03)	0.24 (0.02)	0.32 (0.01)
8. How often did you feel that everything was an effort?	0.88 (0.06)	0.74 (0.04)	0.68 (0.04)	0.69 (0.04)	0.70 (0.05)	0.54 (0.05)	0.47 (0.05)	0.66 (0.03)	0.70 (0.02)	0.80 (0.04)	0.84 (0.08)	0.60 (0.06)	0.64 (0.02)
9. How often did you feel so sad that nothing could cheer you up?	0.68 (0.03)	0.67 (0.02)	0.63 (0.02)	0.63 (0.02)	0.59 (0.02)	0.54 (0.02)	0.73 (0.03)	0.55 (0.01)	0.69 (0.01)	0.77 (0.02)	0.77 (0.04)	0.47 (0.02)	0.60 (0.01)
10. How often did you feel worthless?	0.30 (0.02)	0.24 (0.01)	0.23 (0.01)	0.24 (0.01)	0.24 (0.01)	0.18 (0.01)	0.15 (0.01)	0.18 (0.01)	0.26 (0.01)	0.32 (0.01)	0.29 (0.03)	0.16 (0.01)	0.20 (0.01)
Mean K10 score	**4.88 (0.16) N=1537**	**4.09 (0.12) N=2173**	**3.81 (0.12) N=2145**	**3.87 (0.12) N=2112**	**3.57 (0.11) N=2175**	**2.87 (0.10) N=1835**	**2.85 (0.10) N=1468**	**3.27 (0.06) N=5775**	**4.05 (0.06) N=7670**	**4.59 (0.12) N=2723**	**4.15 (0.22) N=678**	**2.74 (0.12) N=1257**	**3.55 (0.05) N=8787**

When the K10 score is disaggregated into its 10 components, the items which contribute the most to psychological distress include feeling tired, restless, or that everything is an effort, while the items which contribute the least include feeling hopeless, depressed, or worthless. On average, females report a K10 score 23.85% higher than that of males, indicating they report experiencing substantially more psychological distress. Expectedly, psychological distress decreases with age and, with a mean K10 score of 4.88, adolescents tend to report worse mental health than any other age bracket. Those who identify as Māori produce the highest mean K10 scores (4.59), followed by Pacific peoples (4.15) and the European/other population (3.55). Asian peoples report the lowest levels of psychological distress (2.74).

New Zealand's mean K10 scores and the associated differences by age, sex, and ethnicity are not dissimilar to those reported in Australia, the US, and Canada. Australian studies have historically employed an alternate scoring method, where K10 item responses are coded using a 1 to 5 range, as opposed to the 0 to 4 range adopted in the current study and elsewhere. When this difference is accounted for, both Australia (Slade, Grove, & Burgess, 2011) and the US (Mewton et al., 2016) return mean K10 scores consistent with those reported in New Zealand. Specifically, all three countries produce means which lie within the 'none or low psychological distress' bracket, where older and male populations report lower levels of psychological distress than do younger and female populations, respectively. Although it has been suggested cultural norms are responsible for the differences in the reported levels of psychological distress between males and females, the K10 has proved to hold little predictive bias based on sex. Therefore, any discrepancy in mean K10 scores between these populations reflects true differences in psychological distress and are not the consequence of biased measurement or interpretation of the K10 items (Baillie, 2005; Darpeau et al., 2010). In terms of ethnic disparities, Bougie, Arim, Kohen, and Findlay (2016) validate the K10 as a measure of psychological distress for Aboriginal peoples in Canada. The mean K10 scores range from 5.5 to 6.3 depending on the subsample of Aboriginal peoples being considered. These levels of psychological distress are higher than those of non-Aboriginal populations – a finding which is also reflected in the mean K10 scores for the different ethnic groups in New Zealand.

Alternatively, studies from Japan (Sakurai et al., 2011) and Hong Kong (Chan & Fung, 2014) report mean K10 scores of 6.1 and 17.2, respectively. Although these scores are much higher, it must be noted Japan has unusually high rates of mood and anxiety disorders (Sakurai et al., 2011), while the Hong Kong literature has largely focused on the age bracket which historically reports the highest levels of psychological distress; adolescents.

3.2.2 Mental Health Factors

A defining feature of the current study is the inclusion of a wide range of factors that can potentially explain income-related mental health inequalities. These variables are included due to their historical association with individual-level mental health status (see Section 2.4) and, consequently, may be related to income-related mental health inequalities at the population level. Factors are organised according to five domains; demographic, socioeconomic, lifestyle, health care system, and racial discrimination. The descriptive statistics of the factors under each of these domains are presented in Table 4.

The final sample consists of respondents over 15 years of age and a female-to-male sex ratio of 1.33. Along with age and sex, a respondent's ethnicity is recorded under one of four broad ethnic categories: Māori (20.25%), Pacific peoples (5.04%), Asian peoples (9.35%), or European/other (65.36%), where European and other populations are combined by the NZHS because the latter refers to only a small percentage of the survey population. To avoid the complications associated with multiple ethnic responses, individuals are assigned to one of these categories using a prioritised classification with the following order: Māori, Pacific peoples, Asian peoples, European/other. Unfortunately, the consequences of disregarding all but one ethnic response can result in the suppression of diversity and intersectionality between ethnic groups (Statistics New Zealand, 2004). A respondent's marital status is not included as a mental health factor as it does not feature in the NZHS.

