Department of Statistics, the University of Auckland

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Adjusting for linkage bias in the New Zealand Longitudinal Census

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Degree: BA/BCom

Abstract

The aim of this project is to adjust for linkage bias in the New Zealand longitudinal census, a series of 15 cohorts linking the 1981, 1986, 1991, 1996, 2001 & 2006 censuses. These include five cohorts of two Censuses, four cohorts of three Censuses, three cohorts of four Censuses, two cohorts of five Censuses, and one cohort of six Censuses.

To determine bias we assessed 2-way (X-Y) correlations between children & adult variables for each cohort for (1) Full (linkable) Census at time t; (2) Sample linked from t to t-1, (3) Sample linked from t to t-1 weighted by each individuals propensity to be linked, by a logistic regression model including main effects only; and (4) Sample linked from t to t-1 weighted by each individuals propensity to be linked by a logistic regression model including main effects and two way interaction effects. We then calculated the magnitude of the differences between the correlations: 1 vs 2 (unweighted); 1 vs 3 (weighted-main); 1 vs 4 (weighted-interactions); and considered correlations to be unbiased if the magnitude was smaller than .01.

Across cohorts, 40–76% of correlations were unbiased in unweighted analyses. Weighting increased the number of unbiased correlations by 3 to 25 percentage points, and the weighted-interaction correlations tended to be less biased than the weighted-main correlations. For adults we can see that we have improvements ranging from about 4 to 25 percentage points. For children we can see that we have improvements ranging from about 4 to 19 percentage points, with the exception of one cohort.

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1.0 Introduction

The census is the official count of how many dwellings and people there are in New Zealand, and it covers the entire population. However it is limited in that it only takes a cross-sectional snapshot in time. The main benefit of a longitudinal study is that developments or changes in the characteristics of the target population are able to be detected by researchers, at both the group and the individual level. As a result of longitudinal studies extending beyond a single moment in time, we can establish sequences of events.

For example, we might choose to look at what factors explain changing ethnic identification. The longitudinal study design would account for variables such as age or gender as the ethnic identification changed over time. Therefore, a longitudinal study is more likely to suggest cause-and-effect relationships than a cross-sectional study by virtue of its scope. It will also become possible to answer questions such as what is the extent of ethnic mobility or is geographical mobility increasing in NZ?

Currently the NZLC contains the censuses from 1981–2006, where records have been "linked" back to the previous census. What this means is that individuals in the eligible population are "linked" back to a previous census, where the eligible population is define to be where the individual was (1) in New Zealand at the previous census and (2) old enough to have been alive at the last census.

The 15 cohorts of the NZLC are shown in Figure 1. These include five cohorts of two Censuses, four cohorts of three Censuses, three cohorts of four Censuses, two cohorts of five Censuses, and one cohort of six Censuses. We can see that there is incomplete linkage between Censuses, ranging from 31–75% of theoretical population linked, depending on the cohort. When we link people from one census to another, those people that have been linked may differ from those that could not be linked, such as their age, sex, and ethnic compositions of census pairs may differ across time in a way that has variable effects on research questions. Previous work undertaken by Vera Puti Puti Clarkson in a 2013–2014 summer scholarship found that the five strongest variables that determines linkage across the cohorts are: Same address 5 years ago, Martial Status, European Ethnicity, Live with partner and sex.

Having the bias can result in a tendency to overestimate or underestimate important relationships between variables, such as the effect of a person's occupation on mortality risk. This tendency could potentially result in incorrect conclusions. Thus this project could be very helpful for other projects that use the New Zealand Longitudinal Census to investigate the effect of different variables.

Figure 1 table:

Cohort	Number of Censuses	1981	1986	1991	1996	2001	2006	% linked
06-01	2					2,311,000		70.3
01-96	2				2,171,000			69.5
96-91	2			2,174,000				72.0
91-86	2		2,220,000					75.9
86-81	2	2,078,000						72.1
06-01-96	3					1,592,000		54.5
01-96-91	3				1,571,000			56.2
96-91-86	3			1,603,000				59.4
91-86-81	3		1,581,000					59.4
06-01-96-91	4					1,173,000		45.4
01-96-91-86	4				1,177,000			47.5
96-91-86-81	4		1,154,000					47.5
06-01-96-91-86	5				882,000			38.6
01-96-91-86-81	5			850,000				38.3
06-01-96-91-86-81	6			647,000				31.5

Figure 1. New Zealand Longitudinal Census cohorts

Weighting refers to the process trying to infer results for the relevant population by adjusting a sample. To do this, a 'weight' is allocated to each individual. The weight attempts to adjust for how many people in the relevant population are represented by each person in the sample. Weights allow for linked records to estimate longitudinal populations. The project "Developing Bias Weights for the New Zealand Longitudinal Census" is attempting to adjust for linkage bias in the New Zealand longitudinal census. This will be done by conducting analyses to estimate bias weights, and examining the extent to which adjusting for these weights results in unbiased analyses.

2.0 Methods

The program used to analyze the data was SAS Enterprise Guide.

For two census cohorts

Each two census pair file (i.e. 2006–2001, 2001–1996, 1996–1991, 1991–1986, 1986–1981) was created by merging the appropriate Census level files. Variables were then modified to change them all into numeric values, and categorised. We then separated the data into "adult" (age ≥15) and "child" (age <15) data set . Afterwards, we used the ranuni SAS function separately on both of these data sets, to randomise the data and then split the randomised data into two parts. The training set contained 70% of the data, and the test case contained 30% of the data. To assess linkage before adjusting for weights, we made a correlation matrix <u>using test cases only</u> for the full linkable Census in t (e.g. 2006) and the linked census from t to t-1 (e.g. 2006 to 2001) separately for adults and children, using the adult and children variables. We then assessed the magnitude of differences between the full linkable Census and the linked census correlations (weighted), for both the adults and children. We then used these magnitudes to determine how biased the cohorts are. If the difference in correlations was smaller than .01 we considered the correlation to be unbiased.

Note, we always compared correlations using data from the latter of the two linked Censuses (t), as all those in t are eligible to be linked back to t-1. Thus, we want correlations among those linked from t to t-1 to match as closely as possible correlations among those in t. The opposite is not the case: some in t-1 are not eligible to be liked to t (e.g. those who die or emigrate in the interim). As such, correlations among those linked from t to t-1 are not expected to match the correlations among those in t-1.

To adjust for weights we calculated each individual's probability to be linked, based on their characteristics. This was done using two logistic regression models, <u>run on the training data</u>. The first logistic regression model included main effects only (weighted-main). Predicted probabilities of being linked were output from this model. We then weighted observations by inverse of these probabilities in analyses. Correlation matrices using test cases only for the full linkable Census in t and the main-effects-weighted linked census from t to t-1 were made for adults and children, using the adult and children variables. We then assessed the magnitude of differences between the full linkable Census and the linked census correlations, for both the adults and children. We then used these magnitudes to determine how biased the cohorts were. If the difference in correlations was smaller than .01 we considered the correlation to be unbiased.

The second logistic regression model included both main effects and two-way interaction effects (weighted-interactions). Note that processing power did not allow the inclusion of all two-way interactions, so only those deemed 'important' were included. To determine 'important' interaction effects, we ran a proc surveyselect on the adults on a sample size of 14,500 to create a new data set (approximately 10,000 training cases and 4,500 test cases). Any two-variable interaction found to be significant was added into the logistic regression model in addition to the other adult variables. Thus, we considered any interaction significant in a random sample of 10,000 to be 'important' enough to include in the logistic model. Correlation matrices for the full linkable Census in t and the interaction-effects-weighted linked census from t to t-1 were made for adults, using the adult variables. We then assessed the magnitude of

differences between the full linkable Census and the linked census correlations. We then used these magnitudes to determine how biased the cohorts are. If the difference in correlations was smaller than .01 we considered the correlation to be unbiased. The child data set involved all the steps taken in the adult data set using instead the child data set and child variables.

For three and higher census cohorts:
The weights obtained in the second method above combined using two different methods, where the method that had the highest reduction in bias was used.

1. The Arithmetic mean method: Calculated by adding the weights together and dividing by the number of censuses in the set. For example in the 060196 cohort we added the 0601 and 0196 weights, then divided by two to obtain the new weights.

2. Geometric mean: Calculated by multiplying the weights together and taking the number of censuses root. For example in the 060196 cohort we multiplied the 0601 and 0196 weights, then raised them to the 2nd root (square root).

For each method we then assessed the magnitude of differences between the full linkable Census and the Arithmetic mean or Geometric mean linked census correlations. We then used these magnitudes to determine how biased the cohorts are. If the difference in correlations was smaller than .01 we considered the correlation to be unbiased. This was undertaken separately for adults and children as before.

The three cohort and above censuses require some additional coding, to allow for the fact that the individual must alive at the earliest census, and have been in New Zealand at the previous censuses. For example for cohort 06019691, the individual must be at least 15 years old, and have been in New Zealand for both the 0196 and 9691 censuses. This also means that there will be no child data sets beyond the three cohort censuses, as the individual will have to be 15 or older, which means they will not meet the census definition of a child.

3.0 Results

Adults 2 census cohorts table

Adults				
Cohort	Non-biased linkages before weighting	Non-biased linkages after main effects weighting	Non-biased linkages after main and interaction effects weighting	Largest increase in non-biased linkages
0601	40.9%	57.2%	57.8%	16.9%
0196	46.5%	71.1%	71.3%	24.8%
9691	63.7%	71.7%	71.0%	8%
9186	42.8%	52.0%	53.1%	10.3%
8681	45.5%	49.8%	47.7%	4.3%

We can see that we have improvement across all five adult cohorts, ranging from about 4% to 25%. The non-biased linkages before the weighting range from 41% to 64%, and after weighting we can see they improve to about 50% to 72%. We can also see that there are occasions when the main effects weighting give better results than the main and interaction effects weighting, such as in the case of cohort 9186 and 8681.

Adults 3+ census cohorts table

Adults				
	before weighting	linkages after weighting	biased linkages	
060196	62.7%	83.8%	21.1%	Geometric mean
019691	72.1%	79.2%	7.1%	Arithmetic mean
969186	75.2%	83.0%	7.8%	Geometric mean
918681	72.0%	78.3%	6.3%	Geometric mean
06019691	72.3%	81.1%	8.8%	Arithmetic mean
01969186	74.4%	81.3%	6.9%	Geometric mean
96918681	76.0%	82.0%	6.0%	Geometric mean
0601969186	73.2%	78.2%	5.0%	Arithmetic mean
0196918681	75.8%	79.8%	4.0%	Geometric mean
060196918681	71.3%	74.2%	2.9%	Geometric mean

We can see that we have improvement across the remaining ten adult cohorts, ranging from about 3% to 9%. The non-biased linkages before the weighting range from 72% to 76%, and after weighting we can see they improve to about 78% to 83%. We can also see that although geometric mean weighting usually give a better result, there are occasions when the arithmetic mean weighting give better results, such as in the case of the cohort 019691, cohort 06019691 and cohort 0601969186.

Children 2 census cohorts table

Children			
Cohort	Non-biased linkages before weighting	Non-biased linkages after main effects weighting	Non-biased linkages after main and interaction effects weighting	Largest increase in non-biased linkages
0601	54.5%	68.0%	73.6%	19.1%
0196	62.3%	78.9%	73.3%	16.6%
9691	58.3%	57.7%	65.0%	6.7%
9186	55.6%	60.8%	56.9%	5.2%
8681	61.9%	66.7%	70.5%	8.6%

We can see that we have improvement across all five children cohorts, ranging from about 5% to 19%. The non-biased linkages before the weighting range from 55% to 62%, and after weighting we can see they improve to about 61% to 79%. We can also see that there are occasions when the main effects weighting gives better results than the main and interaction effects weighting, such as for cohort 9691.

