University of Sheffield

INF6029 Data Analysis

Understanding Social Isolation in the Ageing Population of the UK

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Abstract

In the early months of 2020, various governments worldwide started imposing social isolation measures to control the outbreak of the Covid-19 pandemic. Within a few months, the effects of these social isolation measures had started to crop with many reporting changes in their health and behavioural patterns. However, social isolation is not a new concept, there are significant numbers of people experiencing social isolation and this has been linked to various detrimental health effects. This paper looks to study the social isolation experienced by ageing people who participated in the ELSA wave 7 study. Chi-square tests are carried out to understand if social isolation is experienced equally in groups sorted based on various demographic and socio-economic factors such as age, gender, education levels and frequency of alcohol and internet use. A binary logistic regression is then done to see if these factors can be used to classify people into isolated and non-isolated groups. The results of the chi-square tests indicate that people in different groups experience different levels of isolation, however for the logistic regression alcohol use and gender wasn't significant enough for classification. The analysis done here indicates that longitudinal studies can help understand social isolation in a better manner which can in turn help relevant public authorities or health professionals in reducing social isolation.

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Introduction

Social Isolation has been a renewed topic of discussion over the past few with the pandemic setting a toll on the mental health of people. Social isolation is usually defined in terms of how much a person mingles or maintains relations with the people around him. Social isolation has also been a topic of great misunderstanding where people and researchers alike misunderstand this for loneliness. Loneliness is often used to describe the emotions of a person when their levels of engagement with the people around them are lower than they desire. To put it in more simpler terms, a person who is lonely isn't necessarily socially isolated. Unlike loneliness, which is a subjective feeling, social isolation is more quantifiable(Wigfield & Alden, 2018). Social isolation has been linked to several adverse health effects, both physical and mental, and many of these effects happen independently of loneliness. Over the past few years with the Covid-19 pandemic forcing people to isolate themselves from others, the effects of social isolation have started to become more visible, and researchers and health professionals have started to investigate the possible effects of this with renewed vigour(Pancani et al., 2021). Even before the pandemic set in social isolation had been linked with increased cardiovascular diseases, and mortality and was even known to increase suicidal tendencies or thoughts(Kamiya et al., 2010; Lay-Yee et al., 2022; Naito et al., 2023). The impact of social isolation on mortality is on par with that of other factors such as obesity and smoking. Although there have been numerous studies about the effects of social isolation on health, i.e, where health was the outcome being analysed, the studies analysing social isolation as an individual entity have been surprisingly less when compared to the former, which makes it even more important to study how social isolation stems from. Present-day literature has found social isolation to be associated with several demographic and socio-economic factors and this paper focuses on understanding the association that social isolation has with the factors concerning age, gender, alcohol intake, internet use and education levels.

Literature Review

Previous studies have been able to establish that social isolation was more prominent amongst adolescents and older age groups. Social isolation has been known to result in poor ageing with older socially isolated people experiencing various mental and physical health problems like depression, heart and other chronic diseases(Steptoe et al., 2013).

Social isolation has also been found to impact gender groups in different manners. A study on college students found that social isolation and loneliness together were linked with depression in females, whereas in males, social isolation was independently linked with depression. (Liu et al., 2020). A study by Umberson et al. indicates how males are more isolated than females and how this gender difference becomes more visible as they age. The study here aims to find if there are similar differentiations in the cohort being analysed (2022).

Alcohol has been hailed as a social lubricant for a long time with even certain psychological studies even confirming this notion. These studies have shown that the consumption of alcohol in moderate amounts can impact human behaviour in a positive way which can also correspond to an increase in social connections (Creswell, 2021; Gambles et al., 2022). This study looks to find if similar associations can be found between alcohol consumption and the social isolation levels of people.

The use of the internet and the associated social networking tools that come with it have increased over the past few years. Studies have also pointed out how this increase has been significant in the older population too. The internet has facilitated the breaking down of various social barriers. However, the studies to find out if internet use was beneficial or was associated with social isolation have been mixed, with certain studies finding good relations between the two and others finding

very mild relations (Hampton et al., 2009; Stockwell et al., 2021). The study here looks to find if any such relations can be observed with isolated people and their frequency of internet use.