Respondents are more likely to hold at least a bachelor's degree or higher (34.37%), as opposed to high-school education (levels 1 through 3 certificates) (27.80%), some post-school education (levels 4 through 6 certificates or diplomas) (19.55%), and no qualification (18.28%). Despite over 80.00% of respondents holding some level of formal educational qualification, 58.34% of respondents are employed. However, this figure does not include respondents who are actively seeking a job or those who are retired, a homemaker, caregiver, or full-time student. As a result, the income measure of interest is gross household income (before tax), which is derived from employment and self-employment earnings, investment earnings, benefits or allowances, as well as any other income sources. Household income is favoured over personal income as it accounts for any income earned by other household members which could influence an individual's level of socioeconomic status and/or mental health. The NZHS data reports household income distributed across six brackets. These are regrouped into low-income households (23.68% of respondents), medium-income households (34.19% of respondents),

Table 4: Factor Descriptive Statistics

Factor	Label	Definition	Mean (%)
		Demographic	
Age	age_15_24	Dummy variable: (1 = 15-24 years, 0 = otherwise) *(reference group)*	11.43
	age_25_34	Dummy variable: (1 = 25-34 years, 0 = otherwise)	16.16
	age_35_44	Dummy variable: (1 = 35-44 years, 0 = otherwise)	15.95
	age_45_54	Dummy variable: (1 = 45-54 years, 0 = otherwise)	15.71
	age_55_64	Dummy variable: (1 = 55-64 years, 0 = otherwise)	16.18
	age_65_74	Dummy variable: (1 = 65-74 years, 0 = otherwise)	13.65
	age_75_plus	Dummy variable: (1 = 75 years or more, 0 = otherwise)	10.92
Sex	female	Dummy variable: (1 = female, 0 = otherwise)	57.05
Ethnicity	māori	Dummy variable: (1 = Māori, 0 = otherwise)	20.25
	pacific_peoples	Dummy variable: (1 = Pacific peoples, 0 = otherwise)	5.04
	asian_peoples	Dummy variable: (1 = Asian peoples, 0 = otherwise)	9.35
	european_other	Dummy variable: (1 = European/other, 0 = otherwise) *(reference group)*	65.36
		Socioeconomic	
Education	no_qual	Dummy variable: (1 = no qualification, 0 = otherwise) *(reference group)*	18.28
	school_qual	Dummy variable: (1 = level 1, 2 or 3 certificates, 0 = otherwise)	27.80
	post_school_qual	Dummy variable: (1 = level 4 certificate or level 5 or 6 diploma, 0 = otherwise)	19.55
	bachelors_plus_qual	Dummy variable: (1 = bachelor's degree or higher, 0 = otherwise)	34.37
Employment	employed	Dummy variable: (1 = employed, 0 = otherwise)	58.34
Household income	low_hh_income	Dummy variable: (1 = $30,000 or less, 0 = otherwise) *(reference group)*	23.68
	med_hh_income	Dummy variable: (1 = $30,001-$70,000, 0 = otherwise)	34.19
	high_hh_income	Dummy variable: (1 = $70,001 or more, 0 = otherwise)	42.13
Area-level deprivation	low_dep	Dummy variable: (1 = deciles 1-3, 0 = otherwise)	20.74
	med_dep	Dummy variable: (1 = deciles 4-7, 0 = otherwise)	45.21
	high_dep	Dummy variable: (1 = deciles 8-10, 0 = otherwise) *(reference group)*	34.04

Lifestyle			
Smoker	smoker	Dummy variable: (1 = current smoker, 0 = otherwise)	19.40
Drinker	drinker	Dummy variable: (1 = hazardous drinker, 0 = otherwise)	25.00
Physical activity	active	Dummy variable: (1 = active, 0 = otherwise)	48.68
Nutrition	nutrition	Dummy variable: (1 = eats well, 0 = otherwise)	38.27
Body Mass Index (BMI)	underweight	Dummy variable: (1 = BMI is less than 18.5, 0 = otherwise)	1.32
	normal_weight	Dummy variable: (1 = BMI is between 18.5-24.9, 0 = otherwise) *(reference group)*	28.42
	overweight	Dummy variable: (1 = BMI is between 25-29.9, 0 = otherwise)	33.55
	obese	Dummy variable: (1 = BMI is 30 or more, 0 = otherwise)	36.71
Health Care System			
Usual general practitioner (GP)	no_usual_gp	Dummy variable: (1 = no usual GP, 0 = otherwise)	4.41
Unmet needs (GP)	no_gp_schedule	Dummy variable: (1 = experienced unmet need for GP services due to inability to schedule an appointment within 24 hours in the past 12 months, 0 = otherwise)	19.97
	no_gp_cost	Dummy variable: (1 = experienced unmet need for GP services due to cost in the past 12 months, 0 = otherwise)	16.61
	no_gp_transport	Dummy variable: (1 = experienced unmet need for GP services due to a lack of transport in the past 12 months, 0 = otherwise)	4.40
	no_prescription_cost	Dummy variable: (1 = unfilled prescription due to cost in the past 12 months, 0 = otherwise)	8.77
Health insurance	insured	Dummy variable: (1 = covered by health or medical insurance, 0 = otherwise)	28.52
Racial Discrimination			
Verbal attack	verbal_attack	Dummy variable: (1 = victim of an ethnically motivated verbal attack, 0 = otherwise)	15.10
Physical attack	physical_attack	Dummy variable: (1 = victim of an ethnically motivated physical attack, 0 = otherwise)	4.22
Unfair treatment by a health professional	unfair_prof	Dummy variable: (1 = treated unfairly by a health professional because of their ethnicity, 0 = otherwise)	2.98

and high-income households (42.13% of respondents). Additionally, the New Zealand Deprivation Index 2013 (NZDep2013) provides further insight into the socioeconomic status of respondents. The NZDep2013 considers factors such as income, access to transport and communications, housing, family structure, and home ownership to provide a deprivation score for each mesh block, or small geographical areas specified by Statistics New Zealand (Atkinson, Salmond, & Crampton, 2014). The NZDep2013 organises deprivation scores into deciles, where one and 10 represent areas with the least and most deprived scores, respectively. The only benefit of including the NZDep2013 is the explanatory power area-level deprivation offers after removing household income. To ensure this benefit is realised, the NZDep2013 is orthogonalised to remove the collinearity between household income and area-level deprivation. Finally, the NZDep2013 is regrouped into low-deprivation (20.74% of respondents), medium-deprivation (45.21% of respondents), and high-deprivation (34.04% of respondents) areas.

