Aotearoa; New Zealand: old culture in a new country.

A study of Māori and non-Māori life expectancy.

Abstract

Objective – A study on how Māori and non-Māori New Zealander life expectancy is different and what causes these differences.

Methods – Mortality data of 2016 will be used to decompose the difference in life expectancy, per cause of death. Large contributors will be examined into further detail and possible explanations for their contribution will be discussed.

Results – Neoplasms, diseases of the respiratory and circulatory system and endocrine diseases are the largest contributors to the 7.15 years difference in life expectancy, mostly resulting from unhealthy behaviour. Diseases of the nervous system and mental and behavioural diseases are chapter headings in which Māori seem to hold an advantage over Non-Māori. The results show a possible mortality-crossover in the age group 85+, although this could be a result of distortion in mortality data.

Conclusions – In the Māori population unhealthy behaviour and lifestyle is most often the underlying cause for the difference in life expectancy. The Māori cultural value of social pasttime, low self-esteem throughout history and generally low socio-economic status amplify unhealthy behaviour and thus the difference in life expectancy. Political response is present, but future research should be done to study how exactly the political dimension can stimulate improvement of Māori life expectancy.

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1. Introduction

The Māori are the native inhabitants of Aotearoa. Aotearoa roughly translates to 'long white cloud', referring to the cloud formations that guided Māori explorers to this land. In the late 18th, early 19th century many waves of ships brought colonists from the British Crown to Aotearoa, while the Māori had come to this country about 600 years prior. The Māori lived in balance and harmony with nature, which was one of the fundamental beliefs and values in their culture. When the British arrived, the Māori welcomed them, being very eager to trade and learn the culture and technology of the British. In the two following centuries, the colonists from the British Crown have taken over Māori land, causing many wars leading to significant reduction in Māori population size (Sorrenson, 1956). The Māori resisted oppression, but were at a severe disadvantage, lacking technology like muskets and bayonets. Disowning the Māori of Aotearoa, the British colonists built the country that is now known as New Zealand. Since then, in history, the Māori people have been forcibly held at a place inferior to the British and European colonists (Sorrenson, 1956). To this day this has directly influenced their access to many socio-economic, political and healthcare benefits (Gaiser, 1984). In the past few decades, since the 1960's, Māori activism has grown, and so has their recognition in New Zealand politics and society.

The two populations, the Māori, and descendants of the British and European colonists (or referred to as non-Māori New Zealanders), are now considered closely intertwined and are living in the same space. Yet, the life expectancy of the Māori is lower than that of the Non-Māori New Zealanders.

Life expectancy is a measure of mortality and can be considered an indicator for the welfare of a population. (WHO (World Health Organisation), 2019; OECD, 2019) The Māori have always had a lower life expectancy than Non-Māori New Zealanders, and the future projections indicate no change in this position any time soon (Ministry of Health, 2019). In 2016, the Māori had a life expectancy 7.15 years lower than Non-Māori New Zealanders (Ministry of Health, 2018). To put this into perspective, for the last 25 years (or rather, since reliable Māori mortality data is available), the difference in life expectancy between Māori and non-Māori has been larger than the difference between white and black in the United States (United States National Center for Health Statistics, 2013; New Zealand Ministry of Health, 2019).

Finding out which causes of death are responsible for an increased mortality for Māori, will open up possibilities to research the contexts affecting these mortality rates. Understanding these contexts, like health risks, will be used to build knowledge on how these differences came to be, if, and how circumstances can be improved to stimulate a convergence in life expectancy between Māori and Non-Māori New Zealanders. This will also be the structure of this thesis.

This thesis will aim to answer the following questions:
How does Māori life expectancy compare to that of Non-Māori New Zealanders, and how do health risks and socio-economic, cultural and political contexts explain this difference?

- Which causes of death hold the largest contributions to the difference in life expectancy?
- What are the health risks underlying these causes of death, and how do they explain the difference?
- How can the different prevalence of these causes of death be explained through socio-economic, cultural or political contexts?

2. Theoretical framework

2.1 Defining concepts and illustrating the conceptual model

Figure 1 illustrates the conceptual model underlying this research. In this model, mortality refers to the data and statistics of death registrations, classified by cause of death. Health indicators, or health risks, are human behaviours that have been proven to impact their life expectancy, like smoking or drinking habits (OECD, 2019). This behaviour is often result of cultural and socio-economic contexts, as seen in the model. Life expectancy itself, refers to the average number of additional years a person at age x may expect to live beyond that age, based upon such health risks and mortality statistics, assuming current health conditions persist during his/her whole life; it is a tool to summarize mortality patterns that prevail across all ages (Preston, 2001; WHO, 2006). Life expectancy at age x may also be referred to as e_x, or e_0 when discussing life expectancy at birth (age 0). Building upon life expectancy, this thesis will frequently refer to 'potential gain in life expectancy' (PGLE). This is an analysis, based on multiple-decrement life table techniques, that computes how many years of e_0 would be gained, in the scenario the input cause of death is suddenly eradicated (Arriaga, 1984; Lai & Hardy, 1999).

