

AS 91582 - Statistical Inference: Excellence example (Household Savings Survey).

INTRODUCTION

A household, according to *Statistics New Zealand (2014)* is “a person or group of people living in a single home or dwelling”. The Household Savings Survey (HSS) was administered to both individuals and couples who live in households. (*Statistics New Zealand, 2002*). The HSS was conducted in 2001, by Statistics New Zealand. A primary reason for the collection of the the survey data was to establish how much New Zealanders are worth (“Net worth”). The survey population is the usually resident population of New Zealand, 18 years and over, living in permanent private dwellings on the main islands of New Zealand.

The ‘Net worth’ of a household is similar to the accounting definition of Assets minus Liabilities. A positive net worth means a household owns a higher value of assets than liabilities (e.g. debt). A negative net work means means a household has a higher value of liabilities (e.g. debt) than assets (*Statistics New Zealand, 2002*).

This investigation will look into any differences in the Net Worth (how much New Zealanders are worth) between those who have jobs (are “employed”) and those who do not (are “unemployed”). These are only loose definitions of employed / unemployed but I will use these generalised groups for this report.

There seems to be a perception out there that in New Zealand, it is easy to go on the ‘dole’ or receive a benefit payment from the government. The welfare system is designed to take care of those people who are unable to work. But there are those who abuse it.

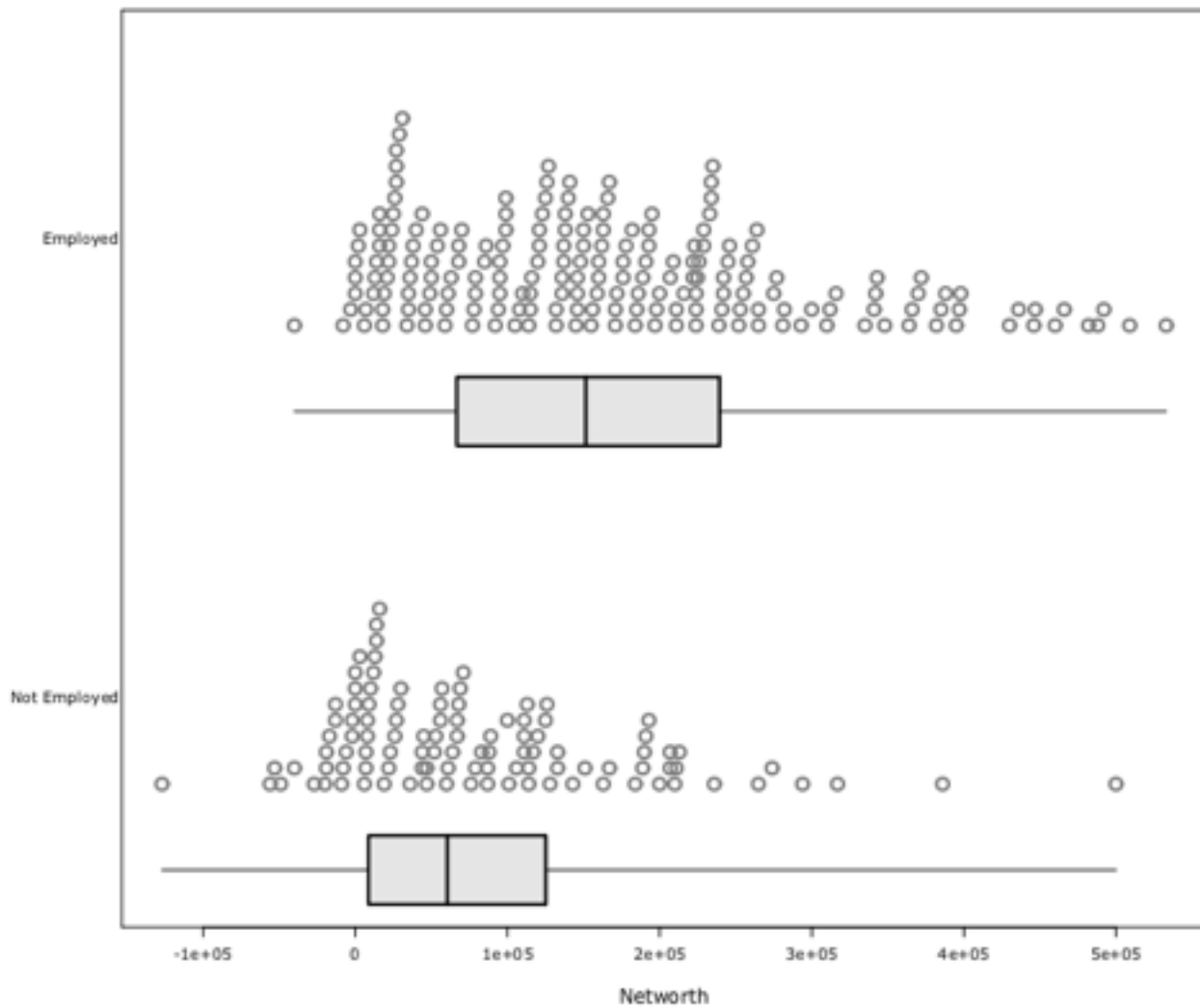
A recent article titled ‘Around the world on the dole’ (*Fairfax New Zealand Limited, 2014*) speaks of how a man on the dole managed to go on a two year world trip. This person should have a negative net worth.... but the article suggest he may have a positive net worth.