In terms of lifestyle factors, 19.40% of respondents admit to smoking at least monthly (and have smoked more than 100 cigarettes in their entire life) and 25.00% of respondents fit the profile of a hazardous drinker. The Alcohol Use Disorders Identification Test (AUDIT) covers consumption, dependence, and adverse consequences (World Health Organisation, 2001). Hazardous drinkers are those who obtain an AUDIT score above seven and display an established behaviour that increases the risk of damage to both physical and mental health. 48.68% of respondents report they complete at least 30 minutes of moderately intense physical activity on at least five or more days per week and 38.27% of respondents report they eat at least three servings of vegetables and two servings of fruit per day. The Ministry of Health considers these individuals to be active and consume adequate fruit and vegetables, respectively (Ministry of Health, 2015). Further, according to WHO's Body Mass Index (BMI), which divides an individual's weight by their height, and the associated cut off points (World Health Organisation, 2018b), a respondent is more likely to be obese (36.71%) than overweight (33.55%), of normal weight (28.42%), or underweight (1.32%).

The majority (95.59%) of respondents have a regular GP or medical centre in which they visit when they are unwell or injured, however, there are substantial unmet needs. In the past 12 months, a substantial percentage of respondents were unable to visit their GP due to GP availability (19.97%), cost (16.61%), or a lack of transport (4.40%). Additionally, 8.77% of respondents were unable to fill a prescription due to cost. Adding to these access barriers is the

low rate of respondents (28.52%) who are covered by some form of health or medical insurance.

In terms of racial discrimination, 15.10% of respondents report they are a victim of an ethnically motivated verbal attack, and 4.22% of respondents report they are a victim of an ethnically motivated physical attack. Furthermore, 2.98% of respondents report they have been treated unfairly by a health care professional as a result of their ethnicity.

3.3 Analytical Methods

The current study follows the methodology developed by Wagstaff et al. (2003) to construct a CI and undertake decomposition analysis to identify the proportional contribution of factors towards income-related health inequalities. Additionally, Blinder-Oaxaca decomposition (Blinder, 1973; Oaxaca, 1973) is applied to average ethnic mental health inequalities to understand the degree to which they are explained by each factor. The current study uses Stata 15 to conduct these analyses.

3.3.1 Concentration Index Decomposition

The CI is dependent on the covariance between the population's health and socioeconomic status and is calculated as follows:

$$CI = \frac{2}{\mu} cov(y_i, R_i) \tag{1}$$

Where μ is the mean health outcome, y_i is the health outcome (for individual $i = 1, \dots, N$), and R_i ranks each individual by their income ($R_i = \frac{1}{N}$ for the lowest earning individual to $R_i = \frac{N}{N}$ for the highest earning individual). The following regression is estimated to decompose the CI in a stepwise fashion:

$$y_i = \alpha + \sum_k \beta_k x_{ki} + \varepsilon_i \tag{2}$$

Where α is the intercept, β_k are the coefficients attached to x_{ki}, which are the factors hypothesised to be associated with income-related health inequalities, and ε_i is the error term. After calculating the means and CIs of the health outcome and each of the factors, the absolute contribution of each factor is computed as:

$$\left(\frac{\beta_k \bar{x}_k}{\mu}\right) C_k \tag{3}$$

Where $\bar{x}_k$ is the mean of x_k and C_k is the CI for x_k. The relative (or proportional) contribution of each factor is calculated as:

$$\left(\left(\frac{\beta_k \bar{x}_k}{\mu}\right) C_k\right) / CI \tag{4}$$

In this way, the overall CI is additively decomposable as it is equal to the weighted sum of each factor's CI and the CI of any unexplained income-related health inequalities, C_ε (Kakwani, Wagstaff, & Van Doorslaer, 1997):

$$CI = \sum_k \left(\frac{\beta_k \bar{x}_k}{\mu}\right) C_k + \left(\frac{C_\varepsilon}{\mu}\right) \tag{5}$$

3.3.2 Blinder-Oaxaca Decomposition

Although the CI decomposition allows for mental health inequalities to be decomposed across a country's entire income distribution, it does not highlight the contribution of group differences in factor magnitudes. The Blinder-Oaxaca procedure (Blinder, 1973; Oaxaca, 1973) can be applied to quantify factor contributions towards mental health inequalities between ethnic groups. Initially developed for the study of labour market outcomes, Blinder-Oaxaca decomposition separates inequalities into two components; 'explained' and 'unexplained'. This method is based on two regression models which are fitted separately for two populations. Consider the European/other (e) and Māori (m) populations:

$$y_e = \boldsymbol{x}_e' \beta_e + \varepsilon_e \tag{6}$$

$$y_m = \boldsymbol{x}_m' \beta_m + \varepsilon_m \tag{7}$$

Where y_e and y_m are mean health outcomes, $\boldsymbol{x}_e$ and $\boldsymbol{x}_m$ are vectors of factors, β_e and β_m are coefficients (including the intercept), and ε_e and ε_m are error terms. The average inequality in health outcomes between the two populations is:

$$\Delta\bar{y} = \bar{\boldsymbol{x}}_e' \hat{\beta}_e - \bar{\boldsymbol{x}}_m' \hat{\beta}_m \tag{8}$$

Where $\Delta\bar{y}$ is the average health inequality, $\bar{\boldsymbol{x}}_e$ and $\bar{\boldsymbol{x}}_m$ are means of $\boldsymbol{x}_e$ and $\boldsymbol{x}_m$, and $\hat{\beta}_e$ and $\hat{\beta}_m$ are estimates of β_e and β_m. This can be rearranged as follows:

$$\Delta\bar{y} = (\bar{\boldsymbol{x}}_e - \bar{\boldsymbol{x}}_m)'\hat{\beta}_m + \bar{\boldsymbol{x}}_m'(\hat{\beta}_e - \hat{\beta}_m) + (\bar{\boldsymbol{x}}_e - \boldsymbol{x}_m)'(\hat{\beta}_e - \hat{\beta}_m) \quad (9)$$