One of the concepts that is of fundamental value to this research is 'Māori' ethnicity. The concept can clearly be defined as a self-defined ethnicity, but the fact it is self-defined is a drawback in terms of data quality, which will be addressed in the data discussion.

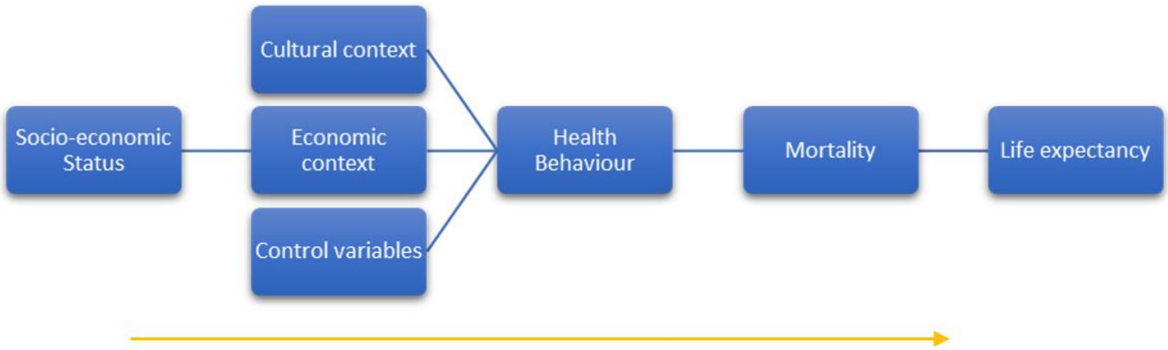


Figure 1. Conceptual model.

2.2 Academic relevance

As described, Māori hold a lower life expectancy than non-Māori in New Zealand. On average, Māori people die 7 years younger than non-Māori people, even though they live in the same country and, in theory, have access to the same medical provisions (Ministry of Health, 2019). As life expectancy is a frequently used health status indicator, it can reflect on the general wellbeing of a population in terms of health, making it important to comprehend more than simply its concrete meaning (OECD, 2019). The reasoning behind this, is that knowledge of which causes of death Māori are especially susceptible to - those they hold a higher mortality rate in - will allow for more effective and better targeted attempts at stimulating a convergence of the Māori life expectancy with that of the non-Māori (Bramley, 2004). Māori life expectancy related research and knowledge, as aimed for in this thesis, is required to understand how to appropriately stimulate life expectancy equality through means of, for instance, government policies.

3. Methodology

3.1 Contributions to the difference in life expectancy

Cause-specific mortality data of each population can be used to compute a decomposition of the difference in life expectancy at birth (Arriaga, 1984; Preston, 2001). In the context of this thesis, this analysis tells us how a cause of death contributes to the difference of 7.15 years in life expectancy, between the Māori and non-Māori New Zealanders. This is the perfect tool to research exactly what is leading to a lower life expectancy for Māori. The comparison is reasoned out of the perspective where the cause of death is a larger issue for the Māori population than the non-Māori population. Where the contribution takes a negative value it means the Māori hold what can be called an 'advantage' over the non-Māori population. If the contribution is positive, it means the Māori have a higher mortality rate in the cause of death, meaning they are currently more affected than non-Māori.

On top of this, using the same cause-specific mortality data, the beforementioned PGLE analysis can be performed. The PGLE analysis is performed by age, meaning for every age group (age x) a calculation is done to compute how many years that person can expect to gain in e_0 in the scenario a cause of death is eradicated.

However, due to incompatibility between decomposition of difference in e_0 and PGLE, results from these analyses should not be directly compared with each other (Jdanov, Shkolnikov, van Raalte, 2017).

3.2 Discussing data quality

3.2.1 Data quality and drawbacks

Upon inspecting the quality of the data provided by the Ministry of Health, one will be mostly satisfied. From 2000 onward, causes of death are coded to Australian Modification of the ICD-10 standard, a coding system widely accepted and used by statistics offices and academics (Ministry of Health, 2019). This coding system works with three layers: the broadest level is that of chapter headings, which contain subgroups, which contain 'three character codes' as the most detailed level. Along with every mortality dataset, the Ministry of Health publishes a methodology report. This report provides a sound explanation of: survey design, sample design, data collection, data processing, analyses methods and reports on response and coverage rates (Ministry of Health, 2019). However, with the research objective of this thesis in mind, there are two drawbacks.

