Physical Stature and Its Interpretation in Nineteenth Century New Zealand

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1. Introduction

In this paper we identify and interpret the evidence of physical stature among male New Zealanders born during the late nineteenth century. Research in other countries in this period reveals a tendency for mean stature to decline and then, during, the early 20th century, a transition to increasing stature. We extend this research to New Zealand. Was there in New Zealand as elsewhere some tendency for height to diminish for those born before 1900? If there was a transition from stagnant or declining stature to rising heights, did it occur at roughly the same time in New Zealand as elsewhere? Can we identify particular groups within New Zealand which did not share equally in the experience of robust physical well-being? Are there socio-economic correlates that hint at the underlying causation for inequality and change over time?

New Zealand arguably was the healthiest of the neo-European environments. Extraordinarily high incomes, low population densities and relative isolation from the world's major disease pools allowed the New Zealand government to claim that their country offered the world's healthiest environment. The New Zealand Official Yearbook for 1913, for example, claims the lowest infant mortality rates anywhere in the world. In this paper we review and add to the literature of physical well-being for this unusual population. If anywhere in the world might have been exempt from the pressures toward diminishing stature before 1900, it would be New Zealand.

As is common in the anthropometric literature for countries at low and middle levels of income our principle evidence of well-being is stature or height. Adult stature and body mass are used as a proxy measure of health. Though body composition is not a complete measure of health, height and weight data from military records and modern nutrition surveys are the best sources for systematically understanding long-term change, and can be compared to international standards. Enlistment in the world wars was broadly representative of the male population; widespread volunteering was followed by conscription with few exemptions. We are fortunate that both height and weight are recorded in the medical examinations that accompanied enlistment for both volunteers and conscripts in the New Zealand Expeditionary Forces in World War One. Body composition was consistently measured across the military records.

2. Method

Stature and body mass both measure the net nutritional environment of a population. Stature is a coarse although broadly reliable measure of net nutrition in childhood and adolescence, and is an indicator of health and well-being (Eveleth and Tanner 1990; Steckel 1995; Bogin 1999). Is it widely used to measure the biological standard of living

since 1800 (Floud, Wachter et al. 1990; Steckel 1991; Komlos 1994; Komlos and Baten 1995; Steckel 1995; Komlos 1998; Floud 2002; Komlos and Baten 2004). This literature builds on the long-accepted observation that sustained nutritional deficits in childhood from inadequate food supply, disease exposure, adverse living conditions and/or excessive work may limit physical growth. Parallel observations arise from studies of contemporary populations (Bogin 1999; Cameron 2002; Hauspie, Cameron et al. 2004; Silventoinen 2003). Until the mid-twentieth century, periodic or sustained nutritional deficits in calories were common in developed western nations.

Body mass complements stature, by measuring current nutrition. International research demonstrates that current obesity and stature increases are a reversal of earlier net nutrition trends (Costa and Steckel 1997; Floud 1998). Higher BMI results in greater morbidity and mortality risk (Costa 1993; Calle, Thun et al. 1999; Jeffreys, McCarron et al. 2003; Corrada, Kawas et al. 2006). However, the relationship between body mass and mortality has not been extensively studied in New Zealand at an individual level (Campbell, Spears et al. 1990; Ni Mhurchu, Turley et al. 2005; Lawes, Stefanogiannis et al. 2006).

3. Historiographical Context

The stature of men in North America and most of Western Europe fell in the late 19th century, and only recovered in the 20th century (Steckel 1995; Steckel and Haurin 1995; Komlos 1998; Haines, Craig et al. 2003; Haines 2004). Industrial and urban growth meant that despite rising incomes, nutrient-dense food was less affordable. Protein deficient diets—especially deficient in milk protein—contributed to declines in stature (Baten and Murray 2000; Koepke and Baten 2005). While Australian-born men were taller than white men in North America and Europe, Australians born in the long economic depression of the 1880s and 1890s were shorter than men born in the 1870s or early 20th century (de Souza 1994; Whitwell, de Souza et al. 1997). International comparisons of indigenous and European stature are limited. North American evidence suggests indigenous populations were continued to have adequate protein in their diets because they were more rural (Steckel and Prince 2001; Komlos 2003; Prince and Steckel 2003). International research also suggests declines in physical activity in sedentary urban occupations contributed to growing BMI in some groups in the late 19th century (Costa 1993; Kahn and Williamson 1994; Helmchen and Henderson 2004; Henderson 2005).