Children 3+ census cohorts table

Children			
Cohort	Non-biased linkages before weighting	Non-biased linkages after weighting	Increase in non-biased linkages	Method Used
060196	69.1%	79.3%	10.2%	Arithmetic mean
019691	72.1%	75.6%	3.5%	Geometric mean
969186	68.3%	75.8%	7.5%	Geometric mean
918681	72.6%	72.2%	~0%	

We can see that we have improvement across the remaining four children cohorts, with the exception of cohort 918681, ranging from about 4% to 10%. The non-biased linkages before the weighting range from 68% to 73%, and after weighting we can see they improve to about 72% to 79%. We can also see that although geometric mean weighting usually give a better result, there are occasions when the arithmetic mean weighting give better results, such as in the case of the cohort 060196.

Note:
There are no results for children beyond these cohorts due to the longitudinal nature of the NZLC. To be in a four census cohort, the individual had to be at least 15 years old in the earliest census, and due to a child being defined as a 0–15 year old in the census, by definition there cannot be children beyond the 3 cohort censuses.

4.0 Discussion & Conclusions

Across cohorts, 40–76% of correlations were unbiased in unweighted analyses. Weighting increased the number of unbiased correlations by 3 to 25 percentage points, and the weighted-interaction correlations tended to be less biased than the weighted-main correlations. For adults we can see that we have improvements ranging from about 4 to 25 percentage points. For children we can see that we have improvements ranging from about 4 to 19 percentage points, with the exception of one cohort.

While we cannot eliminate bias from the census, we can significantly reduce it. The project has successfully found ways to significantly reduce bias across all cohorts, and thus has achieved its intended goal. However there are still a few things left that could potentially improve the current results. Firstly, new variables have been created that we could include in the correlation matrix to create better weights to use, reducing the bias further. The second thing that could be done is to use the weights obtained in the interaction and main effects logistic regression model to get better results in the later census cohorts.

For cohorts with 3+ Censuses, we tried a number of analysis methods, but found using the two census cohort weights we had obtained in the previous logistic regressions to estimate weights for three census and above cohorts worked very well, bypassing the need to use the logistic model for further cohorts
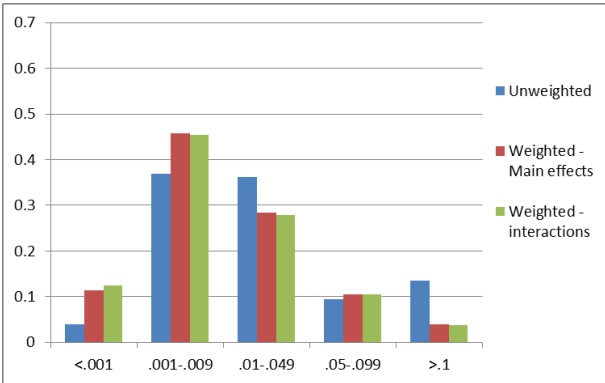
5.0 References

Statistics New Zealand (2013). Linking Censuses: New Zealand Longitudinal Census 1981–2006. Available from www.stats.govt.nz.
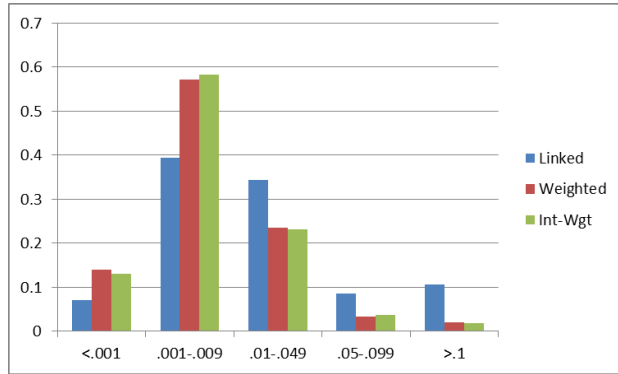
Appendices

1. Graphs of proportion of correlations with different magnitudes of bias using different weighting methods (all cohorts)
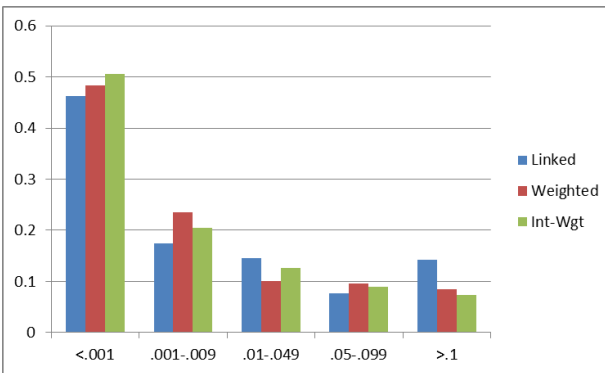
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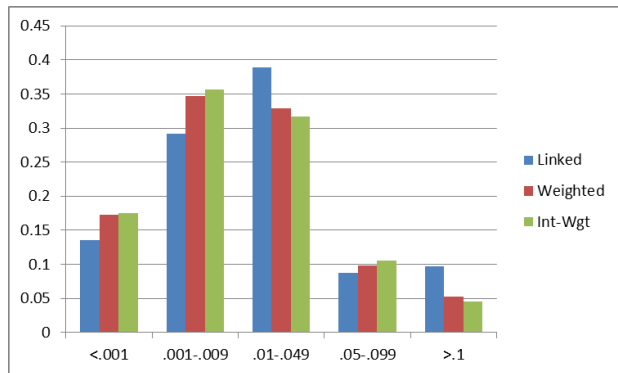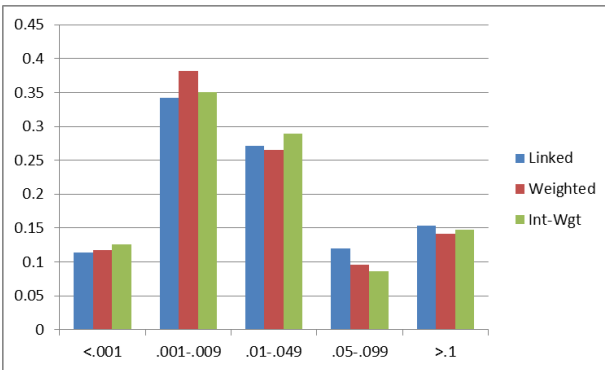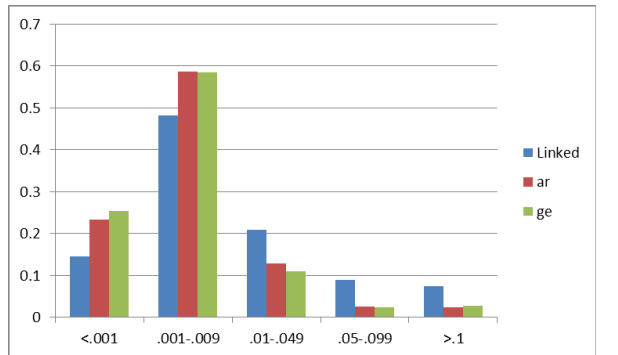

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9691

9186
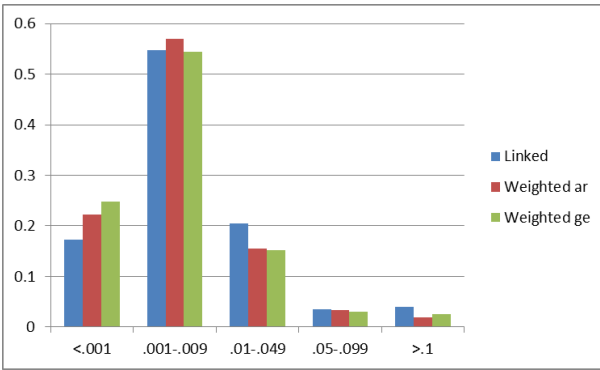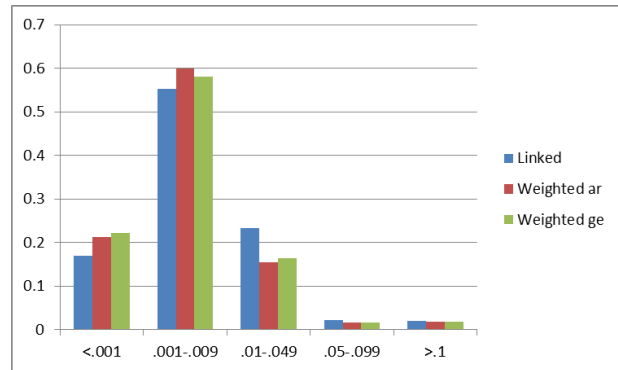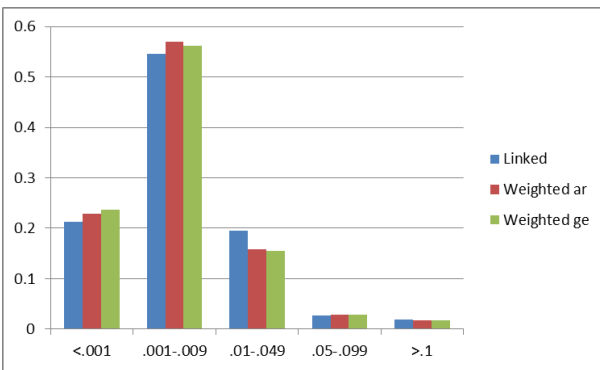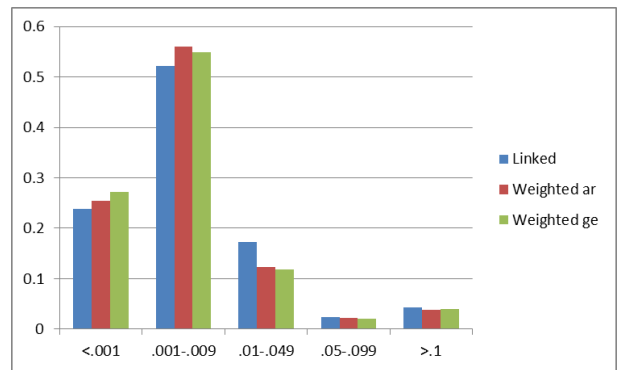

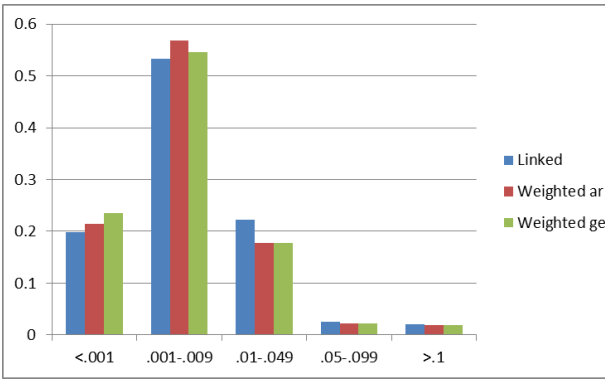8681

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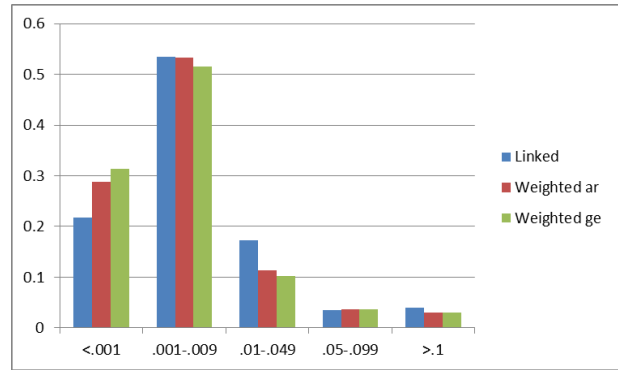
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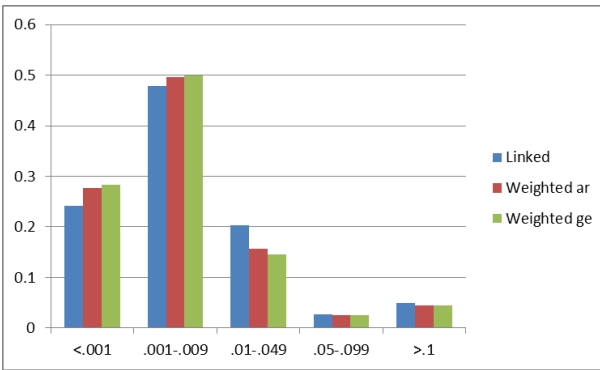
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918681