3.2.2 Drawbacks resulting of sample size

While in absolute terms the Māori population is large (723,500 people in 2016), in comparison to non-Māori New Zealanders (3,973,030 people in 2016), it is significantly smaller (StatsNZ, 2018). The problem with this shows in the 2016 mortality dataset, as it only contained 3,465 Māori deaths, and 27,918 non-Māori deaths (Ministry of Health, 2018). For the Māori population, more often than usual, there will be classifications which simply do not hold enough cases to be able to be used in analyses. On top of this, because the data is not age-standardized, the registered deaths are classified by age, in groups of 5 years, resulting in even lower cases per category. The strength of the statistical analysis performed in this thesis partly depends on the number of cases. The reasoning behind this, is that many causes of death in the mortality dataset are susceptible to strong random variability, also known as stochasticity (Moore & McCabe, 2006). When a sample size goes over 30 cases, the chance of distortion and stochasticity reach a low enough point to result in a sufficient probability value (p-value) to base legitimate statistic interpretation upon. Or, as the 'law of large numbers' sets out, the higher the amount of cases, the higher the confidence interval.

Health surveys, on the other hand, suffer less from this issue. In the methodology report of the health survey of 2016/2017, methods are described to ensure that Māori are adequately sampled (Ministry of Health, 2019). These methods ensure larger Māori samples, as well as ensuring the representativeness of this sample. Without these extra measures, the issue of the mortality dataset could also apply to the health survey. Though some survey results may still contain a low amount of cases, the methods applied should limit the influence of stochasticity (Moore & McCabe, 2006). Such methods to collect better Māori data cannot be applied to mortality, as that sample is not determined beforehand: it is a result of the occurrence of death.

3.2.3 Self-defining Māori ethnicity and assigning Māori ethnicity

Māori ethnicity itself is a variable that can be adequately surveyed as the New Zealand Ministry of Health considers it a self-defined attribute (Ministry of Health, 2019). However, the problem poses when ethnicity has to be defined on behalf of someone else. The mortality data is collected from Certificates of Causes of Death, sent in by funeral directors and coroners' reports. These reports obtain supplementary data from hospital discharge data, for extra insights on the underlying causes of death which produced the fatal injury (WHO, 2019). This is where the issue lies, as this is where ethnicity, as collected for the mortality dataset, might have to be assessed for, and not by, the deceased. This means ethnicity would have to be determined mainly by visual judgement, or where applicable, information provided by relatives (Ministry of Health, 2019). This could lead to a distortion in the data, as one might be classified as an ethnicity they do not, or no longer, associate with. However, research on ethnicity in mortality and census data from 2001 and 2006 shows that discrepancies in ethnicity counts and assessment are limited, and 'results support ongoing use of the census definition of ethnicity on all health datasets' (Tan et. al., 2010). Nevertheless, it is a matter that has to be kept in mind and should continuously be assessed in such research, as there is not a way to solve these ethnicity mismatches within datasets to maintain the current quality of data; these issues occur in the data collection process.

4. Results

4.1 Orientation

4.1.1 Where are the differences?

The first two data columns in table 1 contain the absolute amount of deaths, per cause of death classified as ICD-10 chapter headings, for the Māori and non-Māori population. With this data, a decomposition of the difference in e_0 between the Māori and non-Māori population has been performed. The contribution is displayed in the table in absolute years and in percentages.
Not all ICD chapter headings are presented in this table. If a chapter heading did not have enough cases to allow statistical analysis, was no significant contributor to mortality, or if there was no substantial difference in contribution of this cause to difference in e_0 between the two populations, it was left out of this table. The table contains nine out of nineteen total chapter headings.

Cause of death	*Deaths Māori*	*Deaths Non-Māori*	*Contribution to difference in e_0*	*... in %*
Neoplasms	1,087	8,513	1.94	27.2
Endocrine, nutritional and metabolic diseases	240	861	0.80	11.2
Mental and behavioural disorders	54	1,692	-0.11	-1.6
Diseases of the nervous system	73	1,425	-0.07	-1.0
Diseases of the circulatory system	1,013	8,793	2.33	32.6