We are particularly interested in the health and physique of the indigenous population (Blakely, Tobias et al 2005; Bramley, Hebert et al 2005; Pretty 1998; Rose 1972). Anthropologists have shown that Pacific Island and Maori populations were taller than Europeans before 1800 (Houghton, Leach et al. 1975; Houghton 1980; Houghton 1996). Peter Buck's study of 424 Maori soldiers from World War I suggests Maori heights had not decreased significantly by 1900 (Buck 1924). The health consequences of colonisation, however, are not completely established. We hypothesize that any impact of colonisation on health as cumulative disadvantage that persists over generations. A shock to the health of one generation is passed onto children, and subsequently to their

children. It is well established that poor health in utero, and then through childhood and adolescence, has persistent effects on health in later life. The exact mechanisms and magnitude of the effects remain open topics of research (Elo and Preston 1992, 1995; Fogel 1993; Fogel and Costa 1997; Barker 1998; Blackwell, Hayward et al. 2001; Hayward and Gorman 2004). The persistence of socio-economic inequalities in health can also be attributed to cumulative patterns of disadvantage persisting over generations (Bartley, Blane et al. 1997; Holland, Berney et al. 2000; Halfon and Hochstein 2002). Thus, to understand present patterns of socio-economic inequalities in health it is imperative to understand socio-economic inequalities in health over several generations.

In fact, surprisingly little is known about Maori health prior to and during colonisation. The decline of Maori population until 1896 is consistent with the hypothesis of deteriorating health under the impact of colonization. While early population estimates are not precise, there was a 25% decline in population between the first accurate census of Maori in 1858 and the population nadir in 1896. It is likely that the Maori population halved over the nineteenth century (Pool 1977; Pool 1991). The Maori population recovered rapidly in the twentieth century, with delayed declines in fertility, compared to the Pakeha population. Measured by mortality, 19th century Maori had very poor health, followed by recovery in the 20th century. Historical research on Maori health during late population decline and early recovery has taken poor health as given, and concentrated on government policy towards Maori health. Yet, no systematic measures of the health of *living* Maori have been published for the period before 1950 (Dow 1999; Lange 1999). Some surveys of Maori health before World War II were carried out by government departments, and the Medical School at Otago. While some of this research was published there were no systematic comparisons of Maori and Pakeha health until the 1960s. If mortality in the nineteenth and early twentieth centuries was selective, the average health of survivors could have been better than researchers have assumed. Further complications arise because the Maori were more likely to live in rural areas than Pakeha, which provided a better nutrition and disease environment (Pool 1991). One possibility is that rural lifestyle allowed Maori to retain nutritious diets, but they were still susceptible to new diseases.

While Maori population figures indicate poor health status before 1900, Pakeha enjoyed good health by international standards before World War II, according to evidence on material living standards, population growth, and mortality. International evidence suggests improving health before World War II resulted from improvements in public health, personal hygiene, income, and medical technology, though there is date on the magnitude of these factors (Preston 1975; McKeown 1976; Ewbank and Preston 1990; Cutler and Miller 2005). Pakeha lived in an environment conducive to improving health and longevity. Incomes were high, population density was low, and nutrient-dense food was relatively cheap (Greasley and Oxley 2004). Workplace accidents and inter-personal violence declined in the early twentieth century (Fairburn 1989). Thus, the Pakeha population grew through both natural increase and migration. An objective measure of high Pakeha health standards was an early decline in infant mortality (Olssen 1981; Mein Smith 1986; Mein Smith 1988; Bryder 2003). By contrast, reliable Maori infant mortality figures are not available before World War II (Statistics New Zealand 2006).