06019691

01969186

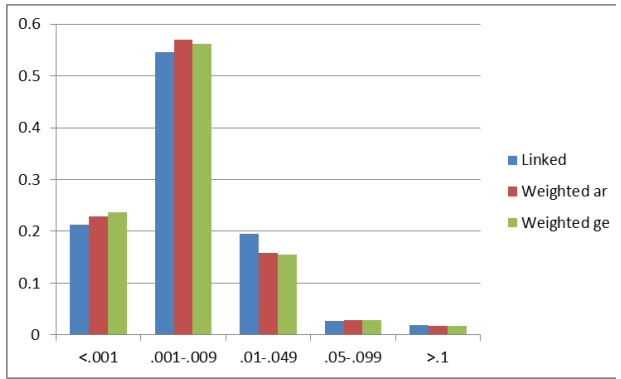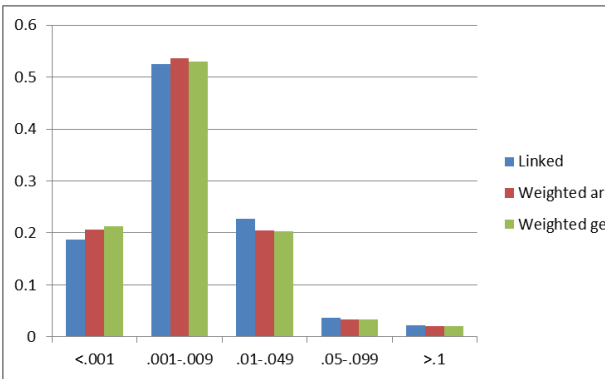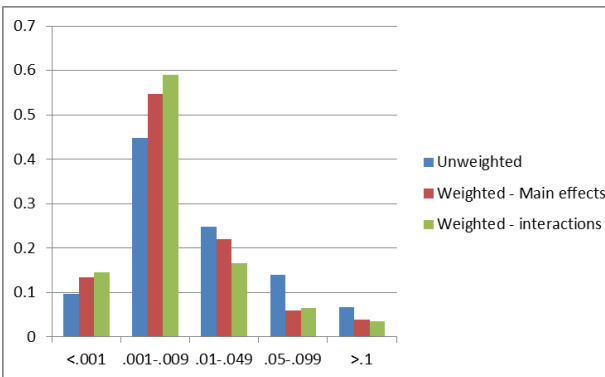## 96918681