Schools and other educational institutions have not just been places to gain educational degrees, but they have also been places of social interactions where friends and other relationships have been made. Statistical studies have shown that people with lower education levels tend to be more socially isolated and this study aims to see if this notion holds for the sample being analysed here, i.e, the ageing population in the UK (Suntai & White, 2022).

Research aims and objectives

The research aims to understand the association that social isolation has with demographic factors like age, sex and levels of education and behavioural factors like alcohol consumption and internet use.

The objectives could be phrased as five questions shown below:

1. How do the levels of social isolation change as the age of a population increases? Are older sections of the population isolated?
2. Are there any disparities between genders in terms of social isolation levels and does one gender experience more isolation than the other?
3. Does a lower level of education correspond to an individual getting more isolated?
4. Does alcohol act as a social lubricant and are people who consume it in moderate amounts more insulated from social isolation than the ones who don't?
5. Has the internet facilitated in reducing the amounts of social isolation, and are people who use it more socially inclusive?

Methodology

Overview of dataset

The dataset for this analysis was obtained from wave 7 of the English Longitudinal Study of Ageing (ELSA). The study which is an ongoing one is funded by the National Institute of Ageing in the US and other governmental agencies in the UK. The data for this was collected through means of an interview and questionnaires. The data for wave 7 which was carried out between 2014-15 has 9,666 participants spread out across the UK. The datasets contain information about demographics, behavioural and other health factors.

Measuring social isolation levels

The ELSA dataset does not have a specific variable that quantifies social isolation. The index created here is based on the works of Steptoe et al., where they created a score which ranges from 0 to 5, where a score of 5 indicated extreme isolation and 0 represented a non-isolated individual. The score was constructed by assigning a point if the participant was not married or living with anyone, one each if they maintained less than monthly contact with friends, family and children (This included emails/texts, telephonic and direct communications) and a final one if they were not part of any society or clubs (2013). This index was then further recoded into two categories for our analysis, where a score of zero was kept as 'Not Isolated' and a score of 1 was considered as 'socially Isolated'.

Variables used and pre-processing done

Discounting the variables that were used for creating the social isolation index, the other variables used were that about age, sex, education level, alcohol consumption and internet use. The variables used for the study along with their categories and the computations done to calculate them are

listed in table 1. All the variables except to that related to age had missing data, which had already been assigned the values from -9 to -1 in the dataset. These values were assigned as missing values for our analysis. The variables for alcohol intake and internet usage were recoded to merge the original categories into three with labels of low, moderate and extreme. The variable for age also was categorized to include those above 90.

Table 1. List of variables used

Category	Original Variable Name	Recoded Variable name	Description	Values	Type
Social Isolation Index	N.A	BiSocialIsoLevels	Levels of social isolation	0 = Not Isolated 1 = Socially Isolated	Categorical Binary (Dependent)
Age	indager	AgeCategories	Age categories of respondent	1 = 60 – 75 years 2 = 76 – 90 years 3 = 90 plus years	Categorical Ordinal (Independent)
Gender	DiSex	Not recoded	Respondent sex	1 = Male 2 = Female	Categorical Binary
Education Levels	fffqend	Not recoded	Age education ended	1= Not Yet Finished 2=Never Went to School 3=14 or under 4=15 5=16 6=17 7=18 8=19 or over	Categorical Ordinal (Independent)
Alcohol Consumption	scako	AcoholIntakeFreq	Frequency of Alcohol Intake	1 = Low levels of drinking 2 = Moderate levels of drinking 3 = Extreme levels of drinking	Categorical Ordinal (Independent)
Internet use	scint	InternetUseFreq	On average, how often do you use the internet or email?	1 = Very Less Internet Use 2 = Moderate Internet Use 3 = Frequent Internet Use	Categorical Ordinal (Independent)

Analysis

All the analysis was done in version 28 of IBM SPSS Statistics. Since the variables used for this study were categorical in nature, this implied that they were non-normal distributions and the Chi square test used to test the associations between groups could be used to test the association of social isolation with each variable. A binary logistic regression was then done to analyse to check if the independent variables were significant enough to predict if the respondent was socially isolated or not.

