ARE CORRELATES OF LONELINESS SIMILAR ACROSS THE LIFE-COURSE?

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CAREER COMMENTS

This scholarship benefitted my career path in many ways. I learned the SAS language, which I had no prior experience with. SAS is an important tool used by many practising statisticians, so I am very happy to have added it to my skill set. It was also most beneficial to learn of the research areas that the COMPASS team investigates. One of these is Mental Health, which is of great interest to me as an aspiring Medical Statistician. Finally, I learned many important statistical practices from Roy Lay-Yee, for which I am most grateful.

LAY SUMMARY

We investigated patterns of loneliness in New Zealand using data from the Social Attitudes Survey 2017, part of the International Social Survey Programme (ISSP). We found that the level of loneliness varied with age. We also found that good health, both mental and physical, was associated with low levels of loneliness. Statistical modelling revealed that some correlates of loneliness, like deprivation, varied with age. Others, such as Māori ethnicity, did not vary with age.

INTRODUCTION

Loneliness is now recognized as an important risk factor for mental and physical health (Tzouvara, *et al*. 2015). The complex and multidimensional nature of loneliness generates many unanswered questions and hence the need for corresponding studies.

Valid studies of loneliness hinge on an effective definition. For the purposes of this report we adopt the definition used by Morrison and Smith (2017); “loneliness is the state of being alone and not liking it.” Thus some investigations of loneliness involve capturing the emotional states of people who are alone, even if they are in a situation with apparently many social contacts.

Of the various theories of loneliness we also adopt, for this report, the interactionist theory advanced by Weiss (1973). Loneliness, in this view, arises in part from the absence of an adequate social network. This theory fits the nature of our data source, The International Social Survey Programme (ISSP) for 2017.

The International Social Survey Programme (ISSP) is an annual survey of economic and social policy issues, involving some of the world’s leading academic institutions in 45 countries. Each year, every ISSP member country carries out a short survey using the same questionnaire, from which data is made freely available to all members in a central archive based in Cologne, Germany. The Centre for Methods and Policy Application in the Social Sciences (COMPASS) at the University of Auckland has administered the New Zealand arm of the survey since 2013. The annual surveys allow researchers to compare findings across different countries, cultures, and over time.

In 2017, a ‘Social Networks’ Survey was run. The ISSP questionnaire contained items assessing loneliness, as well as data on a number of socio-demographic and attitudinal risk factors. The aim of this project was to explore whether (social network) risk factors for loneliness vary across age, by analysing data taken from the 2017 survey.

METHODS

The sampling procedure was as follows. The New Zealand Electoral Rolls were sampled with 12 key strata, aiming to maximise response rate based on previous surveys, with a total of 3,876 surveys sent out. The weighted survey response rate was 41.2%, resulting in a data set of 1,358 observations on 161 variables.

We began by examining the questionnaire and the data set. Potential variables relevant to loneliness were identified, including both single variables and question blocks. Table 1 outlines the main blocks.

Table 1. Question blocks relevant to loneliness

Block
Social Network Breadth
Community Participation
Perceived Social Support
Trust in People
Social Support Attitudes
Conflicted Relationships
Social Contact
Physical Health
Mental Health

Table 2 lists a series of variables that we examined for the prevalence of loneliness in different categories.

Table 2. Variables examined for the prevalence of loneliness

Variable
Age
Gender
Maori Ethnicity
Pacific Ethnicity
Urbanicity
Region of Origin
Region of Residence
NZ Deprivation Index
Education
Employment Status
Physical Health
Mental Health
General Health
Life Satisfaction

A loneliness block was also identified in question 8: How often in the past 4 weeks have you felt that:

- you lack companionship?;
- you are isolated from others?;
- you are left out?;
- you feel alone?

We used SAS to check variable scale consistency – Cronbach's Alpha was 0.916927, greater than our 0.5 criterion, suggesting we were justified in creating a composite loneliness variable, q8New, summing the four scores. Then we created a composite binary variable (Lness) based on a cutoff – first we tried the 90th percentile, which corresponded to the value 13 – see Table 3.

Table 3. Loneliness: distribution of derived variable q8new

q8New	Frequency	Percent	Cumulative Frequency	Cumulative Percent
4	466	35.36	466	35.36
5	87	6.60	553	41.96
6	82	6.22	635	48.18
7	92	6.98	727	55.16
8	140	10.62	867	65.78
9	80	6.07	947	71.85
10	90	6.83	1037	78.68
11	62	4.70	1099	83.38
12	81	6.15	1180	89.53
13	26	1.97	1206	91.50
14	29	2.20	1235	93.70
15	19	1.44	1254	95.14
16	34	2.58	1288	97.72
17	10	0.76	1298	98.48
18	6	0.46	1304	98.94
19	2	0.15	1306	99.09
20	12	0.91	1318	100.00

Frequency Missing = 40

We then crosstabulated Lness with a number of sociodemographic variables, as described in Table 4.