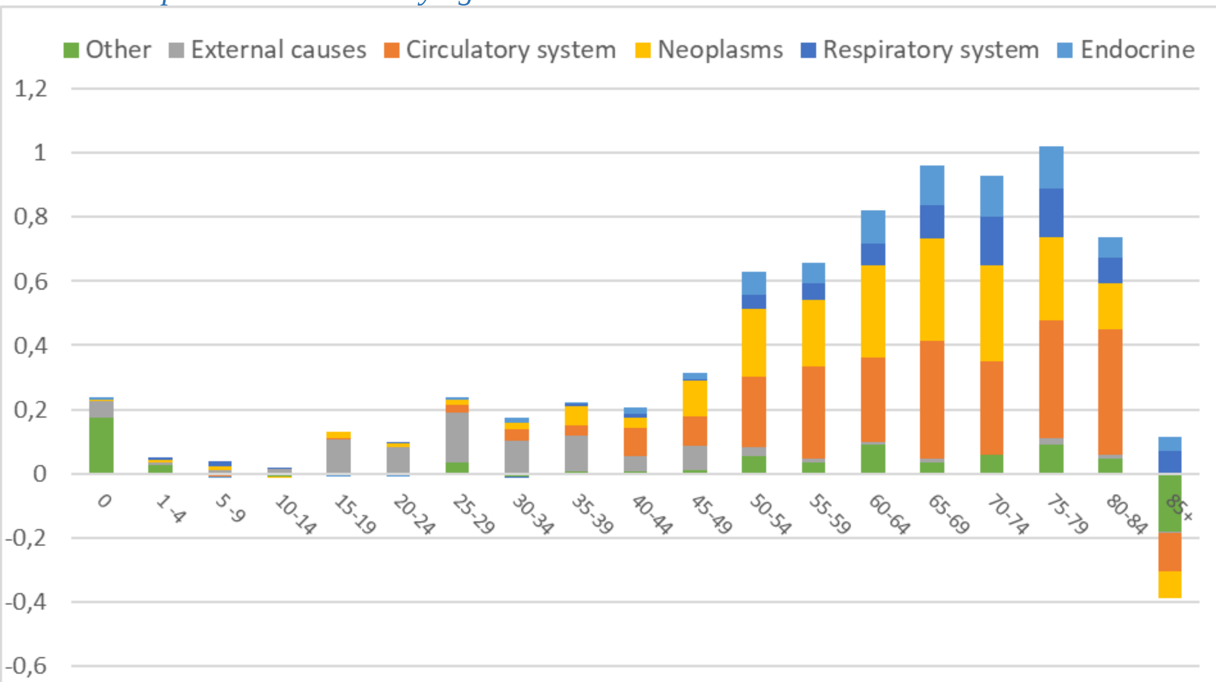
Diseases of the respiratory system	302	2,600	0.77	10.7
Diseases of the digestive system	78	932	0.11	1.5
Certain conditions originating in the perinatal period	52	78	0.11	1.5
External causes of morbidity and mortality	360	1,570	0.85	11.9
SUM OF TABLE	3,259	26,464	6.73	94
ALL-CAUSE MORTALITY	**3,465**	**27,918**	**7.15**	**100**

Table 1: Mortality data from 2016 per cause of death by population group, and their contribution to difference in e_0, (absolute and percentual). Source: Mortality dataset 2016 (Ministry of Health, 2018).

In total, based on the mortality and population data from 2016 (Ministry of Health, 2018), there is a difference in e_0 of 7.15 years. The Māori hold a e_0 of 76 (75.89) years, and the non-Māori hold a 83 (83.04) year e_0. From table 1 we learn that the largest contributor to this difference is diseases of the circulatory system. It is responsible for 2.33 years (32.6%) of the difference in e_0. The second largest contributor is neoplasms. Neoplasms account to 1.94 (27.2%) years difference in e_0. The third, fourth and fifth largest contributors are relatively similar in size. External causes, endocrine, nutritional and metabolic diseases and diseases of the respiratory system contribute around 11% each. Together, these five largest contributors sum up to 6.69 (94%) of the total 7.15 years difference in e_0.

Another notable result is that mental and behavioural diseases and diseases of the nervous system are the only causes of death that hold a negative contribution. This means they are the only causes of death (that were selected out of all chapter headings) where Māori seem to hold an advantage over non-Māori. This result will be discussed later in this thesis.

4.1.2 Decomposition examined by age



Graph 1: Decomposition of difference in e_0, with the five largest contributors.

Graph 1 shows the development of the decomposition difference in e_0 on the vertical axis, over age on the horizontal axis. For example, reading this graph for neoplasms shows that through the period of life, Māori always are at a disadvantage, until the age of 85+. From the ages 45-

49 onward, most causes of death take a significant jump in contribution, as the overall difference in e_0 (the sum of the bar) quickly rises. This implies that starting from the age group 50-54 onward, significantly more deaths occur in the Māori population.

A noticeable turn of events in this graph is seen in the age cohort 85+. Suddenly, it seems that the Māori are at an advantage over the non-Māori, as the difference in e_0 makes a drastic jump to a negative sum value. This finding will be discussed near the end of this thesis, once more background knowledge has been gained, upon examining diseases that are prevalent at later ages.

4.2 Malignant neoplasms

4.2.1 First, the second largest contributor: neoplasms

Before discussing the strongest contributor as found in table 1 (diseases of the circulatory system), two other contributors will be discussed first, as their context together helps understand the context of diseases of the circulatory system.

Closely behind diseases of the circulatory system, neoplasms are a large issue, taking credit for around 31% of all deaths for both populations. When delving deeper into the more specific ICD-10 classifications belonging to the chapter heading of neoplasms, we find that the ICD-10 defined subcategory 'malignant neoplasms' is the most relevant, as it holds almost all cases. Table 2 shows the variants of malignant neoplasms that hold a large share of the cases within this subcategory (codes C00-C75).

Cause of death: malignant neoplasms of…	*Deaths Māori*	*Deaths Non-Māori*	*Contribution to difference in e_0*	*… in %*
digestive organs	284	2,625	0.37	5.1
respiratory and intrathoracic organs	355	1,470	1.06	14.8
breast	72	601	0.08	1.2
female genital organs	45	399	0.06	0.8
male genital organs	49	550	0.08	1.1
urinary tract	47	410	0.07	1.0
SUM OF TABLE	852	6,055		
ALL-CAUSE MORTALITY	**3,465**	**27,918**	**7.15**	**100**

Table 2. Mortality data from 2016 of malignant neoplasms, by population group, and their contribution to difference in e_0 (absolute and percentual). Source: Mortality dataset 2016 (Ministry of Health, 2018).