Results

Descriptive statistics

The social isolation scores along with the count of people in each score are shown as a bar plot below.

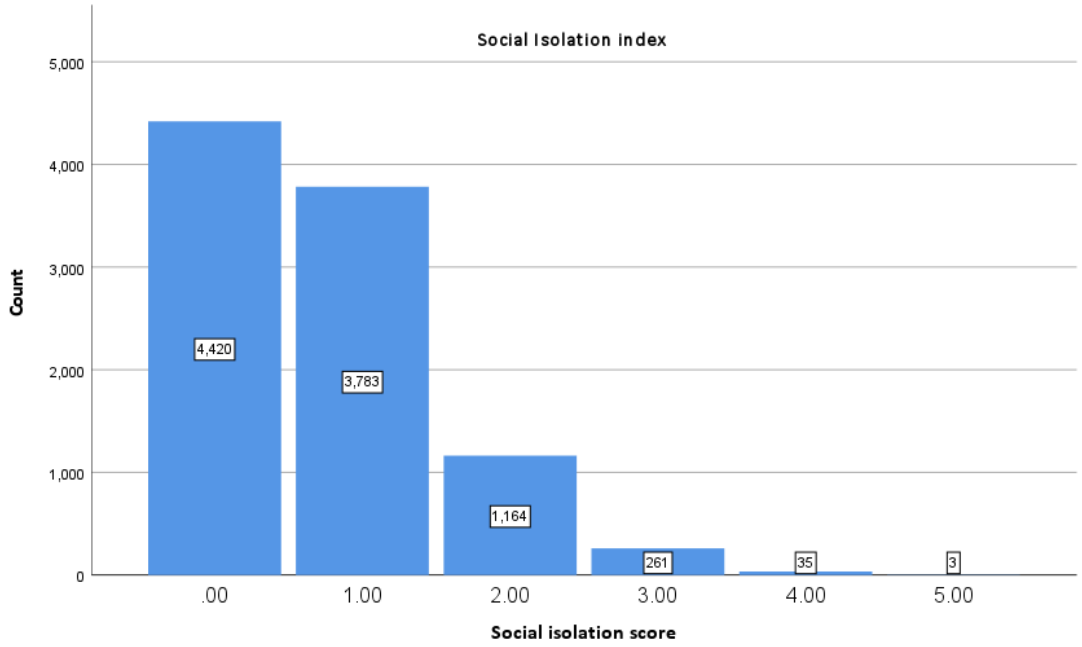

Figure 1. Social isolation index

The descriptive statistics of all the variables being analysed are listed in the tables below.

Table 2. Levels of Isolation - BiSocialIsoLevels

Isolation levels	Frequency	Percent
Not Isolated	4420	45.7
Isolated	5246	54.3
Total	9666	100.0

Table 3. Age categories - AgeCategories

Age categories	Frequency	Percent
60-75 years	5193	70.1
76-90 years	2023	27.3
90 plus	193	2.6
Total	9491	100

*Ages up to 50 were classified as missing

Table 4. Age education ended - fffqend

Age education ended	Frequency	Percent
Not yet finished	139	1.5
Never went to school	36	.4
14 or under	749	7.8
15	2752	28.8
16	2367	24.8
17	838	8.8
18	803	8.4
19 or over	1876	19.6
Total	9560	100.0

Table 5. Respondent Sex - DiSex

Sex	Frequency	Percent
Male	4298	44.5
Female	5368	55.5
Total	9666	100.0

Table 6. Frequency of alcohol intake - AlcoholIntakeFreq

Levels of Drinking	Frequency	Percent
Low levels of drinking	2898	38.6
Moderate levels of drinking	3552	47.3
Extreme levels of drinking	1065	14.2
Total	7515	100.0

Table 7. Frequency of Internet use - InternetUseFreq

Frequency of Internet Use	Frequency	Percent
Very less Internet Use	1991	24.9
Moderate Internet Use	342	4.3
Frequent Internet Use	5659	70.8
Total	7992	100.0

Chi-square tests

The test assumptions required for the Chi-square test were satisfied with both the variables being categorical and all cells having a count of greater than 20. None of the cells had a cell countof less than 5.