Table 4. Sociodemographic variables

Demographic	Variable name	Categories	Source
Gender	qgen	0 = Female 1 = Male	Derived from q35
Age	age	1 = 18–30 2 = 31–44 3 = 45–59 4 = 60–74 5 = 75+	Electoral roll
Ethnicity	ethmaori etheuro ethpacific ethasian ethnzer ethmelaa ethother	0 = No 1 = Yes	Derived binary variables
Urbanicity	urban	1 = Urban major 2 = Urban minor 3 = Rural	Electoral roll
Education	education	1 = No formal qualification 2 = Secondary school qualification 3 = Trade or vocational 4 = University degree	Derived from q44
Region of origin	originregion	1 = New Zealand 2 = Australia 3 = The Pacific 4 = Asia 5 = Europe 6 = Other	Derived from q36, q36b

Demographic	Variable name	Categories	Source
Region of residence	region	1 = Northland 2 = Auckland 3 = Waikato 4 = Bay of Plenty 5 = Hawke's Bay 6 = Taranaki 7 = Wellington 8 = Marlborough 9 = Canterbury 10 = Otago	Electoral roll
New Zealand Deprivation Index	NZDep	1 = Lowest deprivation 2 = Second quintile 3 = Third quintile 4 = Fourth quintile 5 = Highest qualification	Electoral roll

These allowed calculation of the prevalence of loneliness by each of these variables as well as testing the significance of association (Chi-square test of independence). We then examined each conceptual block of variables in turn, according to the following process. The SAS procedure CORR was used to check scale consistency between variables in a block. We again used Cronbach's Alpha to test scale consistency. Depending on the value, we carried out data reduction on selected blocks to create new composite variables intended to represent these. In particular, the criterion was $\alpha > 0.5$. An example of the analysis which led to the construction of such a composite variable is shown below.

Table 5. Scale consistency analysis: Perceived Social Support

Cronbach Coefficient Alpha

Variables	Alpha
Raw	0.731818
Standardized	0.737617

Cronbach Coefficient Alpha with Deleted Variable

	Raw Variables		Standardized Variables	
Deleted Variable	Correlation with Total	Alpha	Correlation with Total	Alpha
qhelpchore_v2	0.379598	0.712371	0.393082	0.717252
qhelpsick_v2	0.460145	0.702069	0.476746	0.704370
qhelpdepressed_v2	0.490713	0.696006	0.512167	0.698799
qhelpfamadvice_v2	0.425289	0.705367	0.443666	0.709509
qhelpsocialocc_v2	0.305772	0.722684	0.324282	0.727560
qhelpmoney_v2	0.330779	0.721345	0.315100	0.728916
qhelpjob_v2	0.367616	0.717340	0.345906	0.724347
qhelpadmin_v2	0.393221	0.710255	0.383052	0.718771
qhelplive_v2	0.468176	0.697348	0.445849	0.709172
qhelpill_v2	0.332177	0.719165	0.334181	0.726093

These variables described the Perceived Social Support block, and the composite variable **close_fam** was constructed from the first five components. While all blocks were considered, it was decided, using Cronbach's Alpha, that some single variables were best not formed into composite variables for analysis. If the item correlation was less than the 0.5 criterion, single variables were left as is.

The end goal of data reduction was to establish a list of potential covariates associated with loneliness. To this end we checked the association of each member of our test list (be they original or new variables) with our binary loneliness variable, using a chi-square test of independence. The criterion for a significant association was a p-value < 0.05, and covariates shown to have a significant association with loneliness were assigned to a set of risk factors for loneliness. For instance, Māori ethnicity showed a significant association with loneliness, as shown in Table 6.

Table 6. Chi-square test of independence for Māori ethnicity

The SURVEYFREQ Procedure

Table of LNess by ethmaori

LNess	ethmaori	Frequency	Weighted Frequency	Std Err of Wgt Freq	Percent	Std Err of Percent
0	0	1035	1028	15.99173	78.6632	1.0811
	1	136	138.81241	10.36184	10.6210	0.7846
	Total	1171	1167	14.62309	89.2842	0.8777
1	0	111	112.99698	10.48051	8.6458	0.7998
	1	27	27.05408	5.20409	2.0700	0.3982
	Total	138	140.05107	11.50174	10.7158	0.8777
Total	0	1146	1141	13.58853	87.3090	0.8258
	1	163	165.86650	10.91389	12.6910	0.8258
	Total	1309	1307	9.93964	100.000	

Frequency Missing = 49

Rao-Scott Chi-Square Test

Pearson Chi-Square	6.2254
Design Correction	1.0640
Rao-Scott Chi-Square	5.8509
DF	1
Pr > ChiSq	0.0156
F Value	5.8509
Num DF	1
Den DF	1297
Pr > F	0.0157

Sample Size = 1309

If the Chi-square test did not reveal a significant association with loneliness, that covariate was not examined further unless it was a part of a composite variable. In that case, the component variables were tested individually for associations with loneliness.

The final stage was to feed the covariates from the significant sub-list into two logistic regression procedures, with Lness as the outcome. The first procedure involved modelling the covariates one at a time. The second was intended to examine the nature of the interaction between age and each member of the apparently significant covariate sub-list.

RESULTS

We present a number of bar charts to describe loneliness prevalence by our significant covariates, each showing the Chi-square test results and error bars representing standard errors.