4.2.2 Neoplasms of respiratory organs

When examining table 2, it instantly becomes clear there are two types of neoplasms that play a bigger role. Malignant neoplasms of respiratory and intrathoracic organs is the largest contributor amongst malignant neoplasms, as it holds 1.06 years contribution of the total 1.94 as found in table 1. Neoplasms of digestive organs take credit for 0.37 years and can be the result of health risks like tobacco use, alcohol consumption and obesity, which will be addressed as this research continues.

Malignant neoplasms of respiratory and intrathoracic organs contains codes C30-39. These codes are the most specific ICD-10 classification. In this range, cause of death 'C34' contains 343 out of 355 cases for the Māori population and 1,414 out of 1,470 cases for the non-Māori population. Therefore, the other forms of malignant neoplasms of respiratory organs will be disregarded as they do not hold enough significance, or enough Māori cases to base any interpretation upon (Moore & McCabe, 2006). C34 refers to malignant neoplasms of bronchus and lung. When the mortality data of lung cancer is input into a PGLE analysis, for each population group separately, it shows that the potential gain in life expectancy for the Māori population would be 1.195 years, while it would only be 0.509 years for the non-Māori population. This means that the first big contributor to the lower life expectancy of Māori people has now been identified on the most detailed scale.

As roughly 90% of all cases of lung cancer are caused by smoking (American Lung Association, 2019), it is safe to assume that smoking is the health risk directly related to this cause of death. The New Zealand Health Survey 2016-2017 shows that in 2016, 32.5% (160,000 adults) of all Māori adults (ages 15 years and over) are daily smokers (Ministry of Health, 2019). For the non-Māori population this percentage was close to a third of the Māori population, at 12.4% (363,000) of all adults.

However, when examining this health risk, one will find smoking is not only related to lung cancer. Chronic respiratory diseases (CRDs), or diseases of the respiratory system, are also caused by tobacco use or air pollution (WHO, 2017). However, as Māori and non-Māori live intertwined in New Zealand, air pollution can be assumed to have the same impact on both populations. CRDs had already been identified as one of the large contributors in table 1. Of all CRDs, chronic lower respiratory diseases are the cause of 248 Māori deaths and 1,492 non-Māori deaths. Together, malignant neoplasms of the lungs and chronic respiratory diseases, as result of smoking, have a contribution of 1.815 years to difference in e_0.

4.2.3 From non-smokers to avid smokers

Originally, the Māori did not smoke. The Cancer Society of New Zealand explains that in the late 1700s 'tobacco was quickly taken up by Māori. (…) European colonists used tobacco to pay Māori (including children) for provisions and services.' (Cancer Society, 2019). Since then, among Māori, smoking had been a symbol of 'reward'. The understanding is that this is how smoking first became part of the Māori population, and remained so until the harmful consequences of smoking became clear and action was taken to reduce tobacco use. This is a typical trend, which can also be recognised in Western cultures. However, this does not explain why smoking became nearly three times more common for the Māori population than the non-Māori population in contemporary times. So then, how can this be explained?

A comprehensive study has been done by Gaiser (1984), to examine how exactly smoking took a presence of this size in the Māori population. His study first provides an explanation out of cultural context: Māori are a more social activity oriented culture than most, leading to the concept of 'social pasttime' through smoking as a more common occurrence. On top of this, in times of strong oppression of Māori culture, Māori generally had low self-esteem, making them less worried of their future health, which is believed to have become part of a Māori mindset (Gaiser, 1984).

Aditionally, in Gaiser's research and a study by Hiscock et. al. (2012) the following argument out of economic context is raised: having little worries about future health is also typical for lower socio-economic groups - to which the Māori generally belong - as 'this class background places more value on short term rather than long term gains'. (Gaiser, 1984; Hiscock et al, 2012). Now that the problem has been identified and the background is uncovered, how can, with this knowledge, something be done about it? This is where the political context comes to light.

4.2.4 Smokefree Aotearoa 2025

The New Zealand Government has been running campaigns to try reduce tobacco usage. For instance, the campaign 'Smokefree Aotearoa 2025' was launched in 2011 which took measures in the form of policies: reducing the supply of tobacco, increasing tobacco taxation, providing the best support for those quitting and by for example banning exposure of tobacco marketing and promotion to children (Ministry of Health, 2019). The campaigns seem to be taking effect, as overall smoking decreased from 39.2% to 32.5% amongst Māori adults, and from 17% to 12.4% amongst non-Māori adults, in the time period of 2006 to 2016 (Tobacco Control Data Repository, 2019). All in all, the argument of socio-economic status made by Hiscock (2012) can be addressed by attempting to stimulate more social and economic Māori equality, and as the attempts made by the government seem to be taking effect, they should be increased and continued.