Table 8. Crosstabulation between social isolation and age categories.

			Age categories			Total
			60-75 years	76-90 years	90 plus years	
Whether the respondent is socially isolated or not	**Not Isolated**	Count	2504	728	23	3255
		% Within Whether the respondent is socially isolated or not	76.9%	22.4%	0.7%	100.0%
		% Within Age categories	48.2%	36.0%	11.9%	43.9%
	Isolated	Count	2689	1295	170	4154
		% Within Whether the respondent is socially isolated or not	64.7%	31.2%	4.1%	100.0%
		% Within Age categories	51.8%	64.0%	88.1%	56.1%
Total		Count	5193	2023	193	7409
		% Within Whether the respondent is socially isolated or not	70.1%	27.3%	2.6%	100.0%
		% Within Age categories	100.0%	100.0%	100.0%	100.0%

Table 9. Null hypothesis.

Null Hypothesis	
H_0	There is no association between social isolation and age categories.
H_1	There is an association between social isolation and age categories.

Table 10. Chi-Square Test for social isolation and age categories.

	Value	df	Asymptotic Significance (2-sided)
Linear-by-Linear Association	163.145	2	<.001
N of Valid Cases	7409		
Minimum expected count	84.79		
Interpretation	With the p-value being less than 0. 05, we can reject our null hypothesis and conclude that there is an association between social isolation and different age groups (χ^2 = 163.145, p <0. 05). Of the isolated respondents, 64% of them belonged to the ages between 60-75. However, this very group also has the highest non-isolated respondents too. When comparing each age category, only the age group of 60-75 has a lower proportion of non-isolated people. For ages 76-90, 64% of the people are isolated and for ages greater than 90, 88% of the people are socially isolated.		

Table 11. Crosstabulation between social isolation and gender.

			Respondent sex		Total
			Male	Female	
Whether the respondent is socially isolated or not	**Not Isolated**	Count	2068	2352	4420
		% Within Whether the respondent is socially isolated or not	46.8%	53.2%	100.0%
	Isolated	Count	2230	3016	5246
		% Within Whether the respondent is socially isolated or not	42.5%	57.5%	100.0%
Total		Count	4298	5368	9666
		% Within Whether the respondent is socially isolated or not	44.5%	55.5%	100.0%

Table 12. Null hypothesis.

Null Hypothesis	
H_0	There is no association between social isolation and gender.
H_1	There is an association between social isolation and gender.

Table 13. Chi-Square Test for social isolation and gender.

	Value	df	Asymptotic Significance (2-sided)
Continuity Correction	17.612	1	<.001
N of Valid Cases	9666		
Minimum expected count	1965.36		
Interpretation	Since the p-value here is less than 0. 05, the null hypothesis can be rejected, and it can be ascertained that there is a relationship between gender and social isolation (χ^2 = 17.612, p <0. 05). Women tend to be more isolated than men, with 57.5% of them being socially isolated.		

Table 14. Crosstabulation between social isolation and education levels.

			Age education ended								Total
			Not yet finished	Never went to school	14 or under	15	16	17	18	19 or over	
Whether the respondent is socially isolated or not	**Not Isolated**	Count	46	17	239	1100	1062	396	412	1064	4336
		% Within Whether the respondent is socially isolated or not	1.1%	0.4%	5.5%	25.4%	24.5%	9.1%	9.5%	24.5%	100.0%
	Isolated	Count	93	19	510	1652	1305	442	391	812	5224
		% Within Whether the respondent is socially isolated or not	1.8%	0.4%	9.8%	31.6%	25.0%	8.5%	7.5%	15.5%	100.0%
Total		Count	139	36	749	2752	2367	838	803	1876	9560
		% Within Whether the respondent is socially isolated or not	1.5%	0.4%	7.8%	28.8%	24.8%	8.8%	8.4%	19.6%	100.0%

Table 15. Null hypothesis.

Null Hypothesis	
H_0	There is no association between social isolation and education levels.
H_1	There is an association between social isolation and education levels.

Table 16. Chi-Square Test for social isolation and education levels.