A neutral coefficients vector, β^*, aids in the identification of the contribution differences in factor magnitudes make to inequality, where β^* is estimated ($\hat{\beta}^*$) from a pooled model over both populations. The average health inequality between the two populations can then be written as:

$$\Delta\bar{y} = (\bar{\boldsymbol{x}}_e - \bar{\boldsymbol{x}}_m)'\hat{\beta}^* + \left[\bar{\boldsymbol{x}}_e'\left(\hat{\beta}_e - \hat{\beta}^*\right) + \bar{\boldsymbol{x}}_m'\left(\hat{\beta}^* - \hat{\beta}_m\right)\right] \quad (10)$$

This is a two-fold decomposition, where $(\bar{\boldsymbol{x}}_e - \bar{\boldsymbol{x}}_m)'\hat{\beta}^*$ is the explained proportion of the inequality which results from group differences in factor endowments, and $\left[\bar{\boldsymbol{x}}_e'\left(\hat{\beta}_e - \hat{\beta}^*\right) + \bar{\boldsymbol{x}}_m'\left(\hat{\beta}^* - \hat{\beta}_m\right)\right]$ is the unexplained proportion of the inequality which results from discrimination and the potential effects of differences in unobserved factors. A minority group (in this case, Māori) dummy variable is included to avoid increasing the explained contribution at the expense of the unexplained contribution (Jann, 2008).

If only one population is assumed to suffer discrimination, the reference coefficients can be those belonging to the population experiencing neither positive nor negative discrimination. The estimated European/other population coefficients can be used, given that the Māori population typically suffers from discrimination (Ellison-Loschmann & Pearce, 2006). In other words, $\hat{\beta}^* = \hat{\beta}_e$ and the average inequality in health outcomes between the two populations can be written as:

$$\Delta\bar{y} = (\bar{\boldsymbol{x}}_e - \bar{\boldsymbol{x}}_m)'\hat{\beta}_e + \bar{\boldsymbol{x}}_m'(\hat{\beta}_e - \hat{\beta}_m) \quad (11)$$

For robustness purposes, the current study conducts Blinder-Oaxaca decomposition using both pooled and non-pooled approaches and is repeated for European/other population and Pacific peoples, and European/other population and Asian peoples.

Chapter 4: Findings and Discussion

Chapter 4 presents the findings from the current study and discusses any relevant policy implications that arise. Chapter 4 is organised as follows: Section 4.1 reports and interprets overall CI values, as well as the results from the CI decomposition. Section 4.2 discusses the key outcomes from the Blinder-Oaxaca decomposition.

4.1 Concentration Index Decomposition

The New Zealand CIs, both for the overall sample and by subgroup, are reported in Table 5. Unfortunately, given that the NZHS reports household income categorically (as opposed to continuously), this limits possible deviations and renders statistical significance tests of the CIs (e.g., confidence intervals) uninformative. In any case, the signs and magnitudes of the CIs are interpreted here.

Table 5: Concentration Indices

	Māori	**Pacific peoples**	**Asian peoples**	**European/other**	**Overall**
Male	-0.20	-0.11	0.02	-0.10	**-0.11**
Female	-0.13	-0.16	-0.09	-0.12	**-0.13**
Overall	**-0.17**	**-0.15**	**-0.04**	**-0.12**	**-0.13**

The sample produces a CI of -0.13, indicating an inverse covariance exists between household income and the level of reported psychological distress. More specifically, higher household income brackets are associated with lower K10 scores. This suggests mental health inequalities favour respondents from high-income households and are detrimental to those from low-income households. The use of various methods, concepts and measures make it challenging to accurately compare the results from the current study to those from previous research. Given the complexity of measuring socioeconomic status, the most notable variation in the methodology of similar studies is the choice of socioeconomic status indicator, which includes, but is not restricted to, income, education, wealth, and standard of living. The signs and magnitudes of these findings are consistent with prior literature that utilises income as an indicator of socioeconomic status (see Section 2.2), however, the CI results in both the current and previous studies do not clarify the direction of causation. It is likely a bidirectional relationship between income and mental health exists, where an individual may experience poor mental health as a result of low income and a constrained budget (as per the Grossman

health production model), or an individual may experience low income as a result of poor mental health and reduced ability to perform (Golberstein, 2015).

The subgroup analysis shows that all but one of the groups also experience negative CIs. The exception exists among Asian males, who return a positive covariance between K10 scores and household income. This result is marginal and suggests there is little income-related mental health inequality within this subgroup. In terms of sex, the female CI is lower than that of their male counterparts, implying there is greater income-related mental health inequality among females than males. This interpretation also applies to the low Māori CI of -0.17 when compared to the CIs of Pacific peoples (-0.15), European/other population (-0.12), and Asian peoples (-0.04), ranked by ethnic groups displaying the most to least income-related mental health inequalities.

The CI decomposition results are highlighted in Table 6. For each of the factors in the first column, the second column reports the factor coefficients from the estimated regression in Equation 2. The third column restates the prevalence, or mean, of the variable within the sample. The fourth column presents the CI for each factor. The fifth column uses Equation 4 to combine and translate the information from previous columns into a proportional contribution for each factor.

Overall, the model explains 88.97% of mental health inequalities between household income brackets, whereas 11.03% remains unexplained and can be attributed to unobserved factors. The unexplained portion of income-related mental health inequalities is derived from the error term in Equation 5. This is a measure of the covariance between the residuals of the estimated regression and individual income rank. In this way, the decomposition results are dependent on the accuracy of the underlying regression model (McGrail et al., 2009). The CI decomposition results are discussed below, grouped by the five factor domains (see Section 3.2.2). It is useful to note the contribution direction relies on two factor-specific sources; the regression coefficient and the CI. Although the regression coefficients cannot be interpreted in a causal manner, they aid in the disentanglement of the partial associations between psychological distress and the included factors. A negative (positive) regression coefficient indicates that, on average, the factor is associated with a lower (higher) K10 score and, therefore, less (more) psychological distress, relative to its comparison group. A positive (negative) CI indicates the factor is relatively more concentrated among high-income (low-income) households. If a factor returns a negative (positive) regression coefficient and a