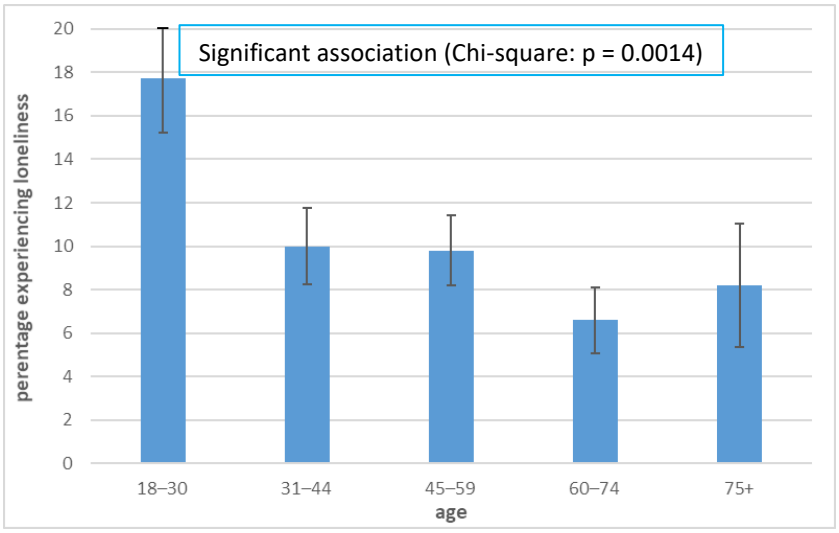

Figure 1: Loneliness prevalence by age group

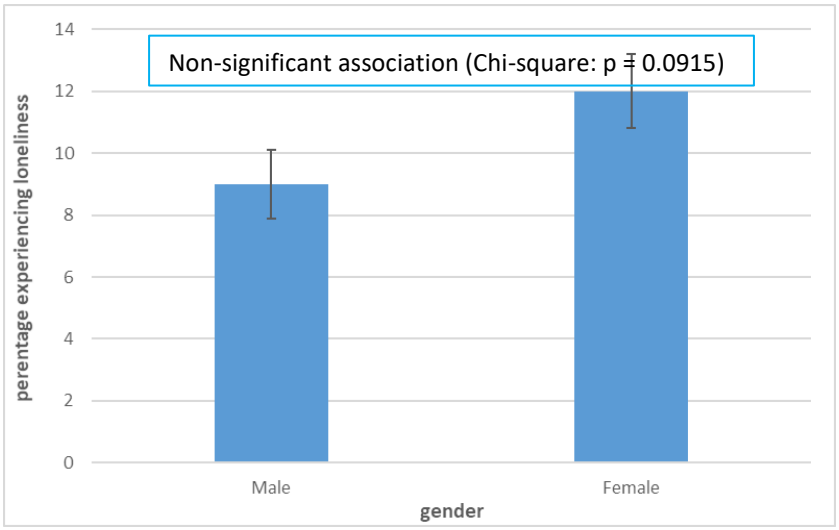

Figure 2: Loneliness prevalence by gender

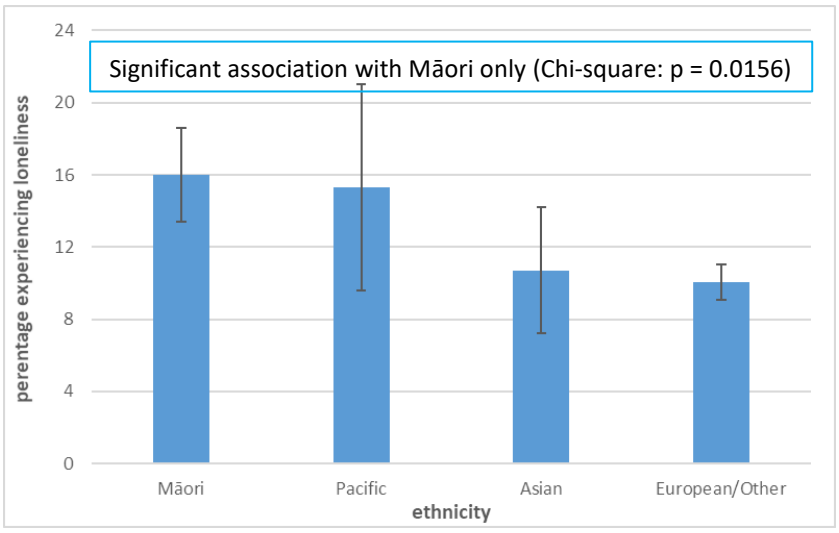

Figure 3: Loneliness prevalence by ethnicity

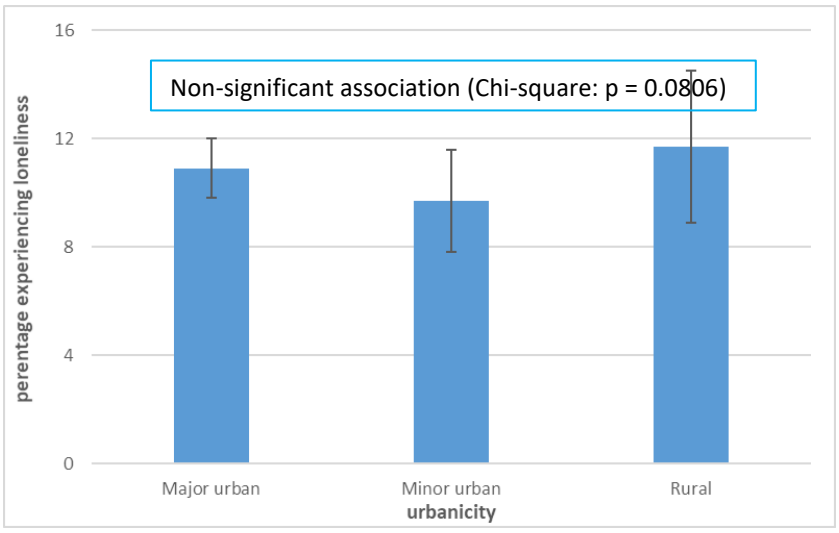

Figure 4: Loneliness prevalence by urbanicity

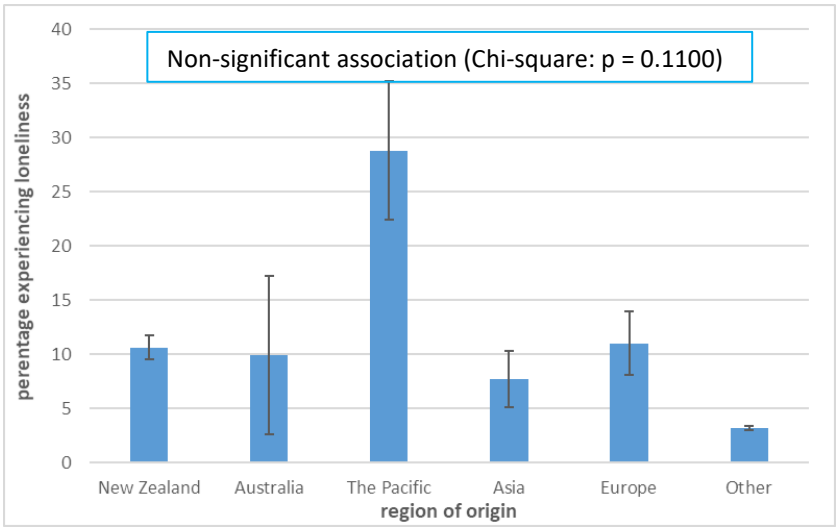

Figure 5: Loneliness prevalence by region of origin for all

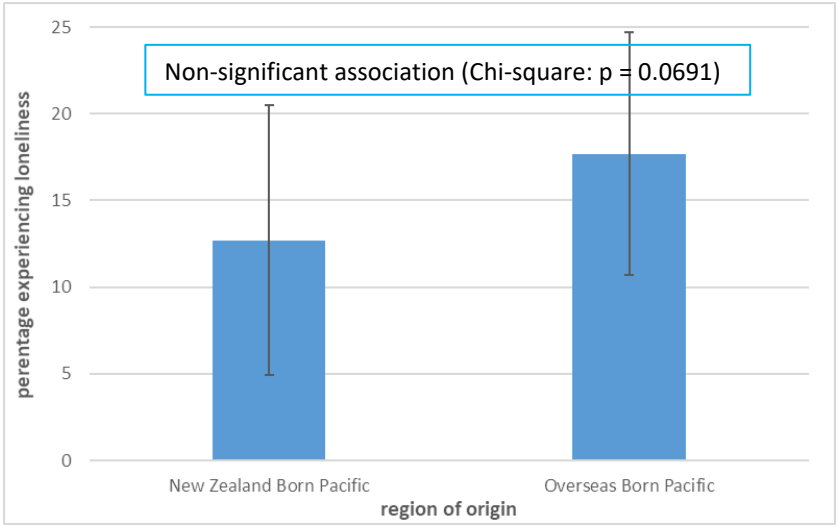

Figure 6: Loneliness prevalence by region of origin for Pacific people

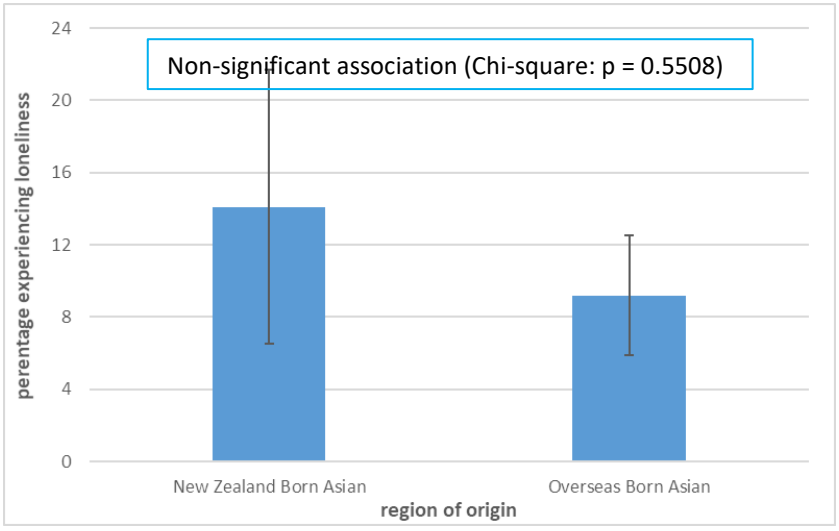

Figure 7: Loneliness prevalence by region of origin for Asian people

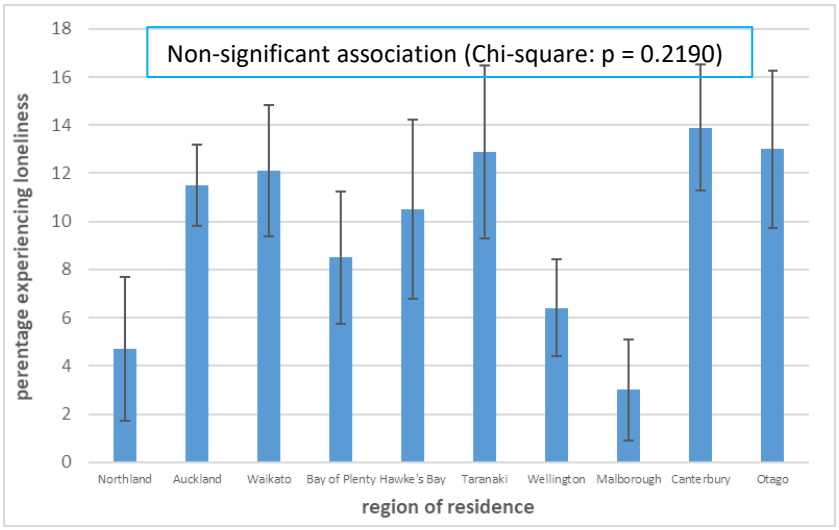

Figure 8: Loneliness prevalence by region of residence

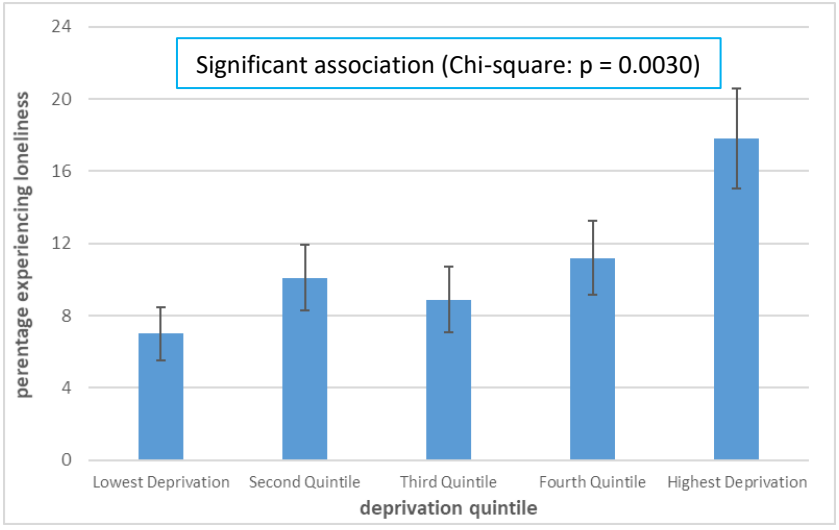

Figure 9: Loneliness prevalence by NZDep quintile

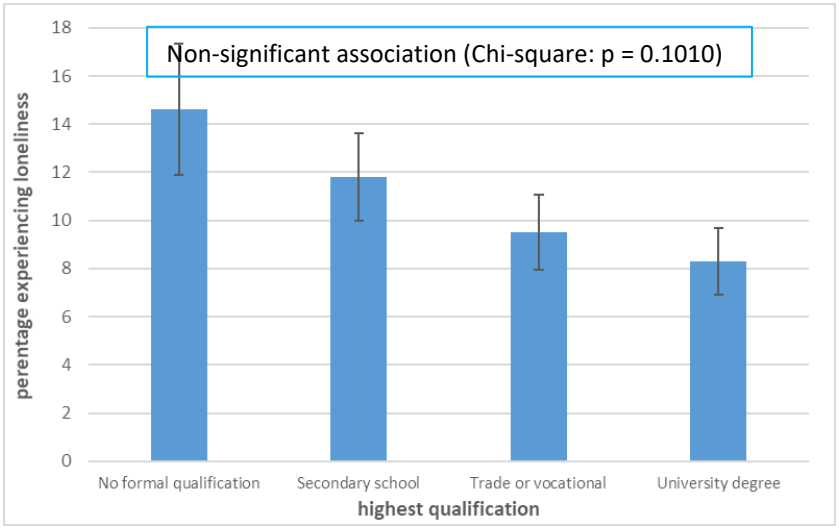

Figure 10: Loneliness prevalence by highest qualification