I wonder if people receiving benefits from the government (those “unemployed”) have the same or higher Net Worth compared to those people who actually work for their money (the “employed”).

I would like to investigate the difference between the Net Worth (in \$) of those who are employed (have jobs) and the Net Worth (in \$) of those who are not employed (have no jobs), from the usually resident population of New Zealand, 18 years and over, living in permanent private dwellings on the main islands of New Zealand.

My expectation after reading the article mentioned above, and the anecdotal evidence I have heard about welfare system abuse, is that those who are unemployed (don’t have a job) will have the same or higher Net Worth as those who are unemployed.

Employment versus Networkh



5 POINT SUMMARY	Employed	Not Employed	Difference
Minimum	-\$40,000	-\$127,000	
Lower Quartile (LQ)	\$66,750	\$8,750	
Median	\$151,500	\$60,500	\$91,000
Upper Quartile (UQ)	\$239,500	\$125,200	
Maximum	\$533,000	\$500,000	
Interquartile range (UQ - LQ)	\$172,750	\$116,450	\$56,300
Mean	\$170,200	\$81,050	
Sample size	196	104	

ANALYSIS: Technical Notes

Centre

The sample median net worth for the employed households in NZ (\$151,500) is \$91,000 higher than the sample median net worth for the unemployed households in NZ (\$60,500). This seems to immediately disprove my expectations about the unemployed having a same or higher net worth than the employed; in fact the difference between the sample medians is almost the same as an entire annual salary. According to *APN Holdings NZ Limited (2013)*, the median income in NZ in 2013 was \$85,000 which is not far off the difference above.

The sample medians by themselves, is not enough evidence to make the call for any differences between the groups. I need to consider the variability of estimates.

The sample distribution for the Net Worth of the employed households in NZ seems to be skewed to the left. The first 75% of the data points that sit between about \$0 and \$240,000 looks like a uniform distribution. The right tail includes the remaining 25%. What this could mean for NZ households, is that most people who have jobs would have a net worth of not more that \$240,000. A possible reason for this uniform distribution, is that New Zealanders seem to have a love affair with buying property, which is frequently reported on in the media. To buy property, a person (or household) firstly needs a stable income; this income will have to be large enough to cover the initial deposit and repayments (*sorted.org.nz, 2014*). What is being seen here seems to make sense. Further investigation in to the sample data, reveals that the median wage & salary of the uniform distribution was \$31,000 compared with the median wage & salary of the right tail which is \$16,000. Further investigation into the types of jobs these households would have would reveal more detail.

The sample distribution for the Net Worth of the unemployed households in NZ appears to be very much left skewed. The bottom 75% of the data sits between -\$100,000 and \$100,000. Comparing this with the sample distribution for the employed, most of the data here is very much in the lower end of the scale with this range of points overlapping less than half. Interestingly, there are some unemployed households who have a positive Net Worth; this means that they do own assets. A possible reason could be houses or items of land that were gifted to unemployed households.

Based on the analysis of the centre of the sample data, the difference in the sample median and the differences in the central tendency of the sample distributions, suggest that employed households tend to have a significantly different, and higher Net Worth than unemployed households.

Spread

The sample middle 50% of Net Worth for employed households in NZ ranges from \$66,750 to \$239,500 (IQR = \$172,750) compared with the middle 50% of Net Worth for not employed households in NZ which ranges from \$8,750 to \$125,200 (IQR = \$116,450).

The spread of the Net Worth data points back in the population (all New Zealanders) is likely to be different by approximately \$56,300; with the employed households having a larger spread than the unemployed households. Further investigation into the sample dataset shows that the employed households have and median salary & wage of \$21,000, where the unemployed households have a median salary & wage of \$1000. Employed households seem to have stable jobs that allows them to purchases a greater amount of assets than the unemployed. According to *ANZ Bank New Zealand Limited (2013)*, the higher stable income that person has, the more money the bank is willing to lend for the purchases of property (i.e. a mortgage).