North American comparisons of indigenous and European-migrant stature show indigenous stature did not decline in the late nineteenth century, while European heights did (Steckel and Prince 2001). Moreover, evidence from Australia in the late 19th century suggests Pakeha stature could have declined in the late nineteenth century (de Souza 1994; Whitwell, de Souza et al. 1997). It is possible, therefore, that the stature of living Maori improved relative to Pakeha in the 1880s and 1890s, although Maori population declined. In order to properly understand how colonisation affected Maori health we need better measures of both Maori and Pakeha health over time.

Our principal sources of information on adult height and weight will be military recruiting records from World War I. Military records are widely used in international research on stature and BMI. Conscription during both world wars means we will have a nearly random sample of adult men. Although minimum physical requirements for conscription included height, it is possible to statistically adjust for sample truncation. (Komlos 2004). New Zealand results will be compared to the extensive international findings (Baten and Murray 2000; Haines, Craig et al. 2003; Cranfield and Inwood 2007). The main limitation of military records is that they are predominantly of men. However, the causes of declining height—nutritional deficits in utero and early childhood—are largely shared by both sexes. Indeed, international research shows that male stature is more sensitive to malnutrition and disease, suggesting the bias towards men in historical sources may be perversely useful (Bogin 1999).

Contemporaries and historians have often argued that late nineteenth century New Zealand was an unusually healthy society. While some of the sources of this view turn out to be less than reliable guides to the health of the population, in comparative perspective the received wisdom may well stand up. As the most remote destination for nineteenth century migrants, boosters of New Zealand had incentives to overstate the health and wealth that awaited the migrant. The received wisdom of New Zealand's unusual healthiness was given scholarly credence by Alfred K. Newman in 1882 whose article “Is New Zealand a Healthy Country?—An Enquiry with Statistics” proceeded quickly to answer “Yes.” (Newman 1882).

While boosters of New Zealand as a destination for the migrant emphasized the crude mortality statistics (favorable with a young population) the comparison held up with age-adjusted mortality rates. New Zealand did have lower mortality rates than Britain. Yet this achievement was less the result of public policy or effective medical interventions, as it was the result of comparatively low population densities compared to both Europe, and some of the New World’s larger cities in North America and Australia. New Zealand cities—mostly situated on the ocean—were also lucky enough to be able to discharge some of their waste into the sea, while obtaining water upstream from rivers and reservoirs. Advantages of location and low population explain whatever good health the New Zealand population enjoyed compared to contemporaries abroad.

Yet as Pamela Wood (2005) shows, New Zealand cities were not especially clean or healthy. They just had smaller areas of poor housing than overseas. In all of the 4 largest

cities there were areas of cramped, damp housing that were both eye-sores to the middle class and unhealthy for their inhabitants. Unhealthy living conditions affected some Pakeha, but many Maori. Most Maori lived in rural areas, which conferred the public health benefits of low population density. However, in areas where Maori had lost a lot of land to European settlers Maori often ended up living in damp, unsanitary conditions. Only a couple of generations past first contact with Europeans Maori had also not acquired immunity to diseases Europeans had grown up with, and brought with them to New Zealand. While infant and child mortality for Europeans declined quite rapidly from the 1890s, Maori mortality below the age of 15 remained very high. Children as well as infants were vulnerable to infectious diseases at rates well above those suffered by Pakeha.