0601969186

0196918681

0601969186

Children

0601

0196
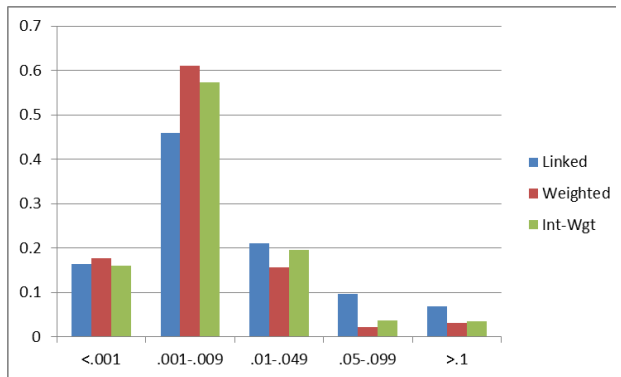
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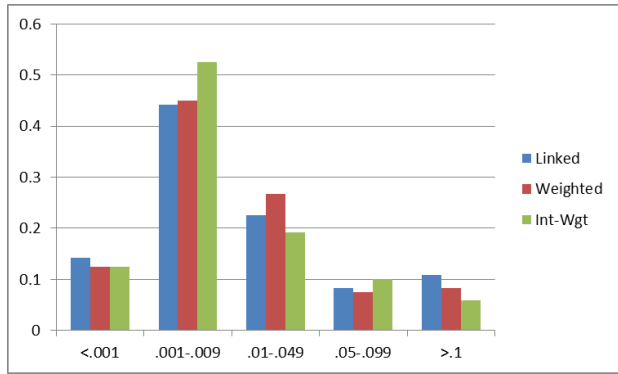
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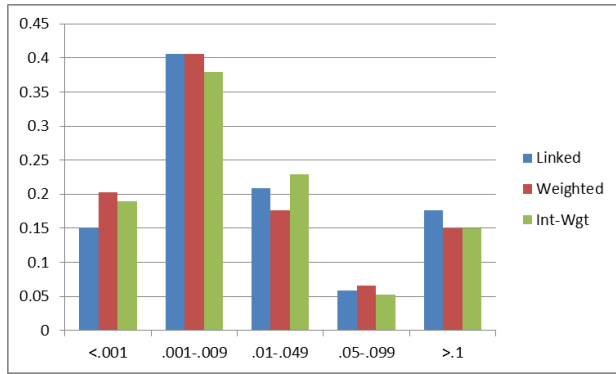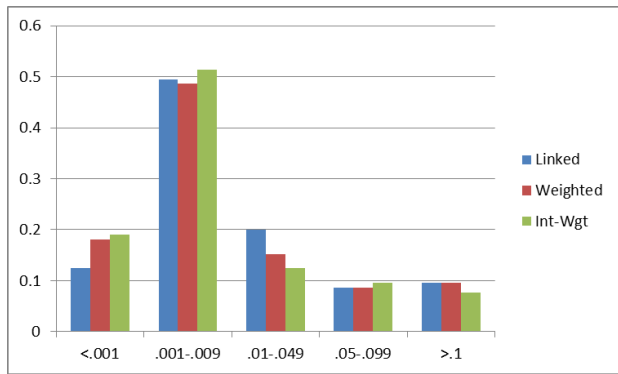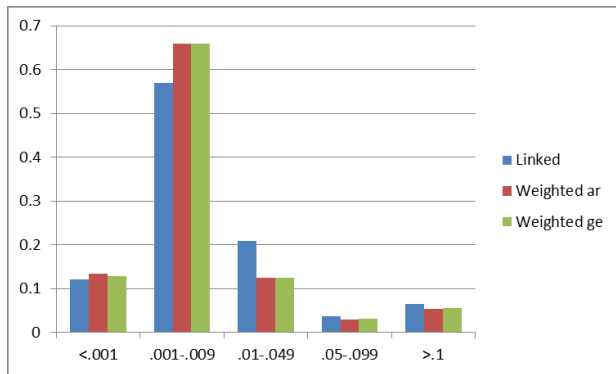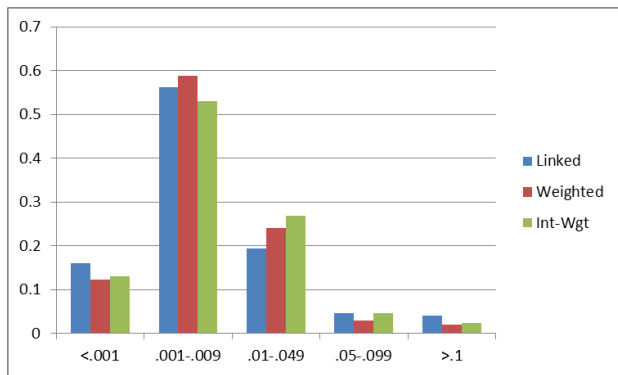
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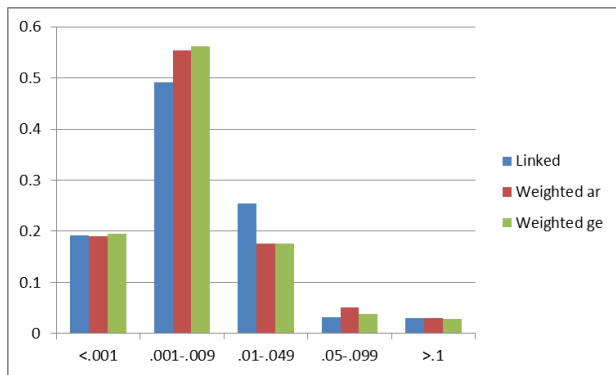
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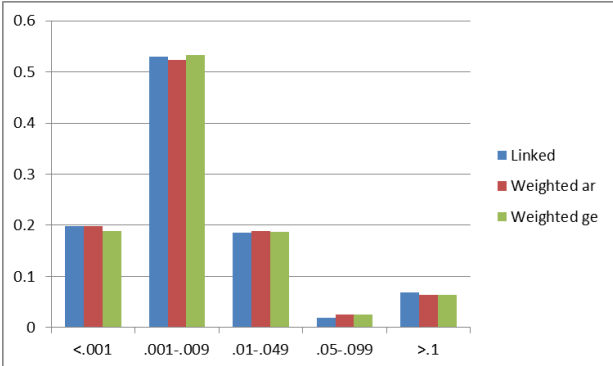
2. Sample SAS Code: Cohort 060196

```sas
libname vera '\\wprdfs08\RO-MAA2013-18 Linkage Bias Longitudinal Census';
libname ver2 '\\wprdfs08\DataLab-MA\MAA2013-18 Linkage Bias Longitudinal
Census\Vera\Updated data dec 2013';
libname vernzdep '\\wprdfs08\RO-MAA2013-18 Linkage Bias Longitudinal
Census\Updated data dec 2013';
libname created '\\wprdfs08\DataLab-MA\MAA2013-18 Linkage Bias Longitudinal
Census\Vera\Created data sets';

data wgt060196 (keep = ID linkind0601 linkind0196 wgt0601 wgt0196
wgt060196_armean wgt060196_gemean) ;
set ver2.wgtfull;
wgt060196_armean = (wgt0601+wgt0196)/2;
if ~(linkind0601=1 and linkind0196=1) then wgt060196_armean = .;
wgt060196_gemean = (wgt0601*wgt0196)**(.5);
if ~(linkind0601=1 and linkind0196=1) then wgt060196_gemean = .;
if linkind0601 ~=.;
run;

proc means data= wgt060196;
var wgt060196_armean wgt060196_gemean linkind0601;
run;

proc corr data= wgt060196;
var wgt060196_armean wgt060196_gemean;
run;

data aa;
set ver2.individual_linkind0601_2006;
run;

data datasex (keep=ID sex);
set ver2.spine_dataset;
run;

data dataeth (keep=ID eur06_06 Mao06_06 Pac06_06 Asian06_06 MELAA06_06
Other06_06 EthNS06);
set ver2.ethnicity_info;
run;

data datanzdep (keep=MB06 nzdep2006);
set vernzdep.nzdep2006_mb06;
nzdep2006=nzdep2006_mb06;
if nzdep2006=. then nzdep2006=99;
run;

data datamb (keep=id mb06); *adding this new dataset to the work library;
set ver2.geogr_linkspine_0601;
mb06=URSmb06_06;
run;

proc sort data=datamb;
by mb06;
run;
```

```
proc sort data=datanzdep;
by mb06;
run;

data data_mb_nzdep; *merging to form a dataset with ID mb06 nzdep2006;
merge datamb datanzdep;
by mb06;
run;

proc sort data=data_mb_nzdep;
by ID;
run;

data data2_mb_nzdep; *removing those meshblocks which no IDs live in;
set data_mb_nzdep;
if id ~=.;
run;

proc sort data=aa;
by ID;
run;

proc sort data=datasex;
by ID;
run;

proc sort data=dataeth;
by ID;
run;

proc sort data=data2_mb_nzdep;
by ID;
run;

data aa2; *merging all datasets together;
merge aa datasex dataeth data2_mb_nzdep;
by ID;
run;

data aa3; *reducing dataset down to those that exist in 2006;
set aa2;
if Linkind0601~=.;
run;

data aa4;
set aa3;
age06=input(age_code_06,f4.0);
if 5<=age06<=9 then age06=1;
if 10<=age06<=14 then age06=2;
if 15<=age06<=19 then age06=3;
if 20<=age06<=24 then age06=4;
if 25<=age06<=29 then age06=5;
if 30<=age06<=34 then age06=6;
if 35<=age06<=39 then age06=7;
if 40<=age06<=44 then age06=8;
if 45<=age06<=49 then age06=9;
if 50<=age06<=54 then age06=10;
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```
if 55<=age06<=59 then age06=11;
if 60<=age06<=64 then age06=12;
if 65<=age06<=69 then age06=13;
if 70<=age06<=74 then age06=14;
if 75<=age06<=79 then age06=15;
if 80<=age06<=84 then age06=16;
if 85<=age06<=120 then age06=17;
adult06=0;
if individual_rec_type_code_06='3' then adult06=1;
yrs_at_addr06=input(years_at_addr_code_06,F4.0);
if 1<=yrs_at_addr06<=5 then yrs_at_addr06=1;
if 6<=yrs_at_addr06<=10 then yrs_at_addr06=2;
if 11<=yrs_at_addr06<=20 then yrs_at_addr06=3;
if 21<=yrs_at_addr06<=98 then yrs_at_addr06=4;
if yrs_at_addr06 in(777,999) then yrs_at_addr06=9;
same_addr_5yrs_ago06=input(addr_5years_ago_code_06,f4.0);
if same_addr_5yrs_ago06=2 then same_addr_5yrs_ago06=0;
if same_addr_5yrs_ago06 in (5,99) then same_addr_5yrs_ago06=9;
NZ_born06=0;
if birth_country_code_06='1201' then NZ_born06=1;
if birth_country_code_06='9999' then NZ_born06=9;
yrs_in_NZ06=input(years_in_NZ_code_06,f4.0);
if 0<=yrs_in_NZ06<=9 then yrs_in_NZ06=1;
if 10<=yrs_in_NZ06<=19 then yrs_in_NZ06=2;
if 20<=yrs_in_NZ06<=97 then yrs_in_NZ06=3;
if yrs_in_NZ06=888 then yrs_in_NZ06=4;
if yrs_in_NZ06 in (777,999) then yrs_in_NZ06=9;
offic_lang_dummy=input(official_language_code_06,f4.0);
if offic_lang_dummy in (2,5) then language_indicator06=1;
if offic_lang_dummy in (1,3,4,6) then language_indicator06=2;
if offic_lang_dummy in (7,8) then language_indicator06=3;
if offic_lang_dummy in (97,98,99) then language_indicator06=9;
Language_count06=input(languages_count_code_06,f4.0);
if 3<=Language_count06<=6 then Language_count06=3;
if 7<=Language_count06<=9 then Language_count06=9;
maori_descent06= input(recode_maori_descent_code_06, f4.0);
if maori_descent06=2 then maori_descent06=0;
if maori_descent06 in (4,7,9) then maori_descent06=9;
iwi_ind06=input(iwi_ind_code_06,f4.0);
if iwi_ind06=2 then iwi_ind06=0;
if iwi_ind06=7 then iwi_ind06=9;
iwi_count06=input(iwi_count_code_06,f4.0);
if 3<=iwi_count06<=5 then iwi_count06=3;
if iwi_count06 in (9) then iwi_count06=0;
if iwi_count06 in (7,8) then iwi_count06=9;
*Created the variable so that if not maori, then iwi_count=0;
religious06=1;
if religion1_code_06='00000' then religious06=0;
if religion1_code_06 in ('94444','95555','97777','98888','99999')
then religious06=9;
live_with_parents06=0;
if living_arrangement6_code_06='0411' then live_with_parents06=1;
live_with_partner06=0;
if living_arrangement1_code_06='0211' then live_with_partner06=1;
if living_arrangement2_code_06='0211' then live_with_partner06=1;
if living_arrangement3_code_06='0212' then live_with_partner06=1;
if living_arrangement4_code_06='0211' then live_with_partner06=1;
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```
if living_arrangement5_code_06='0212' then live_with_partner06=1;
live_with_siblings06=0;
if living_arrangement8_code_06='0511' then live_with_siblings06=1;
live_with_children06=0;
if living_arrangement7_code_06='0311' then live_with_children06=1;
live_alone06=0;
if living_arrangement11_code_06='0111' then live_alone06=1;
live_with_flatmates06=0;
if living_arrangement9_code_06='0611' then live_with_flatmates06=1;
live_with_other06=0;
if living_arrangement10_code_06='7777' then live_with_other06=1;
difficulty_acty_count06=0;
if difficulty_acty1_code_06='1' then difficulty_acty_count06=
difficulty_acty_count06+1;
if difficulty_acty2_code_06='2' then difficulty_acty_count06=
difficulty_acty_count06+1;
if difficulty_acty3_code_06='3' then difficulty_acty_count06=
difficulty_acty_count06+1;
if difficulty_acty4_code='4' then difficulty_acty_count06=
difficulty_acty_count06+1;
if difficulty_acty_count in (4,0) then difficulty_acty_count06=9;
if difficulty_acty4_code='4' then difficulty_acty_count06=0;
disability06=0;
if dsblty_code_06='1' then disability06=1;
if dsblty_code_06 in ('7','9') then disability06=9;
disability_ind06=input(dsblty_ind_code_06,f4.0);
if disability_ind06=7 then disability_ind06=9;
smoke06=input(smoking_Status_code_06, f4.0);
if smoke06 in (2,3) then smoke06=0;
if smoke06 in (7,9) then smoke06=9;
own_residence06=input(tenure_holder_code_06,f4.0);
if own_residence06=2 then own_residence06=0;
if own_residence06 in (7,9) then own_residence06=9;
marital_status_legal06=input(legal_marital_status_code_06,f4.0);
if marital_status_legal06 in (2) then marital_status_legal06=0;
if marital_status_legal06 in (1,3) then marital_status_legal06=3;
if marital_status_legal06 in (6) then marital_status_legal06=1;
if marital_status_legal06 in (4,5) then marital_status_legal06=2;
if marital_status_legal06 in (7,9) then marital_status_legal06=9;
children_born06=input(fertility_code_06,f4.0);
if 2<=children_born06<=10 then children_born06=2;
if children_born06 in (55,77,88,99) then children_born06=9;
had_children06=children_born06;
if children_born06=2 then had_children06=1;
highest_qual06=input(highest_qual_code_06, f4.0);
if highest_qual06 in (1,2,3,4) then highest_qual06=1;
if highest_qual06 in (5,6,7,8,9,10) then highest_qual06=2;
if highest_qual06 in (11,12,13,14) then highest_qual06=3;
if highest_qual06 in (97,99) then highest_qual06=9;
income_source_count06=input(income_srce_count_code_06, f4.0);
if 3<=income_source_count06<=10 then income_source_count06=3;
if income_source_count06=99 then income_source_count06=9;
benefit_income06=0;
if income_srce7_code_06='07' then benefit_income06=1;
if income_srce8_code_06='08' then benefit_income06=1;
if income_srce9_code_06='09' then benefit_income06=1;
if income_srce10_code_06='10' then benefit_income06=1;
```

```
if income_srce11_code_06='11' then benefit_income06=1;
if income_srce12_code_06='12' then benefit_income06=1;
if adult06=0 then benefit_income06=.;
ttl_personal_income06=input(total_income_code_06,f4.0);
if ttl_personal_income06 in (1,2) then ttl_personal_income06=0;
if 3<=ttl_personal_income06<=8 then ttl_personal_income06=1;
if 9<=ttl_personal_income06<=14 then ttl_personal_income06=2;
if ttl_personal_income06=99 then ttl_personal_income06=9;
income_support06=input(income_support_count_code_06,f4.0);
if 1<=income_support06<=6 then income_support06=1;
hrs_work_mainjob06=input(work_hrs1_code_06,f4.0);
if 1<=hrs_work_mainjob06<=29 then hrs_work_mainjob06=1;
if 30<=hrs_work_mainjob06<=49 then hrs_work_mainjob06=2;
if 50<=hrs_work_mainjob06<=168 then hrs_work_mainjob06=3;
if hrs_work_mainjob06 in (777) then hrs_work_mainjob06=9;
if hrs_work_mainjob06=999 then hrs_work_mainjob06=0;
if wklfs_code_06='3' then work_labour_force_status06=0;
if wklfs_code_06='4' then work_labour_force_status06=1;
if wklfs_code_06='1' then work_labour_force_status06=2;
if wklfs_code_06='2' then work_labour_force_status06=3;
if wklfs_code_06='9' then work_labour_force_status06=9;
travel_work06=input(travel_work_code_06,f4.0);
if travel_work06 in (1,2) then travel_work06=0;
if travel_work06 in (3,4,5,8) then travel_work06=1;
if travel_work06 in (6,7) then travel_work06=2;
if travel_work06 in (9,10) then travel_work06=3;
if travel_work06 in (15,77,99) then travel_work06=9;
unpaid_acty_count06=0;
if unpaid_acty1_code_06='01' then unpaid_acty_count06=unpaid_acty_count06+1;
if unpaid_acty2_code_06='02' then unpaid_acty_count06=unpaid_acty_count06+1;
if unpaid_acty3_code_06='03' then unpaid_acty_count06=unpaid_acty_count06+1;
if unpaid_acty4_code_06='04' then unpaid_acty_count06=unpaid_acty_count06+1;
if unpaid_acty5_code_06='05' then unpaid_acty_count06=unpaid_acty_count06+1;
if unpaid_acty6_code_06='06' then unpaid_acty_count06=unpaid_acty_count06+1;