4.3 Endocrine, nutritional and metabolic diseases

4.3.1 Prone to distortion

Table 1 gave us the result endocrine, nutritional and metabolic diseases are responsible for a 0.8 year difference in e_0. For this ICD-10 chapter heading, table 3 has been made using the same methods as for table 2. Notice that the total amount of deaths by endocrine, nutritional and metabolic diseases are significantly lower. This is why of the three character codes belonging to the chapter heading there were noticeably more classifications that could not be used, due to lack of cases not only in the Māori population, but also the non-Māori population. The difference in quantity of cases between neoplasms and endocrine, nutritional and metabolic diseases also means table 3 is much more prone to stochasticity.

Cause of death, endocrine, nutritional or metabolic disease	*Deaths Māori*	*Deaths Non-Māori*	*Contribution to difference in e_0*	*... in %*
Type 1 diabetes mellitus	5	43	0.00	0.0
Type 2 diabetes mellitus	180	598	0.62	8.7
Obesity	31	60	0.10	1.4
Disorders of lipoprotein metabolism and other lipidaemias	9	47	0.02	0.3
SUM OF TABLE	225	748		
ALL-CAUSE MORTALITY	**3,465**	**27,918**	**7.15**	**100**

Table 3: Mortality data from 2016 of endocrine, nutritional or metabolic disease, by population group, and their contribution to difference in e_0 (absolute and percentual). Source: Mortality dataset 2016 (Ministry of Health, 2018).

4.3.2 Type 2 diabetes

From table 3 the most reliable result is that of type 2 diabetes mellitus, as it has the most amount of cases, making it least susceptible to stochasticity. Of the total difference of 7.15 years, 0.62 years is the result of type 2 diabetes. Referring back to the discussion of the drawback of sample size in the methodology, with 31 deaths obesity is on the border of an acceptable amount of cases for a statistical analysis, leaning strongly to the side where they no longer can provide accurate, representative data as the susceptibility to stochasticity increases (Moore & McCabe, 2006). However as obesity and type 2 diabetes have a lot of overlap in terms of cause and result, it would provide similar answers, and thus as cause of death it will be left aside. As health risk however, obesity still provides essential insights. Type 2 diabetes may not have the largest contribution in itself, but when studying the contexts like the health risk obesity, we learn that this also greatly affects other causes of death. For instance, the previously mentioned neoplasms of digestive organs, and the yet to be discussed diseases of the circulatory system share obesity as health risk (Ministry of Health, 2019; WHO 2017). So what is the background of type 2 diabetes?

Of Māori adults (ages 15 and over) 50% is obese, 28.3% is overweight but not obese, and only 20.4% has a healthy weight (Health Survey, 2019). These statistics look better for the non-Māori, although they are still far from a generally healthy population as 30.5% is obese, 36.2% is overweight and 32% has a healthy weight. In a New Zealand case study comparing dietary intakes of different ethnicities, P. Metcalf found that for causes of obesity and type 2 diabetes, the main difference in dietary intake lies with the serving sizes and frequency of consumption (Metcalf, 2008). This can be related to the findings by Gaiser (1984) regarding the importance of social pasttime to Māori culture, as eating is also experienced as social pasttime. On top of this, Hiscock's (2012) argument on the impact of socio-economic status on tobacco use is equally applicable to healthy weight and diet. Metcalf's conclusion of frequency of consumption combined with Hiscock's ideas on Māori socio-economic status and Gaiser's ideas on Māori culture and its impact on their behaviour, provide a possible explanation as to why type 2 diabetes is a more common cause of death in the Māori population.

4.3.3 Better top-down organisation necessary in reducing obesity
Some action is being taken to combat obesity. The Ministry of Health has a childhood obesity plan, which only launched in 2015, in attempt to stimulate a healthy lifestyle for children and increase available support to those at risk of becoming obese (Ministry of Health, 2019). This plan is oriented at prevention of obesity and similar plans to combat already existing obesity does not seem present on the government scale of things. There are some organisations, like Healthy Family NZ and Health Navigator that try to improve awareness of diabetes type 2 and its consequences (Health Family NZ, 2019; Health Navigator, 2019). However there are no visible results, as since 2006 in both populations obesity has been growing in prevalence while healthy weight has been decreasing (Health Survey, 2019). A study on obesity prevalence in New Zealand also concluded that there was sufficient implementation of spreading awareness and policies on providing ingredient lists and nutrient declarations, whilst the implementation of restrictions on unhealthy food marketing was barely existent (Vandervijvere, 2015).

4.4 Diseases of the circulatory system
4.4.1 Finally discussing the number one result
Now that, as mentioned, other causes of death have been examined and answered, attention can finally be drawn to the most significant result of table 1. Diseases of the circulatory system take up a third of the difference in e_0; these diseases are responsible for 2.33 years difference in e_0 between the two populations. Heart diseases (ischaemic, mostly) together with cerebrovascular diseases, account to 7,789 out of 27,918 (27%) non-Māori deaths, and 864 out of 3,465 (25%) Māori deaths in 2016. They also sum up to nearly all of the deaths in the category diseases of the circulatory system. When performing a PGLE analysis, the conclusion is drawn that Māori have 2.98 years of life expectancy to gain in the scenario of eradication of these heart diseases. For the non-Māori population, this is 1.56 years.