4. Preliminary Description of the Data

We have begun to examine the evidence of medical examinations conducted on members of the New Zealand armed forces as they enlisted. To date more than 5200 records have been transcribed from personnel files of soldiers serving in the South African War (1899-1902) and the First World War (1914-1918). At this point only the latter source, personnel records of the New Zealand Expeditionary Force (NZEF) offer sufficient observations to support even a preliminary analysis. We do not consider incomplete records. Neither do we examine those who enlisted before they reached the age of 21 years because many of them were still growing. We also exclude those older than 49 years in order to minimize any complication arising from the diminution of height at advanced ages. We restrict our consideration to those born in New Zealand and in the nearby Pacific Islands (Fiji, Samoa, Tahiti, Tonga, Niue, Norfolk Island, Gilbert Islands, Society Islands, Cook Islands etc) because we wish to interpret adult height as a reflection of early-life conditions. Immigrants to the region may have arrived at a young age but we have no basis for knowing this or of apportioning any influence from childhood into some part reflecting the experience elsewhere and another part reflecting experience in New Zealand and the islands.

We are left with the observations summarized in Table 1. About 10% of the sample derives from the Pacific islands; the remainder are New Zealand-born. The latter divide equally into those born on the North Island and those on the South Island. There is no single unambiguous way to distinguish the men who were entirely or largely of European descent (Pakeha) from those whose native to the region (Maori in New Zealand). However, we do know the names of the individuals. Some names are clearly indigenous in origin, for example Ua Terongom, Ingatu Ngaipu, Moekaa, Kirikava Atai. Other names clearly are of European origin.

We have identified all men with apparently indigenous names. For convenience we refer to them as indigenous, however the caveats here are large. Several decades of interaction inevitably led to some who were ‘mixed race’, neither 100% European nor 100% native. Moreover, a genetically ‘pure’ Maori could adapt a European name, and a European might adopt a Maori name. A further complication is that the Maori and indigenous Pacific Islanders who served in the New Zealand Expeditionary Forces hailed from a

wide variety of islands, some thousands miles distant from others. Not all tropical islands are the same, and not all indigenous groups were closely related to each other. Organizing them as one category simply because they were not (apparently) of European origin creates a complex category of diverse individuals who might not have recognized themselves as having very much if anything in common.

In defence of our procedure, our analysis comes from a tradition that typically presumes environmental influences (nutrition, disease, workload) are much more influential than genetic influences on adult stature. Within this framework, the precise genetic composition of a group of an individual matters less than how she or he lived, especially as a child. Fortunately for us, the reporting of an aboriginal name probably does point to someone who lived within and therefore identified with the indigenous community. This is the influence that we wish to capture.

Admittedly, those who grew up in an indigenous community and yet presented themselves for enlistments with European names will be invisible to us. The proportion of such people within the European-descended but New Zealand-born community probably was small. It is a worry, however, if those within the aboriginal community who crossed the racial line through a name change were systematically different from those who did not. At the moment we have no way to address this concern.

For all of these reasons we regard our tabulations and analysis that rely on the ethnic marker as merely indicative of very broad patterns and tendencies. Our more limited confidence in these data compounds the effect of having a relatively small sample of indigenous files, especially for the Maori. The Maori account for slightly less than one-fifth of the men with apparently indigenous names; the remainder were born in the Pacific Islands. Indeed, roughly two-thirds of the men born in the islands reported indigenous names (against a small minority of the New Zealand-born).

The summary evidence in Table 1 suggests that the Pacific Islanders (with both indigenous and European names) tended to be younger than the New Zealanders at enlistment and by implication were born later. On average they were of comparable height but heavier. The mean and median of both height and weight was similar for all groups suggesting that the indicators of physical stature were not strongly skewed. This is unsurprising for height; most studies of late nineteenth century populations find a near-normal distribution. Evidence for weight is less commonly available but studies of late 20^{th} birth cohorts typically find mean weight is skewed to the right reflecting the presence of a small but significant number of people with large body mass. Apparently this tendency was limited or non-existent in nineteenth-century New Zealand.