Table 6: Concentration Index Decomposition

Factor	Regression Coefficient	Prevalence (%)	Concentration Index	Contribution (%)
		Demographic		
age_25_34	-0.97***	16.16	0.15	4.65
age_35_44	-0.95***	15.95	0.21	6.62
age_45_54	-1.25***	15.71	0.14	5.43
age_55_64	-1.65***	16.18	0.03	1.78
age_65_74	-2.70***	13.65	-0.26	-19.52
age_75_plus	-2.84***	10.92	-0.50	-31.58
female	0.25**	57.05	-0.06	1.63
māori	-0.43***	20.25	-0.11	-1.91
pacific_peoples	-0.96***	5.04	-0.05	-0.49
asian_peoples	-0.83***	9.35	0.09	1.47
Total				**-31.92**
		Socioeconomic		
school_qual	0.00	27.80	-0.05	0.00
post_school_qual	-0.06	19.55	0.01	0.01
bachelors_plus_qual	-0.20	34.37	0.22	3.11
employed	-0.93***	58.34	0.25	27.51
med_hh_income	-0.74***	34.19	-0.14	-7.18
high_hh_income	-1.02***	42.13	0.56	48.96
low_dep	-0.27*	20.74	0.02	0.21
med_dep	0.01	45.21	-0.02	0.02
Total				**72.64**

Lifestyle				
smoker	0.59***	19.40	-0.17	3.87
drinker	0.61***	25.00	0.02	-0.57
active	-0.37***	48.68	0.04	1.59
nutrition	-0.27**	38.27	0.05	1.12
underweight	0.91	1.32	-0.17	0.41
overweight	-0.01	33.55	0.04	0.03
obese	0.26	36.71	-0.06	1.08
Total				**7.53**
Health Care System				
no_usual_gp	-1.10	4.41	0.00	0.01
no_gp_schedule	1.32***	19.97	-0.01	0.80
no_gp_cost	1.62***	16.61	-0.20	10.89
no_gp_transport	3.16***	4.40	-0.34	9.68
no_prescription_cost	2.39***	8.77	-0.30	12.91
insured	-0.27**	28.52	0.33	5.20
Total				**39.49**
Racial Discrimination				
verbal_attack	1.00***	15.10	0.00	0.12
physical_attack	0.67**	4.22	-0.08	0.48
unfair_prof	0.83**	2.98	-0.13	0.63
Total				**1.23**
Total			**-0.13**	**88.97**

* Statistically significant at the 10% level.

** Statistically significant at the 5% level.

*** Statistically significant at the 1% level.

positive (negative) CI, the factor is associated with higher levels of income-related mental health inequalities which favour high-income households. Alternatively, if a factor returns a negative (positive) regression coefficient and a negative (positive) CI, the factor is associated with lower levels of income-related mental health inequalities which benefit low-income households. Finally, the regression coefficients attached to the formal educational qualification, medium area-level deprivation, BMI, and unregistered with a GP factors are not statistically significant and are not discussed here.

The impacts of both age and sex on income-related mental health inequalities are as anticipated. There is a strong positive age-mental health gradient. In fact, it is expected income-related mental health inequalities could be 31.58% lower if each household income category was to contain equal proportions of respondents aged 75 years or over. This contribution is substantial due to a CI of -0.50, implying the elderly population is more concentrated among low-income households. Conversely, holding all else equal, females are associated with an average K10 score increase of 0.25 points, relative to males. Combining this coefficient with a CI of -0.06, females contribute 1.63% towards income-related mental health inequalities.

In Section 3.2.1, Māori and Pacific peoples reported mean K10 scores above that of the European/other population, however, the regression results differ; in comparison to the European/other population, Māori, Pacific peoples, and Asian peoples are associated with an average decrease of 0.43, 0.96, and 0.83 points in their respective K10 scores. Where the regression comparison holds all other endowments equal, the sample mean does not. In other words, if all other endowments are disregarded, or assumed to be equal across all ethnic groups, Māori and Pacific peoples, on average, report better mental health than the European/other population. As this unrealistic condition is relaxed, alternative factors which Māori and Pacific peoples are comparatively more susceptible to (e.g., lower household income) are associated with higher psychological distress levels, relative to that of the European/other population. In support of this example is the finding that both Māori and Pacific peoples produce negative CIs, indicating they are overrepresented in low-income households. Overall, if there was no relationship between these ethnic minority groups and the K10 score, it is expected income-related mental health inequalities could be 2.40% lower. The opposite is true for Asian peoples, who report a CI of 0.09 and a positive contribution of 1.47%. Section 4.3 further investigates mental health inequalities between ethnic groups.

As expected, socioeconomic factors are the largest contributors (72.64%) to income-related mental health inequalities. High household income alone contributes 48.96% towards income-related mental health inequalities. The importance of household income as a factor of income-related mental health inequalities is a result of the unequal distribution of household income present in New Zealand and a positive association between household income and mental health that remains even after other factors are controlled for. Predictably, employment status is another large contributor to income-related mental health inequalities (27.51%). Holding all else equal, employment is associated with an average K10 score decrease of 0.93 points, relative to unemployment. A similar interpretation applies to respondents who live in low-deprivation areas (relative to those who live in high-deprivation areas). These factors have positive CIs and, given that they are more concentrated among high-income households, positive contributions towards income-related mental health inequalities.

Lifestyle factors contribute 7.53% towards income-related mental health inequalities. Smoking is the largest lifestyle contributor (3.87%) to income-related mental health inequalities. This differs from hazardous drinking, which decreases income-related mental health inequalities (-0.57%). The difference in contribution direction between the two vices lies in their income distribution. Although both factors report positive regression coefficients, their respective CIs differ; smoking produces a CI of -0.17, whereas hazardous drinking produces a (marginal) CI of 0.02. In terms of physical activity and nutrition, both scores produce negative regression coefficients and positive CIs, resulting in contributions to income-related mental health inequalities of 1.59% and 1.12%, respectively.