As stated, the cause of these cardiovascular diseases can be explained through previously discovered results. These cardiovascular diseases (CVDs) are often result of health risks like tobacco use, diet and obesity, physical activity and alcohol usage (WHO, 2017). This is why it is no surprise CVDs have a high prevalence in both groups, but especially so for the Māori. Tobacco use has been found to be extremely prevalent in especially the Māori population, as it is also the cause for the large amount of deaths resulting from lung cancers and other chronic respiratory diseases. The same goes for health risks diet and obesity for type 2 diabetes. This is also why improving life expectancy by combatting circulatory diseases falls under the same, or at least very similar, action plans as those for tobacco use and obesity.

4.4.2 'Call for Action on Māori Cardiovascular Health'

Still, a Māori specific 'Cardiovascular Action Plan', was implemented and has attempted to improve the accessibility for Māori to this part of the health sector (Bramley et. al., 2004). Building further upon the previous findings of policies combatting tobacco use and obesity, in relation to CVDs and in combination with the action plan, one will now indeed find that 'much attention has been paid to reducing indigenous disparities in CVD risk factors', but 'less attention has been paid to the role of the health system performance as potential causes of unequal outcomes for indigenous people' (Brown, 2010). In a literature study a statement is made that 'The greater burden of CVD morbidity and premature mortality carried by Māori cannot be explained solely by risk factor variation' (Cram, 2014). Followed up with the conclusion there is currently a lacking connection of Māori to the relevant medical care. Based on these findings, it can be argued that the next step in combatting cardiovascular disease among Māori, lies with increasing their access to cardiovascular health care, to ultimately attempt to stimulate convergence of Māori and non-Māori life expectancy.

4.5 Degenerative diseases

4.5.1 Combining chapter headings

Table 1 presented us with two chapter headings where the Māori population is at, what seems like, an 'advantage'. Mental and behavioural diseases and diseases of the nervous system have a negative contribution (-0.11 years) of to the Māori disadvantage in e_0.

Cause of death, diseases at age	*Deaths Māori*	*Deaths Non-Māori*	*Contribution to difference in e_0*	*... in %*
Vascular dementia	10	355	-0.74	-10.3
Unspecified dementia	36	1,271	0.16	2.2
Parkinson's disease	7	303	-0.31	-4.4
Alzheimer's disease	19	363	0.05	0.7
Other degenerative diseases of nervous system	4	89	-0.01	-0.1
Spinar muscular atrophy	14	119	0.02	0.3
SUM OF TABLE	90	2,500		
ALL-CAUSE MORTALITY	**3,465**	**27,918**	**7.15**	**100%**

Table 4: Mortality data from 2016 per cause of death, with a direct link to prevalence rising at late age. Contribution to difference in e_0 (absolute and percentual). Source: Mortality dataset 2016 (Ministry of Health, 2018).

Table 4 shows, as per usual, the causes of death for both populations. Both chapter headings have most of their cases accounted for with these diseases. An important note to make is that from this table no data should be used in further analyses unadjusted, because of how extremely prone to stochasticity and distortion this data is. Although methods for a way around this issue are available, this is not the point to be made here. Even representative, undistorted data would give the same take-away message from this table, as mortality datasets from 2008-2016 show the causes of death from table 4 in none of these years sum up to higher than 132 Māori deaths (Ministry of Health, 2010-2018). For this reason, table 4 should only be used to visualise how the diseases are near negligible for the Māori but a large issue for non-Māori. Instead, these individual diseases can be grouped together into a classifications of 'diseases prevalent at late age' as they share the same origin.

4.5.2 An advantage, but not really

The reason for grouping these diseases together, and the statement that they share the same 'origin', is the fact they only start to occur at later ages. In general, mental diseases and diseases of the nervous system only really rise in prevalence in the age groups 80-84 and 85+, as the physical body deteriorates (WHO, 2012). For this reason they are referred to as degenerative diseases. This age group brings us back to the finding from graph 1, regarding the negative contribution to difference in e_0 at age groups 85+.

Population estimates provide one of the possible explanations why degenerative diseases are not prevalent among Māori. There are only 6,170 Māori aged 80+ (0.8% of total Māori population), of whom only 2,310 are aged 85+. The non-Māori population on the other hand, has 160,760 people aged 80+ (4.0% of total non-Māori population), of whom 80,530 estimated to be 85+. While the Māori mortality sample of 80-84 years decreases from 340 deaths to 296 in the group 85+, the non-Māori sample nearly triples, from 4,253 deaths in the age group 80-84 to 11,267 in the group 85+. One potential explanation for the negative sum of contribution to e_0, as was seen in graph 1, is that the population distribution over 85 years is very different between the populations. Therefore it is possible, with the 76 years e_0 in mind, Māori people simply do not get old enough to allow these degenerative diseases to play a notable contribution in mortality. However, it is also possible the Māori 'advantage' is a distortion resulting from a small Māori mortality sample, combined with grouping too many age groups from the non-Māori population together. This is a result of the quality of the mortality datasets, upon which the classification of age groups is based, and limited to.