The near-normality of height distribution for those born in New Zealand is clear from Figures 1 and 2. There are two principal exceptions to an otherwise remarkably normal-looking pattern. The proportion of people reporting the height of 71 inches is smaller than expected. We have no explanation for this although we plan to investigate more closely and in particular re-examine our treatment of half-inch increments. The second

exception is a small but noticeable under-representation of those 63 inches and shorter. An obvious explanation here is the stated minimum height requirement of 64 inches.

The coefficient of variation indicates that characteristics for Pacific Islanders as also those with an indigenous name are bunched more closely around the mean than for Pakeha. In part this would appear to arise from the more limited dispersion of age among indigenous-designated records and Pacific Islanders (the latter being disproportionately indigenous.

5. Preliminary Analysis of Patterns in Adult Height

Our goal in the analysis is to assess the extent of social differentials and change over time in stature. In this we need to recognize the minimum height requirement of 64 inches for service in the New Zealand Expeditonary Force (NZEF). Admittedly, some men taller than the threshold were rejected for service on the basis of being unfit just as some men shorter than 64 inches were permitted to serve. Although the truncation was inconsistent, the frequency distributions in Figures 1 and 2 make clear that it had some effect. Accordingly we discard all records of men shorter than 64 inches and estimate with a maximum-likelihood truncated regression model.

We capture change over time by partitioning the sample into men born in the 1860s and 1870s (11% of the sample), 1880s (47%) and 1890s (42%). As noted above, evidence of declining height is reported from Australia (Whitwell et al 1997), Canada (Cranfield and Inwood 2007) and the United States (Steckel and Haurin 1995), the three most obvious societies for comparison with New Zealand, as well as a number of others (Haines 2004; Komlos 1998)). Hence there is considerable interest to ascertain if New Zealand's exceptionality extends to this arena.

We also examine the influence of socio-economic status via occupations organized into five classes: professional-clerical, farmer, farm labourer, other labourers and servants, and all other. These groups account for 13%, 20%, 12%, 13% and 27% of the New Zealand-born sample for estimation. The soldier's occupation is assumed to correlate with his father's occupation, which in turn speaks to the net nutritional circumstances in which the soldier was growing up. Admittedly occupation is a very rough socio-economic indicator. The presumption of intergenerational persistence further reduces precision. Nevertheless, in the absence of other indicators we examine the hypothesis that these occupation-based socio-economic grouping capture the net effect of various influences on adult height.

We hypothesize that rural occupations indicate access as children to a lower relative price of food and limited exposure to infectious disease. The professional and clerical occupations suggest a higher class standing and family circumstances permitting greater spending on food and healthy housing. We anticipate that both groups will be taller, on average. Soldiers born to father with labouring occupations, especially those in urban areas and lacking in specific skills, probably grew up with lower family income in less healthy environments, and consequently were shorter as adults. Occupation correlates

partially with the indigenous identity indicator discussed above. Nevertheless, to the extent that men with indigenous names report a variety of occupation, inclusion of the indigenous identity variable identifies picks up a 'pure' effect of being indigenous over and above any effects of ethnic clustering in particular occupations.

The estimation results reported in Table 2 indicate that, as expected, farmers and the professional-clerical class in New Zealand were considerably taller than the omitted category 'all other occupations'. Farm labourers also were taller although by a smaller margin. The stature of ordinary labourers and servants, in contrast, could not be distinguished statistically from the omnibus omitted class. None of the occupational effects were significant for the Pacific Islanders possibly because of small sample size.

Those with an indigenous name in New Zealand, the Maori, were two-thirds of an inch taller than Pakeha. The significance level (17%) is not large enough to sustain prolonged discussion but nonetheless it is suggestive. There is no sign of a similar height advantage for those with an indigenous name in the Pacific Islands. Specification of the indigenous marker had no discernible impact on any of the other coefficients.