Health care system factors contribute substantially (39.49%) towards income-related mental health inequalities. The collective contribution of unmet needs in health care is 34.28%, largely driven by the inability to fill a prescription due to cost (12.91%) or visit their GP due to cost (10.89%) or transport (9.68%). These barriers to access are predominantly experienced by low-income households, implied by extremely negative CIs. On the other hand, having some form of health or medical insurance is more prevalent among high-income households and is associated with lower levels of psychological distress, relative to those without insurance. As a result, insurance contributes 5.20% to income-related mental health inequalities.

Despite their statistical significance, the racial discrimination variables only contribute 1.23% to income-related mental health inequalities. This is potentially due to the small share of the sample who have experienced attacks or mistreatment as a result of their ethnicity. Respondents

from low-income households are more likely than those from high-income households to experience physical attacks and receive unfair treatment from health care professionals. Conversely, verbal attacks are distributed relatively evenly among low-income and high-income households.

4.2 Blinder-Oaxaca Decomposition

The results from the Blinder-Oaxaca decomposition using estimated coefficients from pooled (European/other and the respective ethnic minority populations) and non-pooled (European/other population) regressions are similar. For ease of interpretation, Māori, Pacific peoples, and Asian peoples are compared with the European/other population using the relevant coefficients from the non-pooled regressions. The Blinder-Oaxaca decomposition results are reported according to the five factor domains in Table 7 and highlight the extent to which ethnic mental health inequalities reduce or widen when an ethnic minority group receives the observed factor endowments of the European/other population. These results provide insight into the proportion of the ethnic mental health inequality that is explained by the factors and the proportion that remains unexplained due to unobserved, cultural-specific factors. The results for each ethnic group are discussed in turn.

4.2.1 Māori versus European/Other

The Blinder-Oaxaca decomposition calculates mean K10 scores of 4.52 and 3.25 for Māori and European/other populations, respectively. This suggests there is an average difference in K10 scores of 1.27 points, in favour of the European/other population. Differences in the observed endowments over-explain (134.65%) the inequality present between the mean K10 scores of Māori and European/other populations, as opposed to differences in the estimated coefficients and/or unobserved factors (-34.65%). In other words, if Māori had the same characteristics as the European/other population, their K10 score would, on average, decrease by 1.71 points. Māori would report better mental health than their European/other counterparts. These results are unsurprising. The Māori regression coefficient from Table 6 is negative, indicating that, holding all else equal, identifying as Māori is associated with a decrease in the average K10 score, relative to the European/other population. When endowments are considered in Table 3, this outcome reverses and Māori report relatively

Table 7: Blinder-Oaxaca Decomposition

		Māori vs. European/other			Pacific peoples vs. European/other			Asian peoples vs. European/other		
Mean K10	European/other	3.25***			3.25***			3.25***		
	Minority ethnic group	4.52***			3.66***			2.75***		
	Difference	**-1.27*** **			**-0.40**			**0.50** **		
		Coefficient	**(Un) Explained %**	**Difference %**	**Coefficient**	**(Un) Explained %**	**Difference %**	**Coefficient**	**(Un) Explained %**	**Difference %**
Explained	Demographic	-0.37***	21.64	29.13	-0.54***	37.76	135.00	-0.48***	137.14	-96.00
	Socioeconomic	-0.18***	10.53	14.17	-0.02	1.40	5.00	0.23***	-65.71	46.00
	Lifestyle	-0.30***	17.54	23.62	-0.33***	23.08	82.50	0.08*	-22.86	16.00
	Health Care System	-0.67***	39.18	52.76	-0.45***	31.47	112.50	0.04	-11.43	8.00
	Racial Discrimination	-0.19***	11.11	14.96	-0.09**	6.29	22.50	-0.22***	62.86	-44.00
	Total	**-1.71*** **	**100**	**134.65**	**-1.43*** **	**100**	**357.50**	**-0.35*** **	**100**	**-70.00**
Unexplained	Demographic	-0.42**	-95.45	33.07	-0.17	-16.50	42.50	0.04	4.71	8.00
	Socioeconomic	0.25	56.82	-19.69	-1.02	-99.03	255.00	-1.08**	-127.06	-216.00
	Lifestyle	-0.91**	-206.82	71.65	-0.16	-15.53	40.00	-0.90***	-105.88	-180.00
	Health Care System	0.23	52.27	-18.11	-0.02	-1.94	5.00	0.05	5.88	10.00
	Racial Discrimination	-0.01	-2.27	0.79	0.04	3.88	-10.00	-0.08	-9.41	-16.00
	Constant	1.30**	295.45	-102.36	2.35**	228.16	-590.00	2.82***	331.76	564.00
	Total	**0.44*** **	**100**	**-34.65**	**1.03*** **	**100**	**-257.50**	**0.85*** **	**100**	**170.00**

** Statistically significant at the 5% level.

*** Statistically significant at the 1% level.

higher levels of psychological distress. In other words, Māori have coefficients and/or unobserved factors that improve their mental health but endowments that hinder their mental health, relative to the European/other population.

The mental health inequality between Māori and European/other populations is explained: a consequence of endowment differences. If the coefficients attached to the explained proportion of the inequality are positive (negative), this implies the mental health status of Māori would deteriorate (improve) if they were to receive the same endowments as the European/other population. The largest contributors to the explained proportion of the mental health inequalities between Māori and European/other populations relate to health care system factors (39.18%), predominantly a result of differences in unmet needs due to prescription cost (14.33%), GP cost (10.44%), or a lack of transport (10.11%). For example, the coefficient attached to the health care system domain indicates that, should Māori experience the same level of unmet needs and insurance status as the European/other population, their mean K10 score would, on average, decrease by 0.67 points, holding all else equal. A similar interpretation applies to the other domains. The contributions from factors within the demographic (21.64%) and lifestyle (17.54%) domains are also considerable, specifically, those belonging to the age (21.23%), smoking (7.55%) and hazardous drinking (5.87%) factors. Further, the racial discrimination and socioeconomic domains contribute 11.11% and 10.53% towards the mental health inequality between Māori and European/other populations, respectively.