As discussed in the “Centre” section above, most the of the sample data points of employed households, is significantly further up the scale of Net Worth compared with the unemployed households. The lower quartile of employed households in the sample data is \$66,750, which seems much higher than the lower quartile of the unemployed households of \$8,750 - the middle 50% if shifted up the scale by \$58,000. There is an overlap of the middle 50%’s between \$66,750 and \$125,200 (this equates to an overlap of approximately 30% only). The sample median Net Worth of the unemployed sits outside the middle 50% of the employed, and conversely, the sample median Net Worth of the employed sits outside the middle 50% of the employed. This evidence, especially the fact the sample medians sit outside of the central 50% of the other group, tells me that my expectations are likely to be very wrong.

Based on the analysis of the spread of the sample data, all of these reasons strongly suggest there will be a difference between the Net Worth of unemployed and employed New Zealanders. In fact, it is likely that the Net Worth of employed households is higher than the Net Worth of unemployed households.

Unusual features

Visually, there is 3 unusual features in the sample data of Net Worth for unemployed households; -\$127,000, \$386,000 and \$500,000.

The person with a Net worth of -\$127,000 is a 39 year old male, who has no partner and a wage & salary of only \$3000. I would expect this person to have a high level of debt; but the sample data shows \$0 for debt. This data point does not make sense and therefore should be deleted from the sample dataset, so the re-sampling process is not biased.

The person with a Net worth of \$386,000 is a 49 year old male, with a wage & salary of only \$3000. However he has a partner, and with total household income of \$92,000. This implies his partner is the bread-winner in the household. A similar situation exists for the person with a Net Worth of \$500,000. These two data points should be left in the sample dataset as they likely to represent a legitimate part of households in New Zealand.

There is cluster of 11 data points in the extreme right tail for the employed households. Because there are so many of them, and they sit extremely close to the rest the sample data... there is no need to investigate these data points further as they likely to represent a legitimate part of households in New Zealand.

	Evidence of difference between Net worth (\$)	Evidence of no difference between Net Worth (\$)
Centre: median	Yes	
Centre: sample distribution	Yes	
Spread: middle 50%	Yes	
Spread: shift	Yes	
Spread: overlap	Yes	

CONCLUSION: Executive Summary

After a close look at the sample data, into the central tendency and the spread, I can safely say with a high degree of certainty, that there is likely to be a difference between Net Worth of employed households and Net Worth of unemployed households in New Zealand; there is also evidence that the employed households have a higher Net Worth than the unemployed households.

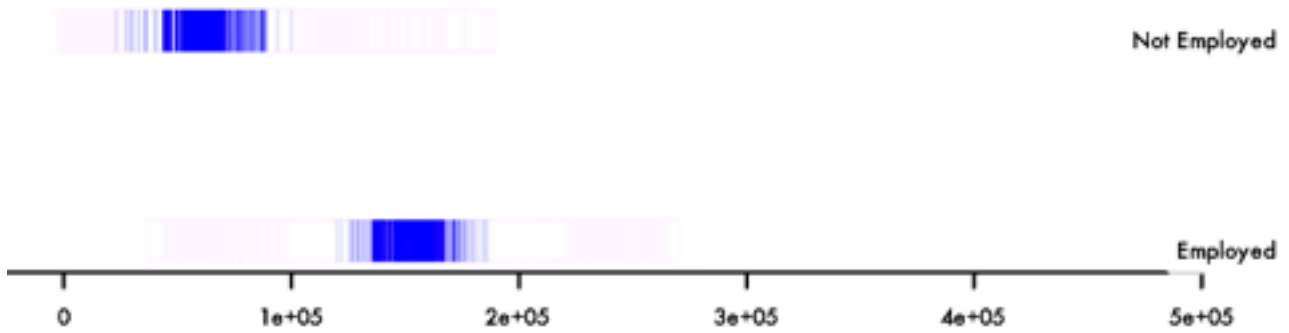
There does not seem to be any evidence in the sample data, of Net Worth being the same for both groups. Unfortunately this is contrary to what I expected about the unemployed having the same or higher Net Worth than the employed.

These findings do make sense as in order to acquire more assets, a person needs a stable income in order to fund their purchases, or at least borrow the necessary funds from the bank (sorted.org.nz, 2013; ANZ Bank New Zealand Limited, 2014).

I cannot make my final decision based on these results alone, and my sample data of NZ Households is only one sample. All samples suffer from sampling error; sampling error is the mismatch that occurs between the sample estimates (e.g. sample median, sample IQR) and the population estimate (e.g. population median, population IQR); the reality is, a sample of 300 NZ households is an efficient way to collect information, to make inferences about all households in New Zealand. I am assuming the sample of 300 collected here for the HSS represents all NZ Households (e.g. has fair mix of geographic locations, ages, ethnicities) and is of a sufficiently large size.