The decadal effects follow an intriguingly different pattern for New Zealand and the Pacific Islands. In New Zealand those born in the 1880s were taller than those born both earlier and later, although admittedly the apparent increase in stature from the 1870s to the 1880s cohort was not significant at a statistically interesting confidence level. In the Pacific Islands the 1870s cohort was tallest by a large measure although here too stature diminished from the 1880s to the 1890s. Sample size clearly limits what can be said about the Pacific Islanders. We consider the robustness of these findings with alternate formulations. The 1890s effect may be exaggerated if those aged 21-25, all born in the 1890s, had not yet stopped growing. However systematically raising the minimum age threshold did not remove or reduce the evidence of stature decline in the 1890s.

We cannot assess stature change before the 1870s-1880s transition with NZEF data. For this purpose we examine the files of a small number of New Zealand-born South African War soldiers. We divide them into equally sized groups of those born 1863-1878 (72 observations) and 1879-1882 (62 observations). The mean stature of both groups was 68.5 inches. Sample size and inability to adjust for confounding factors reduces the value of this evidence but, at a minimum, we can say that the South African War records reveal no evidence of changing stature.

Regional differences in height are pronounced in some countries (eg Canada, Cranfield and Inwood 2007). A dummy variable distinguishing the North Island from South Island was statistically insignificant and did not affect any of the other co-efficients. The economic history literature emphasizes differences in the economic and demographic trajectories of the North and South Island but adult stature, at least, did not differ systematically. Finally, we considered if inclusion of observations for men aged 18-20 year-olds with dummy variables to capture growth effects might reduce standard errors and enhance our ability to test hypotheses. This increases sample size considerably but does not systematically affect the pattern of estimated co-efficients or improve standard

errors. It appears that the noise introduced by the 18-20 year olds offsets any gain from expanding the sample.

6. Conclusion

The experience of stature for men born in late nineteenth-century New Zealand was very different than that of men born a century later. Socio-economic variations in height were pronounced for those born in the 1880s and 1890s. One hundred years later the differentials were reduced (although not eliminated) by the long-term diminution of economic inequality and reduced marginal significance of income for height at high income levels.

Another point of contrast is that during the late twentieth century each generation was significantly taller than the one preceding. This does not appear to be true for nineteenth-century cohorts. As in many other jurisdictions New Zealanders born during the 1890s grew up shorter than those born earlier. We do not yet have sufficient data to establish if this is a short-term, perhaps a cyclical effect or part of a longer trend. It remains clear, though, that any cohort differences were small compared with the occupational effects. This is entirely the opposite of the late twentieth century.

It is useful to situate the dip in height for the 1890s cohort in regional perspective. The 1890s marks the beginning of Australia's long slow experience of falling behind (Greasley and Oxley 1998; McLean 2004). Greasley and Oxley (2004) report evidence of a degree of integration between Australia and New Zealand in the trans-Tasman labour market. Not surprisingly real wages in New Zealand, as in Australia, experienced during the 1890s a significant pause in their long-term upward trajectory. In turn, we should not be surprised to find a decline or, at a minimum, a pause during the 1890s in the upward movement of an alternate indicator of physical well-being, stature, just as in Australia (Whitwell et al 1997). Whether this experience is a purely trans-Tasman experience or a widely-shared 1890s experience in the long-term term evolution of the global economy remains for further research.

We began the paper with a recognition of the importance of historical origins for Maori-Pakeha health differentials. The evidence of Table 2 suggests that Maori stature was superior to that of Pakeha even after controlling for generational and occupational effects. There is no evidence here that by the 1890s Maori health had begun to diminish greatly, at any rate not among those who enlisted in the New Zealand Expeditionary Force. Admittedly, we have no basis for assessing the representativeness of this group in the context of Maori society. And of course sample size remains small.