Another explanation could be an effect like that of the mortality cross-over between black and whites in America. This comes down to a 'crossover', where 'elevated age-specific mortality rates among Blacks invert with those of Whites at advanced ages', which could be the result of a 'disproportionate selective mortality of Blacks and the poor earlier in the life course', as a result of lower socio-economic status (Sautter et.al., 2012). This can be understood as the idea that, in line with the concept of frailty (Vaupel et. al., 1979), those more likely to die prematurely (as a result of their low socio-economic status, thus health behaviour), are more common in the Black population, leaving those with healthier behaviour to reach the age group 85+. These remaining survivors in this age group have a higher individual e_0 than average for their population. In a nutshell, isolating the 'stronger' survivors, may be a cause for such a mortality crossover resulting in a higher e_{85+}. In conclusion, it is a possibility this demographic concept is also applicable to the Māori population, as earlier in this thesis it became apparent many deaths in the Māori population can be connected to health risks prevalent among those of low socio-economic status.

4.6 External causes of morbidity and mortality

The remaining cause of death that showed a large contribution in table 1 and graph 1, is external causes of morbidity and mortality. Generally, causes of death classified under chapter heading 'external causes of mortality' are not a result of diseases (WHO, 2018). This category contains mortality resulting from deaths that can mostly be considered accidental or as result of injury. Upon performing a PGLE analysis, we find a potential gain of 1.49 years for Māori, and 0.84 years for non-Māori. This chapter heading has a contribution of 0.85 years to the total difference in e_0. A possible explanation for this difference can also be found in the socio-economic and cultural context. Once more, as raised by Gaiser (1984), the argument of low self-esteem combined with the argument of low socio-economic status (Hiscock et. al., 2012), influenced Māori to be less concerned with their future. In a link back to the mortality-crossover, the American context where black people of low economic status generally die younger, also were characterised by external causes of mortality (Sautter et. al., 2012). It is possible this reasoning could also be underlying the Māori mortality belonging to this chapter heading, reinforcing the theory that mortality-crossover also is a characteristic of the comparison of the Māori and non-Māori life expectancy. Other studies examining mortality resulting from external causes, in America and South Korea, also confirm a correlation between low socio-economic status and an increased mortality rate for external causes (Song & Byeon, 2000; Signorello et. al., 2014). As this chapter heading is a large umbrella term containing many more subgroupings with significantly stronger variety than the already discussed chapter headings, further research on this topic falls out of the scope of this thesis, and will thus be left to future research.

5. Conclusion

The gap in life expectancy between Māori and non-Māori of 7.15 years, has been decomposed to discover how each cause of death contributes to this difference. For the large contributors, malignant neoplasms, diseases of the respiratory and circulatory system as well as endocrine diseases and mental and behavioural diseases, possible explanations were found and discussed. For these contributors, most of the time explanations were found in underlying health risks. The economic context showed socio-economic status is a direct relation to these health risks and therefore also to mortality itself. From a cultural aspect, the argument of the value Māori hold to social pasttime and the argument of low Māori self-esteem throughout history, further amplify prevalence of unhealthy behaviour like smoking and eating. The political response to these issues with Māori health, were policy-making and campaigns to spread awareness of the risk of unhealthy behaviour. Though some campaigns proved to be effective, albeit slow improvement, others lacked effect.

When examining degenerative diseases, no concrete explanation was found. The result was the discovery of a possible case of mortality-crossover. However, due to discussed data quality drawbacks it is possible this discovery was a result of distortion in data. This is why there is plenty of future research to be done, on if there really is a mortality cross-over and how exactly political action can be taken to stimulate socioeconomic equality for Māori, in attempt to converge Māori and non-Māori life expectancy.

6. Reflection

While data quality was thoroughly examined and discussed, one of the mentioned solutions, age standardisation of the mortality data, was never compared to the data used in this thesis. As discussed in the section of degenerative diseases, it is possible the population distribution of the two populations is different, which in itself would impact life expectancy. No attempts have been made in this thesis to examine the severity of this difference in population distribution. A comparison of sorts could have added to the reliability of data, and so the reliability of results found in this thesis.

In hindsight, before starting research in this thesis, more attempts should have been made to examine how the mortality of 2016 compared to other years. It is possible, especially considering the discussed data quality drawbacks, mortality in 2016 was characterised by stochasticity, or strong random variation. Attempts should have been made to study whether or not 2016 would provide representative, undistorted Māori data.

Identifying large contributors to the difference in e_0 by first looking at chapter headings, proved effective, however it is possible that because of this, interesting differences in mortality rates among the lower ICD-10 scale, were missed. However, it can be argued these causes of death would not have been large contributors to the difference in e_0.

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