if unpaid_acty_count06=0 then unpaid_acty_count06=9;
if unpaid_acty7_code_06='00' then unpaid_acty_count06=0;
if adult06=0 then unpaid_acty_count06=.;
if unpaid_acty_count06 in (3,4,5,6) then unpaid_acty_count06=3;
sex_female06=0;
if sex='2' then sex_female06=1;
Eur06=input(Eur06_06,f4.0);
if Eur06=. then Eur06=0;
Mao06=input(Mao06_06,f4.0);
if Mao06=. then mao06=0;
Pac06=input(Pac06_06,f4.0);
if Pac06=. then Pac06=0;
Asian06=input(Asian06_06,f4.0);
if Asian06=. then Asian06=0;
MELAA06=input(MELAA06_06,f4.0);
if MELAA06=. then MELAA06=0;
Other06=input(Other06_06,f4.0);
if Other06=. then Other06=0;
EthNS2006=input(ethNS06,f4.0);
if EthNS2006=. then EthNS2006=0;
if 100000 < occupation2006_code_06 < 200000 then oc06 = 1;
if 200000 < occupation2006_code_06 < 300000 then oc06 = 2;
if 300000 < occupation2006_code_06 < 400000 then oc06 = 3;
```

```sas
    if 400000 < occupation2006_code_06 < 500000 then oc06 = 4;
    if 500000 < occupation2006_code_06 < 600000 then oc06 = 5;
    if 600000 < occupation2006_code_06 < 700000 then oc06 = 6;
    if 700000 < occupation2006_code_06 < 800000 then oc06 = 7;
    if 800000 < occupation2006_code_06 < 900000 then oc06 = 8;
    if 900000 < occupation2006_code_06 < 1000000 then oc06 = 9;
run;

proc freq data=aa4;
table unpaid_acty1_code_06 unpaid_acty2_code_06 unpaid_acty3_code_06
unpaid_acty4_code_06 unpaid_acty5_code_06 unpaid_acty6_code_06
unpaid_acty7_code_06 unpaid_acty_count06;
run;

proc contents data=aa3;
run;

*reducing to just those variables constructed plus age and yearsinnz;
data aa5 (keep= ID linkind0601 age06 adult06 yrs_at_addr06
same_addr_5yrs_ago06 NZ_born06 yrs_in_NZ06 language_indicator06
Language_count06 maori_descent06 iwi_ind06 iwi_count06 religious06
live_with_parents06 live_with_partner06 live_with_siblings06
live_with_children06 live_alone06 live_with_flatmates06 live_with_other06
difficulty_acty_count06 disability06 disability_ind06 smoke06 own_residence06
marital_status_legal06 children_born06 had_children06 highest_qual06
income_source_count06 benefit_income06 ttl_personal_income06 income_support06
hrs_work_mainjob06 work_labour_force_status06 travel_work06
unpaid_acty_count06 sex_female06 eur06 Mao06 Pac06 Asian06 MELAA06 Other06
EthNS2006 nzdep2006 oc06 age_code_06 years_in_NZ_code_06);
set aa4;
run;

proc freq data=aa5;
tables unpaid_acty_count06;
run;

/* 2001*/
data a;
set ver2.individual_linkind0196_2001;
run;

data datasex (keep=ID sex);
set ver2.spine_dataset;
run;

data dataeth (keep=ID eur06_01 Mao06_01 Pac06_01 Asian06_01 MELAA06_01
Other06_01 EthNS01);
set ver2.ethnicity_info;
run;

data datanzdep (keep= MB06 nzdep2001);
set vernzdep.nzdep2001_mb01_mb06;
nzdep2001=nzdep2001_mb01;
if nzdep2001=. then nzdep2001=99;
run;
```

```
data datamb (keep=id mb06);*creating new data set in work library;
set ver2.geogr_linkspine_0196;
mb06=URSmb06_01;
run;

proc sort data=datamb;
by mb06;
run;

proc sort data=datanzdep;
by mb06;
run;

data data_mb_nzdep; *merging to form a dataset with ID mb06 nzdep2001;
merge datamb datanzdep;
by mb06;
run;

proc sort data=data_mb_nzdep;
by id;
run;

data data2_mb_nzdep; *removing those meshblocks which no IDs live in;
set data_mb_nzdep;
if id ~=.;
run;

proc sort data=data2_mb_nzdep;
by nzdep2001;
run;

data data3_mb_nzdep;
set data2_mb_nzdep;
if nzdep2001=. then nzdep2001=99; *recoding IDs with no identified nzdep as 99;
run;

proc sort data=a;
by ID;
run;

proc sort data=datasex;
by ID;
run;

proc sort data=dataeth;
by ID;
run;

proc sort data=data3_mb_nzdep;
by ID;
run;

data a2;
merge a datasex dataeth data3_mb_nzdep;
by ID;
run;
```

```
data a3; *reducing data set to those IDs only eligible to be linked 0196;
set a2;
if linkind0196~=.;
run;

data a4;
set a3;
adult01=0;
if individual_rec_type_code_01='3' then adult01=1;
yrs_at_addr01=input(years_at_addr_code_01,F4.0);
if 1<=yrs_at_addr01<=5 then yrs_at_addr01=1;
if 6<=yrs_at_addr01<=10 then yrs_at_addr01=2;
if 11<=yrs_at_addr01<=20 then yrs_at_addr01=3;
if 21<=yrs_at_addr01<=98 then yrs_at_addr01=4;
if yrs_at_addr01 in(777,999) then yrs_at_addr01=9;
same_addr_5yrs_ago01=input(addr_5years_ago_code_01,f4.0);
if same_addr_5yrs_ago01=2 then same_addr_5yrs_ago01=0;
if same_addr_5yrs_ago01=5 then same_addr_5yrs_ago01=9;
age01=input(age_code_01,f4.0);
if 5<=age01<=9 then age01=1;
if 10<=age01<=14 then age01=2;
if 15<=age01<=19 then age01=3;
if 20<=age01<=24 then age01=4;
if 25<=age01<=29 then age01=5;
if 30<=age01<=34 then age01=6;
if 35<=age01<=39 then age01=7;
if 40<=age01<=44 then age01=8;
if 45<=age01<=49 then age01=9;
if 50<=age01<=54 then age01=10;
if 55<=age01<=59 then age01=11;
if 60<=age01<=64 then age01=12;
if 65<=age01<=69 then age01=13;
if 70<=age01<=74 then age01=14;
if 75<=age01<=79 then age01=15;
if 80<=age01<=84 then age01=16;
if 85<=age01<=120 then age01=17;
NZ_born01=0;
if birth_country_code_01='1201' then NZ_born01=1;
if birth_country_code_01='9999' then NZ_born01=9;
yrs_in_NZ01=input(years_in_NZ_code_01,f4.0);
if 0<=yrs_in_NZ01<=9 then yrs_in_NZ01=1;
if 10<=yrs_in_NZ01<=19 then yrs_in_NZ01=2;
if 20<=yrs_in_NZ01<=97 then yrs_in_NZ01=3;
if yrs_in_NZ01=999 then yrs_in_NZ01=4; *lived here forever (i.e. not stated);
if yrs_in_NZ01=777 then yrs_in_NZ01=9;
offic_lang_dummy=input(official_language_code_01,f4.0);
if offic_lang_dummy in (2,5) then language_indicator01=1;
if offic_lang_dummy in (1,3,4,6) then language_indicator01=2;
if offic_lang_dummy in (7,8) then language_indicator01=3;
if offic_lang_dummy in (97,98,99) then language_indicator01=9;
Language_count01=input(languages_count_code_01,f4.0);
if 3<=Language_count01<=6 then Language_count01=3;
if 7<=Language_count01<=9 then Language_count01=9;
religious01=1;
if religion1_code_01='00000' then religious01=0;
if religion1_code_01 in ('94444','95555','97777','98888','99999')
then religious01=9;
```

```sas
difficulty_acty_count01=0;
if difficulty_acty1_code_01='1' then difficulty_acty_count01=
difficulty_acty_count01+1;
if difficulty_acty2_code_01='2' then difficulty_acty_count01=
difficulty_acty_count01+1;
if difficulty_acty3_code_01='3' then difficulty_acty_count01=
difficulty_acty_count01+1;
if difficulty_acty4_code_01='4' then difficulty_acty_count01=
difficulty_acty_count01+1;
if difficulty_acty_count01 in (4,0) then difficulty_acty_count01=9;
if difficulty_acty4_code_01='4' then difficulty_acty_count01=0;
disability01=0;
if dsblty_code_01='1' then disability01=1;
if dsblty_code_01 in ('7','9') then disability01=9;
disability_ind01=input(dsblty_ind_code_01,f4.0);
maori_descent01= input(maori_descent_code_01, f4.0);
if maori_descent01=2 then maori_descent01=0;
if maori_descent01 in (3,4,5,6,7,9) then maori_descent01=9;
iwi_ind01=input(iwi_ind_code_01,f4.0);
if iwi_ind01=2 then iwi_ind01=0;
if iwi_ind01=7 then iwi_ind01=9;
iwi_count01=input(iwi_count_code_01,f4.0);
if 3<=iwi_count01<=5 then iwi_count01=3;
if iwi_count01 in (9) then iwi_count01=0;
if iwi_count01 in (7,8) then iwi_count01=9;
live_with_partner01=0;
if living_arrangement1_code_01='0211' then live_with_partner01=1;
if living_arrangement2_code_01='0211' then live_with_partner01=1;
live_with_children01=0;
if living_arrangement3_code_01='0311' then live_with_children01=1;
live_with_parents01=0;
if living_arrangement4_code_01='0411' then live_with_parents01=1;
live_with_siblings01=0;
if living_arrangement5_code_01='0511' then live_with_siblings01=1;
live_with_flatmates01=0;
if living_arrangement6_code_01='0611' then live_with_flatmates01=1;
live_with_other01=0;
if living_arrangement7_code_01='7777' then live_with_other01=1;
live_alone01=0;
if living_arrangement8_code_01='0111' then live_alone01=1;
marital_status_legal01=input(legal_marital_status_code_01,f4.0);
if marital_status_legal01 in (21) then marital_status_legal01=0;
if marital_status_legal01 in (33) then marital_status_legal01=1;
if marital_status_legal01 in (31,32) then marital_status_legal01=2;
if marital_status_legal01 in (11) then marital_status_legal01=3;
if marital_status_legal01 in (77,99) then marital_status_legal01=9;
currently_married=0;
if adult01=0 then currently_married=.;
if legal_marital_status_code_01='21' then currently_married=1;
if legal_marital_status_code_01 in ('77','99') then currently_married=9;
currently_separated=0;
if adult01=0 then currently_separated=.;
if legal_marital_status_code_01 in ('31','32') then currently_separated=1;
if legal_marital_status_code_01 in ('77','99') then currently_separated=9;
never_married=0;
if adult01=0 then never_married=.;
if legal_marital_status_code_01 in ('11') then never_married=1;
```

```
if legal_marital_status_code_01 in ('77','99') then never_married=9;
income_source_count01=input(income_srce_count_code_01, f4.0);
if 3<=income_source_count01<=10 then income_source_count01=3;
if income_source_count01=99 then income_source_count01=9;
income_support01=input(income_support_count_code_01,f4.0);
if 1<=income_support01<=6 then income_support01=1;
benefit_income01=0;
if income_srce7_individual_code_01='07' then benefit_income01=1;
if income_srce8_individual_code_01='08' then benefit_income01=1;
if income_srce9_individual_code_01='09' then benefit_income01=1;
if income_srce10_individual_code_01='10' then benefit_income01=1;
if income_srce11_individual_code_01='11' then benefit_income01=1;
if income_srce12_individual_code_01='12' then benefit_income01=1;
if adult01=0 then benefit_income01=.;
ttl_personal_income01=input(total_income_individual_code_01,f4.0);
if ttl_personal_income01 in (1,2) then ttl_personal_income01=0;
if 3<=ttl_personal_income01<=6 then ttl_personal_income01=1;
if 6<=ttl_personal_income01<=13 then ttl_personal_income01=2;
if ttl_personal_income01=99 then ttl_personal_income01=9;
own_residence01=input(tenure_holder_code_01,f4.0);
if own_residence01=2 then own_residence01=0; if own_residence01 in (7,9)
then own_residence01=9;
highest_qual01=input(highest_qual_code_01, f4.0);
if highest_qual01 in (1,2,3,4,5) then highest_qual01=1;
if highest_qual01 in (6,7,8,9) then highest_qual01=2;
if highest_qual01 in (10,11) then highest_qual01=3;
if highest_qual01 in (97,99) then highest_qual01=9;
if wklfs_code_01='3' then work_labour_force_status01=0;
if wklfs_code_01='4' then work_labour_force_status01=1;
if wklfs_code_01='1' then work_labour_force_status01=2;
if wklfs_code_01='2' then work_labour_force_status01=3;
if wklfs_code_01='9' then work_labour_force_status01=9;
work_at_home01=input(workplace_addr_ind_code_01,f4.0);
if work_at_home01=2 then work_at_home01=0;
hrs_work_mainjob01=input(work_hrs1_code_01,f4.0);