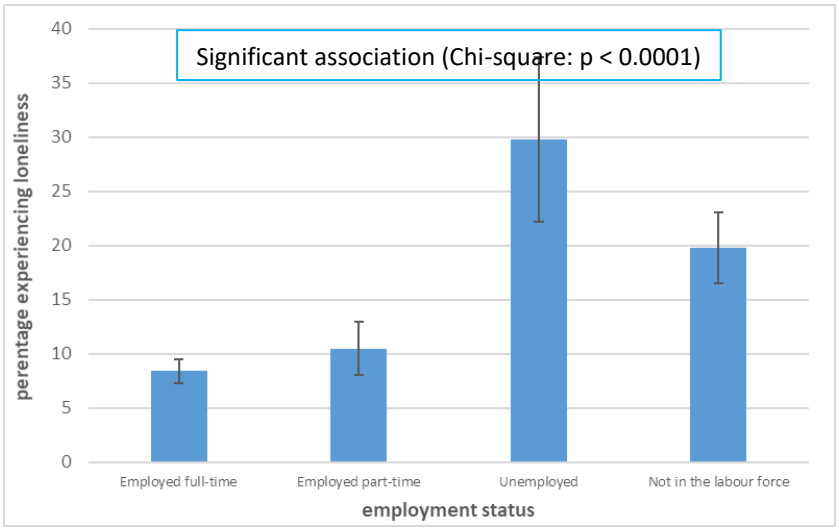

Figure 11: Loneliness prevalence by employment status

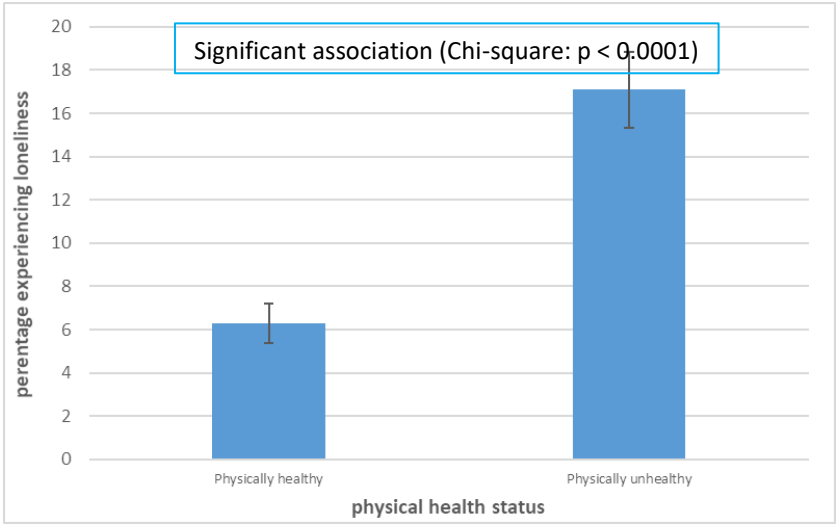

Figure 12: Loneliness prevalence by physical health status

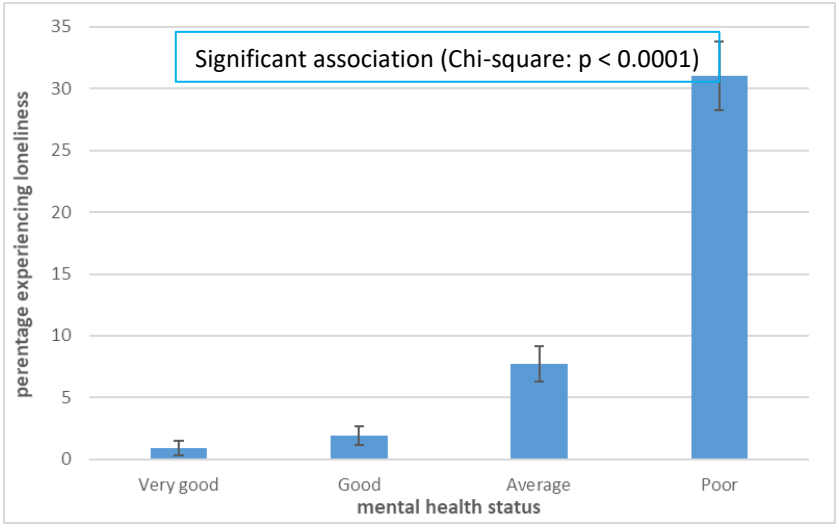

Figure 13: Loneliness prevalence by mental health status

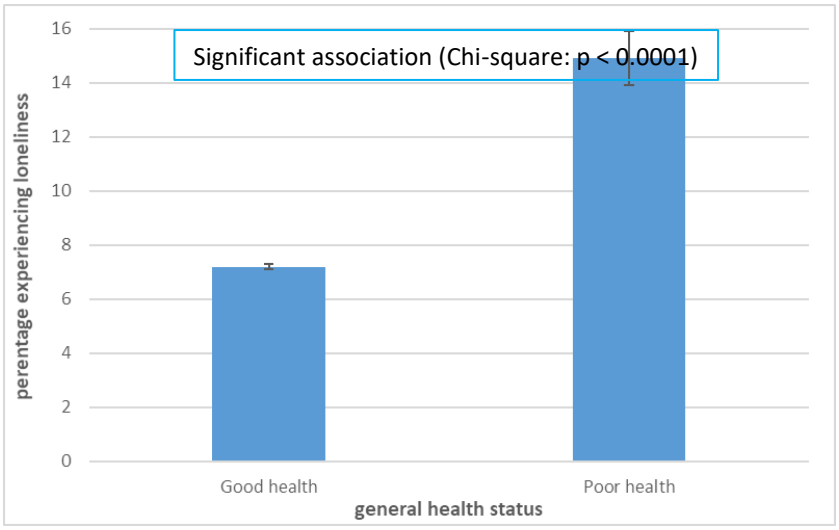

Figure 14: Loneliness prevalence by general health status

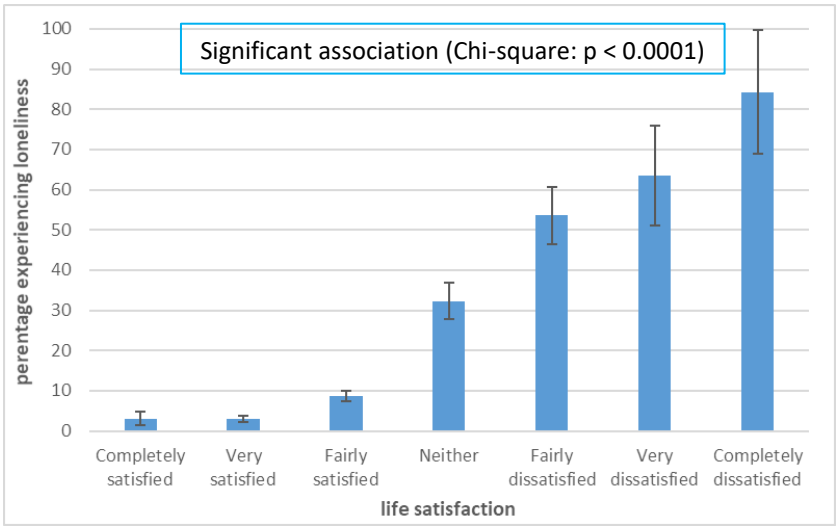

Figure 15: Loneliness prevalence by life satisfaction

Table 7 gives the variables we used to predict our Lness binary variable as single covariates, and associated test results.

Table 7: Variables used as single covariates to predict loneliness binary + results

Variable	Name	Definition	F statistic	p-value
1	Ethmaori	Māori ethnicity	5.73	0.0169
2	Participateleisure	Leisure activities in past 12 months	5.11	0.0004
3	participatepolitics	Political activities in past 12 months	3.44	0.0084