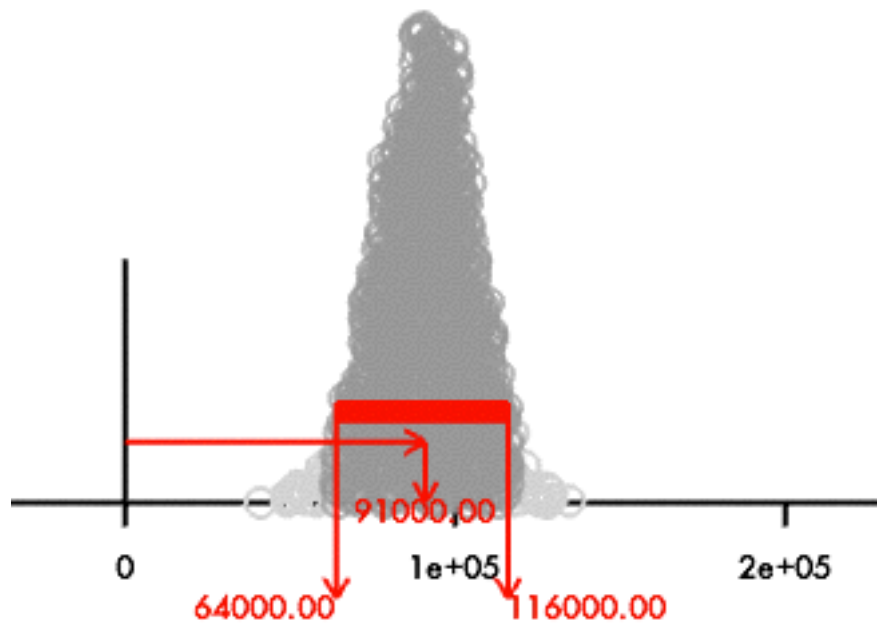
Taking subsequent samples of the same/similar size from all NZ households, will mean that the sample medians from each subsequent sample will vary. As a result, I need to make sure that range of subsequent sample medians shows a difference between Net Worth of employed and unemployed households *approximately as large* as the difference I have witnessed of \$91,000.

I cannot take more samples of 300 from the NZ households, as this would mean running the HSS again. What I will do is use the bootstrapped method of re-sampling, to mimic the sampling process by taking multiple samples with replacement (a "re-sample"), of the original sample. For each re-sample I will compare the range of re-sampled Net Worth medians for both groups.



The re-sampled medians of the Net Worth for the unemployed and employed are in the above graph; the range of values as indicated by the dark-blue portions are highly likely to contain the population median Net Worth for each group. 1000 re-samples were taken, resulting in 2000 re-sampled medians to compare. There is a clear shift right of the central 50% for the employed group, and there is not overlap in the central 50% either. Therefore, there is highly likely to be a difference in the median Net Worth between the two groups, across all households in New Zealand.

Further to this, the bootstrapped confidence interval does not contain \$0, which tells that there is a difference between employed New Zealand Households and unemployed New Zealand Households. It is a fairly safe bet that employed New Zealand Households have a higher Net Worth (\$) than unemployed New Zealand Households by at least \$64,000, and up to \$116,000.



After analysing my sample data, I expected to see this result. Although I have a perception that those NZ households who are not working and are receiving welfare payments could be abusing the welfare system, my findings suggest otherwise. As implied by 'Around the world on the dole' (Fairfax New Zealand Limited, 2014), there may be only a handful of abusers of the welfare system out there.

The results of this analysis should assure the NZ government and the NZ public that most New Zealanders appear to be acquiring assets through legitimate means (e.g. jobs) and the welfare system seems to be used as intended across all households in New Zealand.

A more in depth study about the types of assets and liabilities NZ households have, will be useful in painting a picture of what people spend their money on, especially those who are not employed.

References

Statistics New Zealand. (2002). The Net Worth of New Zealanders, *Data from the 2001 Household Savings Survey*. Retrieved from <http://www.stats.govt.nz>

Statistics New Zealand. (2014). Households. Retrieved from <http://www.stats.govt.nz>

Kingwatch. (2014). Savings and Investment. Retrieved from <http://www.kingwatch.co.nz/>

APN Holdings NZ Limited (2013). Average house income hits 85k. Retrieved from <http://www.nzherald.co.nz>

ANZ Bank New Zealand Limited (2013). Mortgage calculators. Retrieved from <http://www.anz.co.nz>