if 1<=hrs_work_mainjob01<=29 then hrs_work_mainjob01=1;
if 30<=hrs_work_mainjob01<=49 then hrs_work_mainjob01=2;
if 50<=hrs_work_mainjob01<=168 then hrs_work_mainjob01=3;
if hrs_work_mainjob01 in (777,888) then hrs_work_mainjob01=9;
if hrs_work_mainjob01=999 then hrs_work_mainjob01=0;
travel_work01=input(travel_work_code_01,f4.0);
if travel_work01 in (1,2) then travel_work01=0;
if travel_work01 in (3,4,5,8) then travel_work01=1;
if travel_work01 in (6,7) then travel_work01=2;
if travel_work01 in (9,10) then travel_work01=3;
if travel_work01 in (15,99) then travel_work01=9;
unpaid_acty_count01=input(unpaid_acty_count_code_01,f4.0);
if unpaid_acty_count01 in (3,4,5,6,7,8) then unpaid_acty_count01=3;
if unpaid_acty_count01=99 then unpaid_acty_count01=9;
sex_female01=0;
if sex='2' then sex_female01=1;
Eur01=input(Eur06_01,f4.0);
if Eur01=. then Eur01=0;
Mao01=input(Mao06_01,f4.0);
if Mao01=. then mao01=0;
Pac01=input(Pac06_01,f4.0);
if Pac01=. then Pac01=0;
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```
Asian01=input(Asian06_01,f4.0);
if Asian01=. then Asian01=0;
MELAA01=input(MELAA06_01,f4.0);
if MELAA01=. then MELAA01=0;
Other01=input(Other06_01,f4.0);
if Other01=. then Other01=0;
EthNS2001=input(ethNS01,f4.0);
if EthNS2001=. then EthNS2001=0;
if 10000 < occupation99_code_01 < 20000 then oc01 = 1;
if 20000 < occupation99_code_01 < 30000 then oc01 = 2;
if 30000 < occupation99_code_01 < 40000 then oc01 = 3;
if 40000 < occupation99_code_01 < 50000 then oc01 = 4;
if 50000 < occupation99_code_01 < 60000 then oc01 = 5;
if 60000 < occupation99_code_01 < 70000 then oc01 = 6;
if 70000 < occupation99_code_01 < 80000 then oc01 = 7;
if 80000 < occupation99_code_01 < 90000 then oc01 = 8;
if 90000 < occupation99_code_01 < 92000 then oc01 = 9;
if 92000 < occupation99_code_01 < 100000 then oc01 = 99;
run;

data a5 (keep= ID linkind0196 age01 adult01 yrs_at_addr01
same_addr_5yrs_ago01 NZ_born01 yrs_in_NZ01 language_indicator01
Language_count01 maori_descent01 iwi_ind01 iwi_count01 religious01
live_with_parents01 live_with_partner01 live_with_siblings01
live_with_children01 live_alone01 live_with_flatmates01 live_with_other01
difficulty_acty_count01 disability01 disability_ind01 own_residence01
marital_status_legal01 highest_qual01 income_source_count01 benefit_income01
ttl_personal_income01 income_support01 hrs_work_mainjob01
work_labour_force_status01 travel_work01 unpaid_acty_count01 sex_female01
eur01 Mao01 Pac01 Asian01 MELAA01 Other01 EthNS2001 nzdep2001 oc01
age_code_01 years_in_NZ_code_01);
set a4;
run;

proc sort data=aa5;
by ID;
run;

proc sort data=a5;
by ID;
run;

data a;
merge aa5 a5;
by ID;
run;

data b;
set a;
if linkind0601 ne .;
if age06>=2;
if (yrs_in_NZ06~=1 | linkind0196~=.);
run;

proc sort data=b;
by ID;
run;
```

```
proc sort data=wgt060196;
by ID;
run;

data mergedwgt060196;
merge b wgt060196;
by ID;
run;

data bb;
set mergedwgt060196;
if age06 ne "";
linkind060196=0;
if (linkind0601=1 and linkind0196=1) then linkind060196=1;
run;

proc means data=bb;
var linkind060196 wgt060196_armean wgt060196_gemean;
run;

*previously done with **1.85;
data cc;
set bb;
wgt060196_armean_scaled = wgt060196_armean+.4697;
wgt060196_gemean_scaled = wgt060196_gemean+.4817;
if wgt060196_armean_scaled>20 then wgt060196_armean_scaled = 20;
if wgt060196_gemean_scaled>20 then wgt060196_gemean_scaled = 20;
run;

proc means data=cc;
var linkind060196 wgt060196_armean wgt060196_gemean wgt060196_armean_scaled
wgt060196_gemean_scaled;
run;

data adultcc;
set cc;
if adult06=1;
run;

data childcc (keep= ID linkind0601 linkind060196 wgt060196_armean
wgt060196_gemean age06 adult06 yrs_at_addr06 same_addr_5yrs_ago06 NZ_born06
yrs_in_NZ06 language_indicator06 Language_count06 maori_descent06 iwi_ind06
iwi_count06 religious06 live_with_parents06 live_with_partner06
live_with_siblings06 live_with_children06 live_alone06 live_with_flatmates06
live_with_other06 difficulty_acty_count06 disability06 disability_ind06
sex_female06 eur06 Mao06 Pac06 Asian06 MELAA06 Other06 EthNS2006 nzdep2006
linkind0196 age01 yrs_at_addr01 same_addr_5yrs_ago01 NZ_born01 yrs_in_NZ01
language_indicator01 Language_count01 maori_descent01 iwi_ind01 iwi_count01
religious01 live_with_parents01 live_with_partner01 live_with_siblings01
live_with_children01 live_alone01 live_with_flatmates01 live_with_other01
difficulty_acty_count01 disability01 disability_ind01 sex_female01 eur01
Mao01 Pac01 Asian01 MELAA01 Other01 EthNS2001 nzdep2001);
set cc;
if adult06=0;
run;
```

```
data adultdd;
set adultcc;
r=ranuni(1018);
test=0;
if r>.7 then test=1;
run;

data childdd;
set childcc; r=ranuni(1810);test=0;
if r>.7 then test=1;
run;

proc freq data = adultdd;
table test linkind060196 test*linkind060196;
run;

proc freq data = childddd;
table test linkind060196 test*linkind060196;
run;

proc corr data=adultdd (where=(test=1)) noprob;
var age06 yrs_at_addr06 same_addr_5yrs_ago06 NZ_born06 yrs_in_NZ06
language_indicator06 Language_count06 maori_descent06 iwi_ind06 iwi_count06
religious06 live_with_parents06 live_with_partner06 live_with_siblings06
live_with_children06 live_alone06 live_with_flatmates06 live_with_other06
difficulty_acty_count06 disability06 disability_ind06 smoke06 own_residence06
marital_status_legal06 children_born06 had_children06 highest_qual06
income_source_count06 benefit_income06 ttl_personal_income06 income_support06
hrs_work_mainjob06 work_labour_force_status06 travel_work06
unpaid_acty_count06 sex_female06 eur06 Mao06 Pac06 Asian06 MELAA06 Other06
EthNS2006 nzdep2006 oc06 age01 yrs_at_addr01 same_addr_5yrs_ago01 NZ_born01
yrs_in_NZ01 language_indicator01 Language_count01 maori_descent01 iwi_ind01
iwi_count01 religious01 live_with_parents01 live_with_partner01
live_with_siblings01 live_with_children01 live_alone01 live_with_flatmates01
live_with_other01 difficulty_acty_count01 disability01 disability_ind01
own_residence01 marital_status_legal01 highest_qual01 income_source_count01
benefit_income01 ttl_personal_income01 income_support01 hrs_work_mainjob01
work_labour_force_status01 travel_work01 unpaid_acty_count01 sex_female01
eur01 Mao01 Pac01 Asian01 MELAA01 Other01 EthNS2001 nzdep2001 oc01;
run;

proc corr data=adultdd (where=(test=1 & linkind060196=1)) noprob;
var age06 yrs_at_addr06 same_addr_5yrs_ago06 NZ_born06 yrs_in_NZ06
language_indicator06 Language_count06 maori_descent06 iwi_ind06 iwi_count06
religious06 live_with_parents06 live_with_partner06 live_with_siblings06
live_with_children06 live_alone06 live_with_flatmates06 live_with_other06
difficulty_acty_count06 disability06 disability_ind06 smoke06 own_residence06
marital_status_legal06 children_born06 had_children06 highest_qual06
income_source_count06 benefit_income06 ttl_personal_income06 income_support06
hrs_work_mainjob06 work_labour_force_status06 travel_work06
unpaid_acty_count06 sex_female06 eur06 Mao06 Pac06 Asian06 MELAA06 Other06
EthNS2006 nzdep2006 oc06 age01 yrs_at_addr01 same_addr_5yrs_ago01 NZ_born01
yrs_in_NZ01 language_indicator01 Language_count01 maori_descent01 iwi_ind01
iwi_count01 religious01 live_with_parents01 live_with_partner01
live_with_siblings01 live_with_children01 live_alone01 live_with_flatmates01
live_with_other01 difficulty_acty_count01 disability01 disability_ind01
own_residence01 marital_status_legal01 highest_qual01 income_source_count01
```

```
    benefit_income01 ttl_personal_income01 income_support01 hrs_work_mainjob01
    work_labour_force_status01 travel_work01 unpaid_acty_count01 sex_female01
    eur01 Mao01 Pac01 Asian01 MELAA01 Other01 EthNS2001 nzdep2001 oc01;
    run;

    proc corr data=adultdd (where=(test=1 & linkind060196=1)) noprob;
    weight wgt060196_armean;
    var age06 yrs_at_addr06 same_addr_5yrs_ago06 NZ_born06 yrs_in_NZ06
    language_indicator06 Language_count06 maori_descent06 iwi_ind06 iwi_count06
    religious06 live_with_parents06 live_with_partner06 live_with_siblings06
    live_with_children06 live_alone06 live_with_flatmates06 live_with_other06
    difficulty_acty_count06 disability06 disability_ind06 smoke06 own_residence06
    marital_status_legal06 children_born06 had_children06 highest_qual06
    income_source_count06 benefit_income06 ttl_personal_income06 income_support06
    hrs_work_mainjob06 work_labour_force_status06 travel_work06
    unpaid_acty_count06 sex_female06 eur06 Mao06 Pac06 Asian06 MELAA06 Other06
    EthNS2006 nzdep2006 oc06 age01 yrs_at_addr01 same_addr_5yrs_ago01 NZ_born01
    yrs_in_NZ01 language_indicator01 Language_count01 maori_descent01 iwi_ind01
    iwi_count01 religious01 live_with_parents01 live_with_partner01
    live_with_siblings01 live_with_children01 live_alone01 live_with_flatmates01
    live_with_other01 difficulty_acty_count01 disability01 disability_ind01
    own_residence01 marital_status_legal01 highest_qual01 income_source_count01
    benefit_income01 ttl_personal_income01 income_support01 hrs_work_mainjob01
    work_labour_force_status01 travel_work01 unpaid_acty_count01 sex_female01
    eur01 Mao01 Pac01 Asian01 MELAA01 Other01 EthNS2001 nzdep2001 oc01;
    run;

    proc corr data=adultdd (where=(test=1 & linkind060196=1)) noprob;
    weight wgt060196_gemean;
    var age06 yrs_at_addr06 same_addr_5yrs_ago06 NZ_born06 yrs_in_NZ06
    language_indicator06 Language_count06 maori_descent06 iwi_ind06 iwi_count06
    religious06 live_with_parents06 live_with_partner06 live_with_siblings06
    live_with_children06 live_alone06 live_with_flatmates06 live_with_other06
    difficulty_acty_count06 disability06 disability_ind06 smoke06 own_residence06
    marital_status_legal06 children_born06 had_children06 highest_qual06
    income_source_count06 benefit_income06 ttl_personal_income06 income_support06
    hrs_work_mainjob06 work_labour_force_status06 travel_work06
    unpaid_acty_count06 sex_female06 eur06 Mao06 Pac06 Asian06 MELAA06 Other06
    EthNS2006 nzdep2006 oc06 age01 yrs_at_addr01 same_addr_5yrs_ago01 NZ_born01
    yrs_in_NZ01 language_indicator01 Language_count01 maori_descent01 iwi_ind01
    iwi_count01 religious01 live_with_parents01 live_with_partner01
    live_with_siblings01 live_with_children01 live_alone01 live_with_flatmates01
    live_with_other01 difficulty_acty_count01 disability01 disability_ind01
    own_residence01 marital_status_legal01 highest_qual01 income_source_count01
    benefit_income01 ttl_personal_income01 income_support01 hrs_work_mainjob01
    work_labour_force_status01 travel_work01 unpaid_acty_count01 sex_female01
    eur01 Mao01 Pac01 Asian01 MELAA01 Other01 EthNS2001 nzdep2001 oc01;
    run;