4	Close_fam	Composite variable: questions 6a–6e	4.55	0.0004
5	Helpill	Help sources in serious illness	5.81	<0.0001
6	Takeadvantage	How often people take advantage of others	24.40	<0.0001
7	Trustpeople	How much people can be trusted or not	7.33	<0.0001
8	Familyfirst	Help family before other people	8.47	<0.0001
9	Helpfriends	Duty to help disadvantaged friends	2.86	0.0223
10	Goout	Frequency of going out with friends	5.73	<0.0001
11	gooutnewpeople	Frequency of making new friends	2.81	0.0246
12	Contactnum	People contacts per day	5.02	0.0001
13	facetofacepeople	Face to face contacts per day	5.63	0.0002
14	q26New	General health status	37.22	<0.0001
15	Bin_PHealth	Composite physical health; questions 27a–27d	32.20	<0.0001
16	MentalH_f	Composite mental health; questions 28a–28f	35.63	<0.0001
17	Easygoals	Ease of goal accomplishment	11.77	<0.0001
18	Lifesat	General life satisfaction	26.13	<0.0001
19	incendsmeet	Level of difficulty making ends meet	7.55	<0.0001
20	highestqual	Highest formal education	1.99	0.0540
21	Empstatus	Current employment status	7.91	<0.0001
22	SocMTime_f	Weekly hours on social media	4.61	0.0004
23	Age	Age	4.30	0.0019
24	Admin_f	Administrative problem help sources	5.34	0.0049
25	ReConflict_f	Composite variable; questions 13–15	17.87	<0.0001
26	NZDep	New Zealand Deprivation Index (quintiles)	3.70	0.0053

Table 8 gives results of logistic regression models accounting for age and interactions therewith for each covariate.

Table 8: Variables significantly associated with loneliness

Variable	Joint test F statistic	Joint test p-value
Ethmaori	0.50	0.4782
Age	3.69	0.0054
Ethmaori × Age	0.93	0.4459
Participateleisure	0.97	0.4230
Age	2.16	0.0709
Participateleisure × Age	52.56	<0.0001
Participatepolitics	299.59	<0.0001
Age	21.77	<0.0001
Participatepolitics × Age	119.39	<0.0001
Close_fam	263.90	<0.0001
Age	242.17	<0.0001
Close_fam × Age	107.79	<0.0001