The final question of interest to the present meeting is who was taller, kiwis or Canadians. In order to answer this question we estimate a new model comparable to that of Cranfield-Inwood for eastern Canada (2007, table 6). The truncation point differs (63 inches vs 64 inches) although in principle the truncated regression adjusts for this effect. We find that a non-farmer born in the 1880s in New Zealand was 67.6 inches against 67.4 inches in eastern Canada. The farmer effect was larger in New Zealand, and the New

Zealand decline into the 1890s was smaller. Admittedly the eastern Canadian height evidence is for a volunteer while the New Zealand height is for volunteers and conscripts combined. If conscripts were shorter, ceteris paribus, in New Zealand as in Canada, then the Kiwi height superiority is even greater. We conclude that while New Zealand was vulnerable to the same adverse health and nutrition pressures experienced elsewhere, New Zealanders of European descent really were taller than others, at any rate taller than the Canadians. And the Maori were even taller.

Table 1: New Zealand Expeditionary Force Data, Summary Statistics

	N		Age (years)	Height (inches)	Weight (pounds)	Birth Year
b New Zealand	2400	median	26	68	149	1889
		mean	27.4	68	150	1888
		coeff var	.21	.04	.12	.003
b Pacific Islands	233	median	24	68	160	1892
		mean	24.9	68	161	1892
		coeff var	.16	.03	.12	.002
Aboriginal Name	201	median	24	68	162	1892
		mean	25.1	68	163	1891
		coeff var	.16	.03	.11	.002

note: Those with an aboriginal name are included within the New Zealand and Pacific Island categories, in addition to being reported separately in the bottom line. 'Coeff var' is coefficient of variation (standard deviation/mean). B - born

Table 2: Maximum Likelihood Analysis of Stature, New Zealand Expeditionary Force Soldiers 21-50 years at Enlistment, Born in New Zealand and the Pacific Islands

	New Zealand-born N=2323		Pacific Islanders N=224	
	Coef.	P>|z|	Coef.	P>|z|
Born 1870s	-.27	.22	2.83	.10
Born 1880s	-.21	.11	+.57	.18
Farmer	+.93	.00	-.10	.82
Labourer, farm	+.42	.04	+.98	.50
Professional-Clerical	+.57	.00	+.45	.51
Labourer, other	+.14	.47	-.24	.58
Constant	67.5	.00	67.4	.00
	Coef.	P>|z|	Coef.	P>|z|
Born 1870s	-.27	.24	2.82	.10
Born 1880s	-.22	.10	+.62	.15
Farmer	+.92	.00	+.30	.61
Labourer, farm	+.39	.06	1.02	.48
Professional-Clerical	+.56	.00	+.45	.52
Labourer, other	+.07	.73	+.18	.75
Indigenous Name	+.65	.17	-.60	.35
Constant	67.5	.00	67.6	.00

Figure 1: Frequency Distribution of Height for Those Born in New Zealand and Aged 21-49 at the Time of Enlistment in the New Zealand Expeditionary Forces