    proc corr data=adultdd (where=(test=1 & linkind060196=1)) noprob;
    weight wgt060196_armean_scaled;
    var age06 yrs_at_addr06 same_addr_5yrs_ago06 NZ_born06 yrs_in_NZ06
    language_indicator06 Language_count06 maori_descent06 iwi_ind06 iwi_count06
    religious06 live_with_parents06 live_with_partner06 live_with_siblings06
    live_with_children06 live_alone06 live_with_flatmates06 live_with_other06
    difficulty_acty_count06 disability06 disability_ind06 smoke06 own_residence06
    marital_status_legal06 children_born06 had_children06 highest_qual06
```

```
        income_source_count06 benefit_income06 ttl_personal_income06 income_support06
        hrs_work_mainjob06 work_labour_force_status06 travel_work06
        unpaid_acty_count06 sex_female06 eur06 Mao06 Pac06 Asian06 MELAA06 Other06
        EthNS2006 nzdep2006 oc06 age01 yrs_at_addr01 same_addr_5yrs_ago01 NZ_born01
        yrs_in_NZ01 language_indicator01 Language_count01 maori_descent01 iwi_ind01
        iwi_count01 religious01 live_with_parents01 live_with_partner01
        live_with_siblings01 live_with_children01 live_alone01 live_with_flatmates01
        live_with_other01 difficulty_acty_count01 disability01 disability_ind01
        own_residence01 marital_status_legal01 highest_qual01 income_source_count01
        benefit_income01 ttl_personal_income01 income_support01 hrs_work_mainjob01
        work_labour_force_status01 travel_work01 unpaid_acty_count01 sex_female01
        eur01 Mao01 Pac01 Asian01 MELAA01 Other01 EthNS2001 nzdep2001 oc01;
        run;

        proc corr data=adultdd (where=(test=1 & linkind060196=1)) noprob;
        weight wgt060196_gemean_scaled;
        var age06 yrs_at_addr06 same_addr_5yrs_ago06 NZ_born06 yrs_in_NZ06
        language_indicator06 Language_count06 maori_descent06 iwi_ind06 iwi_count06
        religious06 live_with_parents06 live_with_partner06 live_with_siblings06
        live_with_children06 live_alone06 live_with_flatmates06 live_with_other06
        difficulty_acty_count06 disability06 disability_ind06 smoke06 own_residence06
        marital_status_legal06 children_born06 had_children06 highest_qual06
        income_source_count06 benefit_income06 ttl_personal_income06 income_support06
        hrs_work_mainjob06 work_labour_force_status06 travel_work06
        unpaid_acty_count06 sex_female06 eur06 Mao06 Pac06 Asian06 MELAA06 Other06
        EthNS2006 nzdep2006 oc06 age01 yrs_at_addr01 same_addr_5yrs_ago01 NZ_born01
        yrs_in_NZ01 language_indicator01 Language_count01 maori_descent01 iwi_ind01
        iwi_count01 religious01 live_with_parents01 live_with_partner01
        live_with_siblings01 live_with_children01 live_alone01 live_with_flatmates01
        live_with_other01 difficulty_acty_count01 disability01 disability_ind01
        own_residence01 marital_status_legal01 highest_qual01 income_source_count01
        benefit_income01 ttl_personal_income01 income_support01 hrs_work_mainjob01
        work_labour_force_status01 travel_work01 unpaid_acty_count01 sex_female01
        eur01 Mao01 Pac01 Asian01 MELAA01 Other01 EthNS2001 nzdep2001 oc01;
        run;

        data ver2.wgt060196 (keep= ID linkind0601 linkind0196 linkind060196
        wgt060196_armean wgt060196_gemean wgt060196_armean_scaled
        wgt060196_gemean_scaled);
        set cc;
        run;

        proc corr data=childdd (where=(test=1)) noprob;
        var yrs_at_addr06 same_addr_5yrs_ago06 NZ_born06 yrs_in_NZ06
        language_indicator06 Language_count06 maori_descent06 iwi_ind06 iwi_count06
        religious06 live_with_parents06 live_with_partner06 live_with_siblings06
        live_with_children06 live_alone06 live_with_flatmates06 live_with_other06
        difficulty_acty_count06 disability06 disability_ind06 sex_female06 eur06
        Mao06 Pac06 Asian06 MELAA06 Other06 EthNS2006 nzdep2006 yrs_at_addr01
        same_addr_5yrs_ago01 NZ_born01 yrs_in_NZ01 language_indicator01
        Language_count01 maori_descent01 iwi_ind01 iwi_count01 religious01
        live_with_parents01 live_with_partner01 live_with_siblings01
        live_with_children01 live_alone01 live_with_flatmates01 live_with_other01
        difficulty_acty_count01 disability01 disability_ind01 sex_female01 eur01
        Mao01 Pac01 Asian01 MELAA01 Other01 EthNS2001 nzdep2001;
        run;
```

```sas
proc corr data=childdd (where=(test=1 & linkind060196=1)) noprob;
var yrs_at_addr06 same_addr_5yrs_ago06 NZ_born06 yrs_in_NZ06
language_indicator06 Language_count06 maori_descent06 iwi_ind06 iwi_count06
religious06 live_with_parents06 live_with_partner06 live_with_siblings06
live_with_children06 live_alone06 live_with_flatmates06 live_with_other06
difficulty_acty_count06 disability06 disability_ind06 sex_female06 eur06
Mao06 Pac06 Asian06 MELAA06 Other06 EthNS2006 nzdep2006 yrs_at_addr01
same_addr_5yrs_ago01 NZ_born01 yrs_in_NZ01 language_indicator01
Language_count01 maori_descent01 iwi_ind01 iwi_count01 religious01
live_with_parents01 live_with_partner01 live_with_siblings01
live_with_children01 live_alone01 live_with_flatmates01 live_with_other01
difficulty_acty_count01 disability01 disability_ind01 sex_female01 eur01
Mao01 Pac01 Asian01 MELAA01 Other01 EthNS2001 nzdep2001;
run;

proc corr data=childdd (where=(test=1 & linkind060196=1)) noprob;
weight wgt060196_armean;
var yrs_at_addr06 same_addr_5yrs_ago06 NZ_born06 yrs_in_NZ06
language_indicator06 Language_count06 maori_descent06 iwi_ind06 iwi_count06
religious06 live_with_parents06 live_with_partner06 live_with_siblings06
live_with_children06 live_alone06 live_with_flatmates06 live_with_other06
difficulty_acty_count06 disability06 disability_ind06 sex_female06 eur06
Mao06 Pac06 Asian06 MELAA06 Other06 EthNS2006 nzdep2006 yrs_at_addr01
same_addr_5yrs_ago01 NZ_born01 yrs_in_NZ01 language_indicator01
Language_count01 maori_descent01 iwi_ind01 iwi_count01 religious01
live_with_parents01 live_with_partner01 live_with_siblings01
live_with_children01 live_alone01 live_with_flatmates01 live_with_other01
difficulty_acty_count01 disability01 disability_ind01 sex_female01 eur01
Mao01 Pac01 Asian01 MELAA01 Other01 EthNS2001 nzdep2001;
run;

proc corr data=childdd (where=(test=1 & linkind060196=1)) noprob;
weight wgt060196_gemean;
var yrs_at_addr06 same_addr_5yrs_ago06 NZ_born06 yrs_in_NZ06
language_indicator06 Language_count06 maori_descent06 iwi_ind06 iwi_count06
religious06 live_with_parents06 live_with_partner06 live_with_siblings06
live_with_children06 live_alone06 live_with_flatmates06 live_with_other06
difficulty_acty_count0 disability06 disability_ind06 sex_female06 eur06 Mao06
Pac06 Asian06 MELAA06 Other06 EthNS2006 nzdep2006 yrs_at_addr01
same_addr_5yrs_ago01 NZ_born01 yrs_in_NZ01 language_indicator01
Language_count01 maori_descent01 iwi_ind01 iwi_count01 religious01
live_with_parents01 live_with_partner01 live_with_siblings01
live_with_children01 live_alone01 live_with_flatmates01 live_with_other01
difficulty_acty_count01 disability01 disability_ind01 sex_female01 eur01
Mao01 Pac01 Asian01 MELAA01 Other01 EthNS2001 nzdep2001;
run;

*adults 0601 interactions;
proc surveyselect data= adult3b out=adult10000 n=14500 seed=919191;
run;

data adult10000;
set adult10000;
if test=0;
run;
```

```sas
proc logistic data= adult10000;
class age yrs_at_addr same_addr_5yrs_ago NZ_born yrs_in_NZ language_indicator
Language_count maori_descent iwi_ind iwi_count religious live_with_parents
live_with_partner live_with_siblings live_with_children live_alone
live_with_flatmates live_with_other difficulty_acty_count disability
disability_ind smoke own_residence marital_status_legal children_born
had_children highest_qual income_source_count benefit_income total_income
income_support hrs_work_mainjob work_labour_force_status travel_work
UNPAID_ACTY_COUNT06 sex_female eur06 Mao06 Pac06 Asian06 MELAA06 Other06
EthNS nzdep2006 oc06 /ref=first;
model linkind0601 (event='1') = age yrs_at_addr same_addr_5yrs_ago NZ_born
yrs_in_NZ language_indicator Language_count maori_descent iwi_ind iwi_count
religious live_with_parents live_with_partner live_with_siblings
live_with_children live_alone live_with_flatmates live_with_other
difficulty_acty_count disability disability_ind smoke own_residence
marital_status_legal children_born had_children highest_qual
income_source_count benefit_income total_income income_support
hrs_work_mainjob work_labour_force_status travel_work UNPAID_ACTY_COUNT06
sex_female eur06 Mao06 Pac06 Asian06 MELAA06 Other06 EthNS nzdep2006 oc06
/selection=stepwise slentry=.1 slstay=.05 hierarchy=single;
run;

proc logistic data= adult3b;
class age yrs_at_addr same_addr_5yrs_ago NZ_born yrs_in_NZ language_indicator
Language_count maori_descent iwi_ind iwi_count religious live_with_parents
live_with_partner live_with_siblings live_with_children live_alone
live_with_flatmates live_with_other difficulty_acty_count disability
disability_ind smoke own_residence marital_status_legal children_born
had_children highest_qual income_source_count benefit_income total_income
income_support hrs_work_mainjob work_labour_force_status travel_work
UNPAID_ACTY_COUNT06 sex_female eur06 Mao06 Pac06 Asian06 MELAA06 Other06
EthNS nzdep2006 oc06 /ref=first;
model link0601 (event='1') = age yrs_at_addr same_addr_5yrs_ago NZ_born
yrs_in_NZ language_indicator Language_count maori_descent iwi_ind iwi_count
religious live_with_parents live_with_partner live_with_siblings
live_with_children live_alone live_with_flatmates live_with_other
difficulty_acty_count disability disability_ind smoke own_residence
marital_status_legal children_born had_children highest_qual
income_source_count benefit_income total_income income_support
hrs_work_mainjob work_labour_force_status travel_work UNPAID_ACTY_COUNT06
sex_female eur06 Mao06 Pac06 Asian06 MELAA06 Other06 EthNS nzdep2006 oc06
age*yrs_at_addr age*same_addr_5yrs_ago age*NZ_born age*yrs_in_NZ
age*language_indicator age*live_with_parents age*live_with_children age*smoke
age*own_residence age*marital_status_legal age*highest_qual
age*income_source_count age*benefit_income age*UNPAID_ACTY_COUNT06
age*sex_female age*eur06 age*Mao06 age*Pac06 yrs_at_addr*same_addr_5yrs_ago
yrs_at_addr*NZ_born yrs_at_addr*yrs_in_NZ yrs_at_addr*language_indicator
yrs_at_addr*live_with_parents yrs_at_addr*live_with_children
yrs_at_addr*smoke yrs_at_addr*own_residence yrs_at_addr*marital_status_legal
yrs_at_addr*highest_qual yrs_at_addr*income_source_count
yrs_at_addr*benefit_income yrs_at_addr*UNPAID_ACTY_COUNT06
yrs_at_addr*sex_female yrs_at_addr*eur06 yrs_at_addr*Mao06 yrs_at_addr*Pac06