Helpill	116.17	<0.0001
Age	4.59	0.0011
Helpill × Age	55.63	<0.0001
Takeadvantage	6.76	0.0002
Age	121.60	<0.0001
Takeadvantage × Age	52.10	<0.0001
Trustpeople	243.47	<0.0001
Age	76.77	<0.0001
Trustpeople × Age	22.91	<0.0001
Familyfirst	118.89	<0.0001
Age	0.94	0.4384
Familyfirst × Age	6.85	<0.0001
Helpfriends	0.70	0.5915
Age	61.05	<0.0001
Helpfriends × Age	31.07	<0.0001
Goout	0.83	0.5663
Age	12.29	<0.0001
Goout × Age	31.47	<0.0001
Gooutnewpeople	0.61	0.6574
Age	159.09	<0.0001
Gooutnewpeople × Age	56.41	<0.0001
Contactnum	1.70	0.1319
Age	1.81	0.1249
Contactnum × Age	67.22	<0.0001
Facetofacepeople	123.47	<0.0001
Age	221.51	<0.0001
Facetofacepeople × Age	67.23	<0.0001
Q26New	7.05	0.0080
Age	5.25	0.0003
Q26New × Age	1.00	0.4041
Bin_PHealth	10.55	0.0012
Age	1.50	0.2006
Bin_PHealth × Age	0.49	0.7468
MentalH_f	533.55	<0.0001
Age	38.88	<0.0001
MentalH_f × Age	40.34	<0.0001
Easygoals	3.58	0.0016
Age	134.94	<0.0001
Easygoals × Age	67.90	<0.0001