The associated transfer of resources away from Māori during the colonisation of New Zealand has resulted in the ethnic group struggling to keep pace with the European/other population's level of education, employment, and income (Ellison-Loschmann & Pearce, 2006). This has left a large divide in the mental health outcomes between Māori and European populations, and the long-lasting effects are particularly obvious in the level of unmet need for health care services experienced by Māori, relative to the European/other population. This is concerning, particularly given the worsening mental health among Māori. There have been calls for both health and social sectors to increase their joint coordination of approaches, funding, and accountability metrics (Chin et al., 2018), particularly given the interrelated nature of health inequalities, as well as that of the six Māori health concepts (see Section 2.1). An example of this is visible in the health care system results of the current study, where the largest contributions could be reduced if Māori were able to afford prescriptions or transport. Apart from the inability to obtain treatment or attend GP appointments, there is recent concern for

the degree of acceptance and integration of the Māori model of health within the New Zealand health care system (Chin et al., 2018). This demands an increased understanding among health care professionals, regardless of their ethnicity, of the six aspects of Māori health, and the ability to recognise spiritual or physical health issues as being related to mental health issues. Actions such as taking the time to communicate or involve a Māori patient's whānau is vital in building trust and approachability and can often be the difference between a positive mental health outcome or a treatment failure (Best Practice Advocacy Centre New Zealand, 2010). Instead of undertaking a top-down approach, policy-makers should continue to consult and share power with Māori communities in order to promote leadership and self-determination while collecting invaluable insight into what Māori require from health and social policies. The results of the current study suggest ethnic-based policies aimed at a single factor domain are likely to have a limited effect if it is implemented in isolation. There is a clear need for policy intervention that targets health care system access, whether this is through income redistribution or otherwise, but also beyond this to cover lifestyle, racial discrimination, and socioeconomic factors, if the mental health inequality between Māori and European/other populations is to completely converge.

4.2.2 Pacific Peoples versus European/Other

The Blinder-Oaxaca decomposition calculates mean K10 scores of 3.66 and 3.25 for Pacific peoples and European/other populations, respectively. This suggests there is an average difference in K10 scores of 0.40 points, in favour of the European/other population. Again, differences in the observed characteristics over-explain (357.50%) the inequality present in the mean K10 scores of Pacific peoples and European/other populations, as opposed to differences in the estimated coefficients and/or unobserved factors (-257.50%). However, it must be acknowledged that the model does a poor job of predicting the difference in mean K10 scores between these two populations. This lack of statistical significance is likely a result of the inclusion of only a small sample of Pacific peoples, which is an issue not unique to the current study. For example, Lee et al. (2017) uncover high rates of undiagnosed mental health issues among Pacific peoples, which restricts their comparison of diagnosed depression and anxiety by ethnic group. They attribute their small sample size to an underutilisation of mental health services fuelled by language barriers, differences in health views, and a lack of cultural

competence on the part of health care professionals. Due to their lack of statistical significance, these results are not interpreted any further.

4.2.3 Asian Peoples versus European/Other

The Blinder-Oaxaca decomposition calculates mean K10 scores of 2.75 and 3.25 for Asian peoples and European/other populations, respectively. This suggests there is an average difference in K10 scores of 0.50 points, in favour of Asian peoples. Here, it appears the differences in the mental health reported by Asian peoples and European/other populations are attributable (170.00%) to differences in the estimated coefficients and/or the existence of unobserved factors, as opposed to differences in the observable characteristics (-70.00%). In other words, if Asian peoples had the same coefficients as the European/other population and/or relevant unobserved factors were included in the model, their mean K10 score would, on average, increase by 0.85 points. Asian peoples would report worse mental health than their European/other counterparts. Once again, these results are expected. The regression coefficient from Table 6 for Asian peoples is negative, indicating that, holding all else equal, identifying as Asian is associated with an average K10 score decrease, relative to the European/other population. When endowments are considered in Table 3, this outcome remains, and Asian peoples report lower levels of psychological distress. In other words, Asian peoples have endowments, coefficients and/or unobserved factors that improve their reported mental health, relative to the European/other populations.

The mental health inequality between Asian peoples and European/other populations is unexplained: a consequence of coefficient differences and/or presence of unobserved factors. If the coefficients attached to the unexplained proportion of the inequality are positive (negative), this implies the mental health status of Asian peoples would deteriorate (improve) if they were to receive the same coefficients as the European/other population. The largest contributor to the unexplained proportion of the mental health inequalities between Asian peoples and the European/other population is the constant term (331.76%), indicating the mental health inequality can largely be attributed to unobserved, cultural-specific factors which favour Asian peoples. Supporting this, on a smaller scale, are the factors within the health care system (5.88%) and demographic (4.71%) domains, particularly age (28.64%) and unmet needs due to GP cost (24.69%). For example, the coefficient attached to the demographic domain indicates that, should Asian peoples experience the same effect of age and sex on their mental

health as the European/other population, their mean K10 score would, on average, increase by 0.04 points, holding all else equal. A similar interpretation applies to the health care system domain. Opposing these positive contributions, but not offsetting them, are the factors within the socioeconomic (-127.06%), lifestyle (-105.88%) and racial discrimination (-9.41%) domains, specifically, employment (-107.61%), weight (-87.31%), and verbal attack based on ethnicity (-9.16%). For example, the coefficient attached to the socioeconomic domain indicates that, should Asian peoples experience the same effect of formal educational qualifications, employment, level of household income and area-level deprivation on their mental health as the European/other population, their mean K10 score would, on average, decrease by 1.08 points, holding all else equal. A similar interpretation applies to the lifestyle and racial discrimination domains.