same_addr_5yrs_ago*NZ_born same_addr_5yrs_ago*yrs_in_NZ
same_addr_5yrs_ago*language_indicator same_addr_5yrs_ago*live_with_parent
same_addr_5yrs_ago*live_with_children same_addr_5yrs_ago*smoke
same_addr_5yrs_ago*own_residence same_addr_5yrs_ago*marital_status_legal
same_addr_5yrs_ago*highest_qual same_addr_5yrs_ago*income_source_count
```

```
    same_addr_5yrs_ago*benefit_income same_addr_5yrs_ago*UNPAID_ACTY_COUNT06
    same_addr_5yrs_ago*sex_female same_addr_5yrs_ago*eur06
    same_addr_5yrs_ago*Mao06 same_addr_5yrs_ago*Pac06 NZ_born*yrs_in_NZ
    NZ_born*language_indicator NZ_born*live_with_parents
    NZ_born*live_with_children NZ_born*smoke NZ_born*own_residence
    NZ_born*marital_status_legal NZ_born*highest_qual NZ_born*income_source_count
    NZ_born*benefit_income  NZ_born*UNPAID_ACTY_COUNT06 NZ_born*sex_female
    NZ_born*eur06 NZ_born*Mao06 NZ_born*Pac06 yrs_in_NZ*language_indicator
    yrs_in_NZ*live_with_parents yrs_in_NZ*live_with_children yrs_in_NZ*smoke
    yrs_in_NZ*own_residence yrs_in_NZ*marital_status_legal yrs_in_NZ*highest_qual
    yrs_in_NZ*income_source_count yrs_in_NZ*benefit_income
    yrs_in_NZ*UNPAID_ACTY_COUNT06 yrs_in_NZ*sex_female yrs_in_NZ*eur06
    yrs_in_NZ*Mao06 yrs_in_NZ*Pac06 language_indicator*live_with_parents
    language_indicator*live_with_children language_indicator*smoke
    language_indicator*own_residence language_indicator*marital_status_legal
    language_indicator*highest_qual language_indicator*income_source_count
    language_indicator*benefit_income language_indicator*UNPAID_ACTY_COUNT06
    language_indicator*sex_female language_indicator*eur06
    language_indicator*Mao06 language_indicator*Pac06
    live_with_parents*live_with_children live_with_parents*smoke
    live_with_parents*own_residence live_with_parents*marital_status_legal
    live_with_parents*highest_qual live_with_parents*income_source_count
    live_with_parents*benefit_income live_with_parents*UNPAID_ACTY_COUNT06
    live_with_parents*sex_female live_with_parents*eur06 live_with_parents*Mao06
    live_with_parents*Pac06 live_with_children*smoke
    live_with_children*own_residence live_with_children*marital_status_legal
    live_with_children*highest_qual live_with_children*income_source_count
    live_with_children*benefit_income live_with_children*UNPAID_ACTY_COUNT06
    live_with_children*sex_female live_with_children*eur06
    live_with_children*Mao06 live_with_children*Pac06 smoke*own_residence
    smoke*marital_status_legal smoke*highest_qual smoke*income_source_count
    smoke*benefit_income smoke*UNPAID_ACTY_COUNT06 smoke*sex_female smoke*eur06
    smoke*Mao06 smoke*Pac06 own_residence*marital_status_legal
    own_residence*highest_qual own_residence*income_source_count
    own_residence*benefit_income own_residence*UNPAID_ACTY_COUNT06
    own_residence*sex_female own_residence*eur06 own_residence*Mao06
    own_residence*Pac06 marital_status_legal*highest_qual
    marital_status_legal*income_source_count marital_status_legal*benefit_income
    marital_status_legal*UNPAID_ACTY_COUNT06 marital_status_legal*sex_female
    marital_status_legal*eur06 marital_status_legal*Mao06
    marital_status_legal*Pac06 highest_qual*income_source_count
    highest_qual*benefit_income highest_qual*UNPAID_ACTY_COUNT06
    highest_qual*sex_female highest_qual*eur06 highest_qual*Mao06
    highest_qual*Pac06 income_source_count*benefit_income
    income_source_count*UNPAID_ACTY_COUNT06 income_source_count*sex_female
    income_source_count*eur06 income_source_count*Mao06 income_source_count*Pac06
    benefit_income*UNPAID_ACTY_COUNT06 benefit_income*sex_female
    benefit_income*eur06 benefit_income*Mao06 benefit_income*Pac06
    UNPAID_ACTY_COUNT06*sex_female UNPAID_ACTY_COUNT06*eur06
    UNPAID_ACTY_COUNT06*Mao06 UNPAID_ACTY_COUNT06*Pac06 sex_female*eur06
    sex_female*Mao06 sex_female*Pac06 eur06*Mao06 eur06*Pac06 Mao06*Pac06;
    output out=adult5 pred=p;
    run;
```

```
data ver2.interactionwgt06 (keep= ID linkind0601 interactionwgt0601 );
set adult5;
interactionwgt0601=1/p;
run;

proc means data= ver2.wgt06;
var interactionwgt0601;
run;

proc means data= ver2.wgt06 (where=(linkind0601=1));
var interactionwgt0601;
run;

data adult6;
set adult5;
wgt = 1/p;
run;

proc corr data=adult6 (where=(test=1 & linkind0601=1));
weight wgt;
var age yrs_at_addr same_addr_5yrs_ago NZ_born yrs_in_NZ language_indicator
Language_count maori_descent iwi_ind iwi_count religious live_with_parents
live_with_partner live_with_siblings live_with_children live_alone
live_with_flatmates live_with_other difficulty_acty_count disability
disability_ind smoke own_residence marital_status_legal children_born
had_children highest_qual income_source_count benefit_income total_income
income_support hrs_work_mainjob work_labour_force_status travel_work
UNPAID_ACTY_COUNT06 sex_female eur06 Mao06 Pac06 Asian06 MELAA06 Other06
EthNS nzdep2006 oc06;
run;

**0601 children's interaction model;
*testing for important two-way interactions in sample of 10,000;
proc surveyselect data= child2 out=child10000 n=14500 seed=909090;
run;

data child10000;
set child10000;
if test=0;
run;

proc logistic data= child10000;
class age yrs_at_addr same_addr_5yrs_ago NZ_born yrs_in_NZ language_indicator
Language_count maori_descent iwi_ind iwi_count religious live_with_parents
live_with_partner live_with_siblings live_with_children live_alone
live_with_flatmates live_with_other difficulty_acty_count disability
disability_ind sex_female eur06 Mao06 Pac06 Asian06 MELAA06 Other06 EthNS
nzdep2006 /ref=first;
model linkind0601 (event='1') = age yrs_at_addr same_addr_5yrs_ago NZ_born
yrs_in_NZ language_indicator Language_count maori_descent iwi_ind iwi_count
religious live_with_parents live_with_partner live_with_siblings
live_with_children live_alone live_with_flatmates live_with_other
difficulty_acty_count disability disability_ind sex_female eur06 Mao06 Pac06
Asian06 MELAA06 Other06 EthNS nzdep2006 /selection=stepwise slentry=.1
slstay=.05 hierarchy=single;
run;
```

```sas
proc logistic data=child2;
class yrs_at_addr same_addr_5yrs_ago yrs_in_NZ maori_descent iwi_ind
religious live_with_parents live_with_partner live_with_siblings disability
eur06 Mao06 Other06 nzdep2006 /ref=first;
model link0601 (event='1') = yrs_at_addr same_addr_5yrs_ago yrs_in_NZ
maori_descent iwi_ind religious live_with_parents live_with_partner
live_with_siblings disability eur06 Mao06 Other06 nzdep2006
yrs_at_addr*same_addr_5yrs_ago yrs_at_addr*yrs_in_NZ
yrs_at_addr*maori_descent yrs_at_addr*iwi_ind yrs_at_addr*religious
yrs_at_addr*live_with_parents yrs_at_addr*live_with_partner
yrs_at_addr*live_with_siblings yrs_at_addr*disability yrs_at_addr*eur06
yrs_at_addr*Mao06 yrs_at_addr*Other06 yrs_at_addr*nzdep2006
same_addr_5yrs_ago*yrs_in_NZ same_addr_5yrs_ago*maori_descent
same_addr_5yrs_ago*iwi_ind same_addr_5yrs_ago*religious
same_addr_5yrs_ago*live_with_parents same_addr_5yrs_ago*live_with_partner
same_addr_5yrs_ago*live_with_siblings same_addr_5yrs_ago*disability
same_addr_5yrs_ago*eur06 same_addr_5yrs_ago*Mao06 same_addr_5yrs_ago*Other06
same_addr_5yrs_ago*nzdep2006 yrs_in_NZ*maori_descent yrs_in_NZ*iwi_ind
yrs_in_NZ*religious yrs_in_NZ*live_with_parents yrs_in_NZ*live_with_partner
yrs_in_NZ*live_with_siblings yrs_in_NZ*disability yrs_in_NZ*eur06
yrs_in_NZ*Mao06 yrs_in_NZ*Other06 yrs_in_NZ*nzdep2006 maori_descent*iwi_ind
maori_descent*religious maori_descent*live_with_parents
maori_descent*live_with_partner maori_descent*live_with_siblings
maori_descent*disability maori_descent*eur06 maori_descent*Mao06
maori_descent*Other06 maori_descent*nzdep2006 iwi_ind*religious
iwi_ind*live_with_parents iwi_ind*live_with_partner
iwi_ind*live_with_siblings iwi_ind*disability iwi_ind*eur06 iwi_ind*Mao06
iwi_ind*Other06 iwi_ind*nzdep2006 religious*live_with_parents
religious*live_with_partner religious*live_with_siblings religious*disability
religious*eur06 religious*Mao06 religious*Other06 religious*nzdep2006
live_with_parents*live_with_partner live_with_parents*live_with_siblings
live_with_parents*disability live_with_parents*eur06 live_with_parents*Mao06
live_with_parents*Other06 live_with_parents*nzdep2006
live_with_partner*live_with_siblings live_with_partner*disability
live_with_partner*eur06 live_with_partner*Mao06 live_with_partner*Other06
live_with_partner*nzdep2006 live_with_siblings*disability
live_with_siblings*eur06 live_with_siblings*Mao06 live_with_siblings*Other06
live_with_siblings*nzdep2006 disability*eur06 disability*Mao06
disability*Other06 disability*nzdep2006 eur06*Mao06 eur06*Other06
eur06*nzdep2006 Mao06*Other06 Mao06*nzdep2006 Other06*nzdep2006;
output out=child5 pred=p;
run;

*Storing the weights for the Interaction model weighted correlations;
data ver2.interactionchildwgt06 (keep= ID linkind0601 interactionwgt0601);
set child5;
interactionwgt0601=1/p;
run;

proc means data= ver2.interactionchildwgt06;
var interactionwgt0601;
run;

proc means data= ver2.interactionchildwgt06 (where=(linkind0601=1));
var interactionwgt0601;
run;
```

```
data child6;
set child5; wgt = 1/p;
run;

proc corr data=child6 (where=(test=1 & linkind0601=1));
weight wgt;
var age yrs_at_addr same_addr_5yrs_ago NZ_born yrs_in_NZ language_indicator
Language_count maori_descent iwi_ind iwi_count religious live_with_parents
live_with_partner live_with_siblings live_with_children live_alone
live_with_flatmates live_with_other difficulty_acty_count disability
disability_ind sex_female eur06 Mao06 Pac06 Asian06 MELAA06 Other06 EthNS
nzdep2006;
run;

proc logistic data= child2;
class yrs_at_addr same_addr_5yrs_ago yrs_in_NZ maori_descent iwi_ind
religious live_with_parents live_with_partner live_with_siblings disability
eur06 Mao06 Other06 nzdep2006 /ref=first;
model link0601 (event='1') = yrs_at_addr same_addr_5yrs_ago yrs_in_NZ
maori_descent iwi_ind religious live_with_parents live_with_partner
live_with_siblings disability eur06 Mao06 Other06 nzdep2006
yrs_at_addr*same_addr_5yrs_ago;
output out=child5 pred=p;
run;

data child6;
set child5; wgt = 1/p;
run;

proc corr data=child6 (where=(test=1 & linkind0601=1));
weight wgt;
var age yrs_at_addr same_addr_5yrs_ago NZ_born yrs_in_NZ language_indicator
Language_count maori_descent iwi_ind iwi_count religious live_with_parents
live_with_partner live_with_siblings live_with_children live_alone
live_with_flatmates live_with_other difficulty_acty_count disability
disability_ind sex_female eur06 Mao06 Pac06 Asian06 MELAA06 Other06 EthNS
nzdep2006;
run;
```