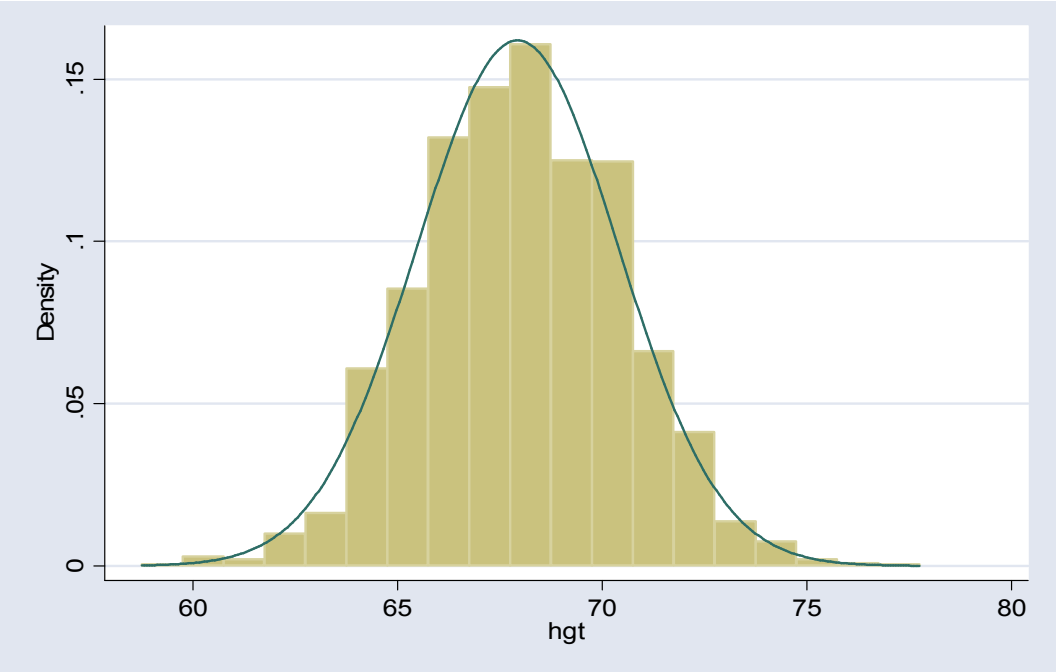
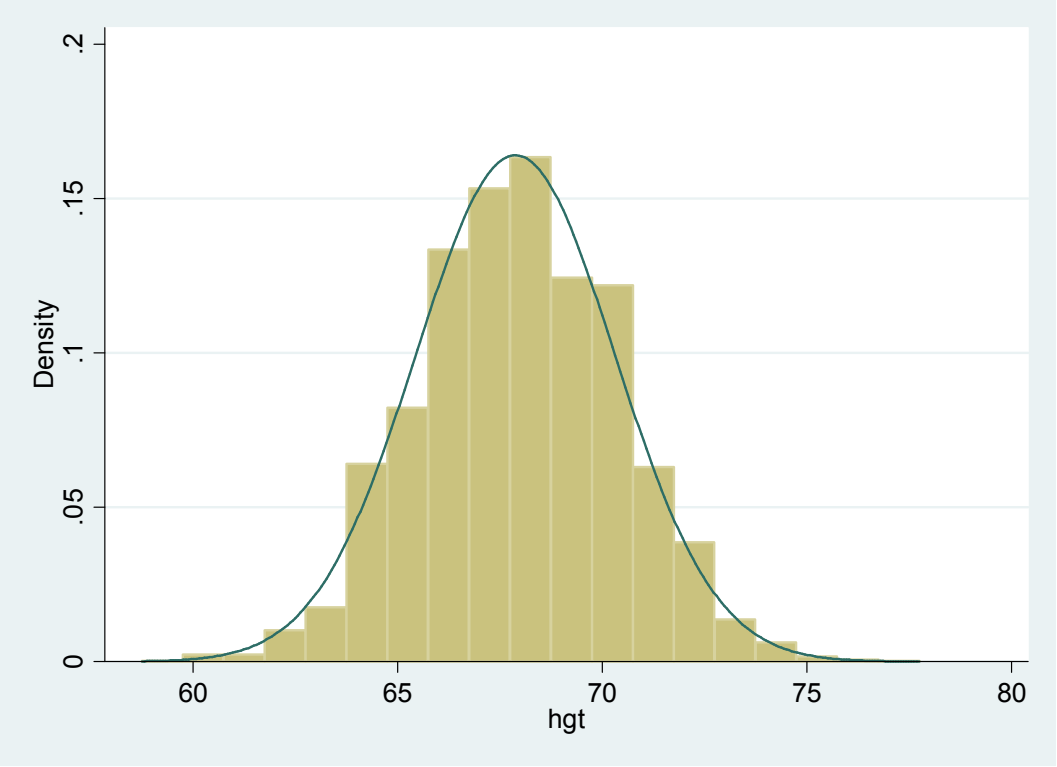


Figure 2: Frequency Distribution of Height for Those Born in New Zealand and Aged 18-49 at the Time of Enlistment in the New Zealand Expeditionary Forces



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