There are several possible unobserved, cultural-specific factors which may contribute to the mental health inequality between Asian peoples and European/other populations. One such explanation is the 'healthy immigrant effect' (Frisbie, Cho, & Hummer, 2001), which refers to the perception that migrants are usually well-educated, come from higher social classes, and are expected to meet minimum levels of health prior to immigrating (Lee et al., 2017). In addition to positive selection, Frisbie et al. (2001) advocate that Asian cultures are more likely than the destination country to hold norms and values that encourage a healthy mental state (e.g., good nutrition or strong social support networks), while they frown upon risky behaviour (e.g., smoking or drinking). A second possible explanation for the relatively better reported mental health of Asian peoples is the shame and stigma associated with poor mental health in Asian cultures, where some mental illnesses are thought of as "supernatural punishments for wrongdoings" (Ho, 2004, p. 51). This discourages Asian peoples from openly acknowledging they require assistance and seeking relevant mental health care services. Furthermore, Asian cultures tend to view the body and mind as separate entities, meaning Asian peoples place more focus on physical health than mental health symptoms (Lin & Cheung, 1999). Lastly, the utilisation of mental health care services by Asian peoples is further hindered by language barriers and differences in traditional health practices (Ho, 2004). Those who cannot speak or understand English are often unable to clearly explain their mental health concerns and may not fully understand medical conditions, assessments, and treatments introduced to them (Ho, 2004). These cultural beliefs and barriers could influence how Asian peoples express or recognise their mental health in different ways to the European/other population, however, there is a lack of research into the mental health status of Asian peoples in New Zealand (Ho,

2004). Health care policies should ensure there is adequate cultural competence within the health care system in order to understand and accurately diagnose Asian peoples, particularly recent Asian immigrants. This can be achieved by increasing the number of health care professionals and interpreters who possess the necessary language skills and cultural understanding (Asian Public Health Project Team, 2003). Policy-makers should also instigate further research into the mental health determinants of Asian peoples to primarily establish whether the current statistics are accurate and not understated. Policy-makers can then study the cultural-specific factors that favour Asian peoples and translate these findings into policies that are applicable to Māori, Pacific peoples, and the European/other population.

Chapter 5: Conclusion

The current study is motivated by the persistent and ever-growing income-related and ethnic mental health inequalities evident in New Zealand and aims to decompose such inequalities into the proportional contributions of demographic, socioeconomic, lifestyle, health care system, and racial discrimination factors. Decomposition highlights the relationship direction and strength between income-related or ethnic mental health inequalities and these various factors, providing more detail than simply quantifying the overall level of mental health inequality in New Zealand. Through utilizing the latest NZHS dataset, including a wide range of independent factors, and the exploration of their effects on mental health as the dependent factor, the current study overcomes the shortcomings of prior literature undertaken in New Zealand.

Mental health is derived from numerous factors, where some can be altered by the individual or society and others are unalterable. Many of the alterable factors tend to be related to socioeconomic status, and the CI is a suitable tool for measuring income-related mental health inequalities. The computation of a CI confirms there are income-related mental health inequalities in New Zealand which favour those from high-income households. Despite the marginal Asian male population results, this interpretation holds in all other populations within the subgroup analysis, which reports income-related mental health inequalities by gender and ethnicity. Both female and Māori populations report worse income-related mental health inequalities than their respective counterparts. Decomposition suggests the five factor domains collectively explain 88.97% of income-related mental health inequalities, where the largest contributions arise from socioeconomic and health care system factors.

The Blinder-Oaxaca decomposition confirms Māori and Pacific peoples report higher levels of psychological distress than the European/other population, whereas Asian peoples report lower levels of psychological distress than the European/other population. Although the results for the Pacific peoples comparison are not statistically significant, the proportional contributions of each of the five factor domains provide insight into the driving forces of the inequalities between Māori or Asian peoples and the European/other population. The mental health inequality between Māori and the European/other population is over-explained by differences in observed characteristics, particularly those relating to unmet needs in the health care system. Māori would report lower K10 scores and better mental health than the European/other population if Māori received the same observed characteristics as the ethnic majority. The

mental health inequality between Asian peoples and the European/other population is under-explained and is likely a result of unobservable, cultural-specific values and norms, given the contribution of the constant term.

The employed methodology gives rise to several limitations, which highlight areas for future research. First, the change in income-related and ethnic mental health inequalities can be measured over time, and with increased attention being paid to such inequalities, it is imperative for policy-makers to obtain trends. Although there are advantages in incorporating previous NZHS data in this investigation, the scope and time constraints of the current study do not allow for this. Future research could conduct similar analyses using prior and future NZHS releases which would allow for the identification of factors associated with income-related and ethnic mental health inequalities and their improvement (or deterioration) over time. Second, as discussed in Section 2.1, there are concerns regarding the subjective nature of SAH status outcomes (e.g., the K10). These negative connotations could be reduced through the inclusion of an objective health outcome (e.g., biosensor or biomedical test results) for comparison and robustness purposes. Unfortunately, although objective measures can produce higher correlations with biological and clinical markers than do subjective measures, they have received less attention due to their costly and resource-intensive nature (Haberer, Trabin, & Klinkman, 2013). Third, the NZHS publishes categorised income, as opposed to continuous income. This presents an issue for the computation of the concentration curve as grouped income creates a stepped 'curve', where the population in each income bracket is aggregated instead of receiving an individual rank. For a conventional CI analysis, future research could utilize Statistic New Zealand's Integrated Data Infrastructure (IDI) to gauge a respondent's precise level of income. Finally, it is likely a small Pacific peoples sample size has rendered the Blinder-Oaxaca analysis results statistically insignificant. Future research could utilise data from locations with a high concentration of Pacific peoples who are active in the New Zealand health care system, such as data from the Counties Manukau DHB area.

The CI and Blinder-Oaxaca decomposition analyses offer a deeper understanding of the relationship that exists between observable factors and both income-related and ethnic mental health inequalities. Given this information, policy-makers are encouraged to target alterable factors that make the largest contributions to income-related health inequalities, as opposed to employing simple income redistribution or targeting unalterable factors. In terms of reducing ethnic mental health inequalities, Māori could benefit from the development of joint social and health care policies, whereas improving the monitoring and understanding of Asian peoples'

culture and norms could help to explain why the ethnic group reports mental health that is far better than other ethnic groups in New Zealand.

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