Variable	Joint test F statistic	Joint test p-value
Lifesat	186.67	<0.0001
Age	49.23	<0.0001
Lifesat × Age	85.78	<0.0001
Incendsmeet	1.16	0.3260
Age	176.56	<0.0001
Incendsmeet × Age	54.37	<0.0001
Highestqual	0.71	0.6603
Age	1.48	0.2055
Highestqual × Age	95.95	<0.0001
Empstatus	3.67	0.0120
Age	146.43	<0.0001
Empstatus × Age	105.32	<0.0001
SocMTime_f	1.65	0.1445
Age	0.13	0.9726
SocMTime_f × Age	42.75	<0.0001
Admin_f	6.40	0.0017
Age	1.62	0.1663
Admin_f × Age	65.24	<0.0001
ReConflict_f	4.59	0.0011
Age	351.53	<0.0001
ReConflict_f × Age	106.79	<0.0001
NZDep	1.73	0.1422
Age	0.86	0.4872
NZDep × Age	137.01	<0.0001

DISCUSSION

There is some evidence to suggest that the prevalence of loneliness follows an approximate U-shape over the lifespan, with a peak in adolescence, a decline in adulthood, and rising to a second peak in old age (Jopling & Sserwanja 2016). Our age prevalence results show some agreement with this pattern, particularly the peak in adolescence. This feature is consistent with the findings of Smith (2015). The prevalence in our elderly category was lower than expected with respect to the report of Jopling & Sserwanja, but their data may not be applicable to the New Zealand population.

Sociodemographic characteristics were significantly associated with loneliness, suggesting that loneliness may be a symptom of social disadvantage.

- Age,
- Māori ethnicity,
- Deprivation, and
- Employment status.

Social network variables were also significantly associate with loneliness, reflecting the importance of the quantity and quality of social connections.

- What leisure activities have you been involved in in the past 12 months?
- What political activities have you been involved in in the past 12 months?
- To whom do you turn in different situations?
- How often would people try to take advantage of you, given the chance?
- How much can you trust other people?
- How much do you make an effort to help your family ahead of other people?
- How much do you feel a duty to help your less well-off friends?
- How often do you go out with friends?
- How often do you meet new friends while out?
- How many people are you in contact with each day?
- How many hours do you spend on social media per week?
- How often do you feel your family are too demanding?

Good health: mental, physical, and general, and high life satisfaction, were related to low levels of loneliness.

Our single covariate regressions had results for all variables except for highest qualification agreeing with our Chi-square results. The models accounting for age and the interaction term revealed eight patterns of association/significance, which can answer our question about whether the relationship between loneliness and each covariate varies by age. Table 9 summarises these patterns and the covariates that showed them.

Table 9: Logistic regression models by significance pattern

Pattern	Covariates	Significance	Models
1	χ	Not significant	Ethmaori
	Age	Significant	
	χ × Age	Not significant	
2	χ	Not significant	Participateleisure
	Age	Not significant	Contactnum
	χ × Age	Highly significant	Highestqual
			SocMTime_f
			NZDep
3	χ	Significant	Participatepolitics
	Age	Significant	Close_fam
	χ × Age	Highly significant	Helpill
			Takeadvantage
			Trustpeople
			Facetofacepeople
			MentalH_f
			Easygoals
			Lifesat
			Empstatus
			ReConflict_f
4	χ	Significant	Familyfirst
	Age	Not significant	
	χ × Age	Highly significant	
5	χ	Not significant	Helpfriends
	Age	Significant	Goout
	χ × Age	Highly significant	Gooutnewpeople
			Incendsmeet
6	χ	Significant	Q26New
	Age	Significant	
	χ × Age	Not significant	
7	χ	Significant	Bin_PHealth
	Age	Not significant	
	χ × Age	Not significant	
8	χ	Significant	Admin_f
	Age	Not significant	
	χ × Age	Highly significant	

1. Māori ethnicity is significantly associated with loneliness on its own, but once age and the interaction term were added to the model, the association changes. The main effect becomes non-significant while age becomes significant. The interaction was not significant: the relationship between Māori ethnicity and loneliness does not vary by age.
2. The relationship between each of these variables and loneliness varies by age, but neither the variable nor age is significantly associated with loneliness on their own.
3. The relationship between each of these variables and loneliness varies by age, and both the variable and age are significantly associated with loneliness on their own as well.
4. Helping out one's family ahead of other people is associated with lower levels of loneliness. This association varies by age but age on its own is not significant in the model.

5. The relationship between each of these variables and loneliness varies by age, but if we do not account for age, each relationship is non-significant.
6. General health status is associated with loneliness. The relationship does not vary by age.
7. Physical health is associated with loneliness. The relationship does not vary by age.
8. People sought to help with administrative issues is associated with loneliness, and the relationship varies by age.

Overall, some correlates of loneliness, such as Māori ethnicity, are similar across the life-course, while others, such as deprivation, vary by age.

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