	Value	df	Asymptotic Significance (2-sided)
Linear-by-Linear Association	194.817	1	<.001
N of Valid Cases	9560		
Minimum expected count	16.33		
Interpretation	The p-value being less than 0.05 allows us to reject the null hypothesis and allows us to confirm that there exists an association between social isolation and education levels (χ^2 = 194.817, p <0.05). 31.6% and 25% of the respondents who left their education at 15 and 16 respectively experienced socially isolation.		

Table 17. Crosstabulation between social isolation and alcohol intake levels.

			Frequency of Alcohol Intake			Total
			Low levels of drinking	Moderate levels of drinking	Extreme levels of drinking	
Whether the respondent is socially isolated or not	**Not Isolated**	Count	1125	1531	455	3111
		% Within Whether the respondent is socially isolated or not	36.2%	49.2%	14.6%	100.0 %
	Isolated	Count	1773	2021	610	4404
		% Within Whether the respondent is socially isolated or not	40.3%	45.9%	13.9%	100.0 %
Total		Count	2898	3552	1065	7515
		% Within Whether the respondent is socially isolated or not	38.6%	47.3%	14.2%	100.0 %

Table 18. Null hypothesis.

Null Hypothesis	
H_0	There is no association between social isolation and the frequency of alcohol consumption. .
H_1	There is an association between social isolation and the frequency of alcohol consumption.

Table 19. Chi-Square Test for social isolation and alcohol consumption.

	Value	df	Asymptotic Significance (2-sided)
Linear-by-Linear Association	9.246	1	.002
N of Valid Cases	7515		
Minimum expected count	440.88		
Interpretation	With the p-value being less than 0.05, we can reject the null hypothesis and conclude that there is an association between alcohol consumption and social isolation ($\chi^2 = 9.246$, $p < 0.02$). Among the respondents who were not isolated, 49.2% of them consumed alcohol at moderate level which was the highest share of people. However, even among the people who were isolated, the highest share of 45.9% was by people who drank at moderate levels.		

Table 20. Crosstabulation between social isolation and internet use.

			Frequency of Internet use			Total
			Very less Internet Use	Moderate Internet Use	Frequent Internet Use	
Whether the respondent is socially isolated or not	**Not Isolated**	Count	555	132	2663	3350
		% Within Whether the respondent is socially isolated or not	16.6%	3.9%	79.5%	100.0%
	Isolated	Count	1436	210	2996	4642
		% Within Whether the respondent is socially isolated or not	30.9%	4.5%	64.5%	100.0%
Total		Count	1991	342	5659	7992
		% Within Whether the respondent is socially isolated or not	24.9%	4.3%	70.8%	100.0%

Table 21. Null hypothesis.

Null Hypothesis	
H_0	There is no association between social isolation and the frequency of internet use.
H_1	There is an association between social isolation and the frequency of internet use.

Table 22. Chi-Square Test for social isolation and internet use.

	Value	df	Asymptotic Significance (2-sided)
Linear-by-Linear Association	224.015	1	<.001
N of Valid Cases	7992		
Minimum expected count	143.36		
Interpretation	With a p-value less than 0.05, it becomes possible to reject the null hypothesis and accept the alternative that there is an association between internet use and social isolation. Among both the isolated and non-isolated respondents, the highest proportion of people are the ones who use the internet frequently with shares of 64.5% and 79.5% respectively.		

Logistic regression

Table 23. Null hypothesis.

Null Hypothesis	
H_0	There is no association between social isolation and the independent variables.
H_1	There is an association between social isolation and the independent variables.

The summary, coding values of the categorical variables and the output of the logistic regression model is listed in table 18, 19 and 20 respectively.

Table 24. Summary of the binary logistic regression model.

-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
7314.220[a]	.042	.056

The model was able to account for only 5.6% of the variance (R^2 = 0.056) which was an indication of a poor model. 61.5% of the respondents were classified successfully with 25.9% of them being classified correctly as non-isolated and 85.5% of them being classified correctly as socially isolated. Table 19 shows how all the categorical variables were coded.

Table 25. Categorical variables coding.

		Frequency	Parameter coding						
			(1)	(2)	(3)	(4)	(5)	(6)	(7)
Age education ended	Not yet finished	96	.000	.000	.000	.000	.000	.000	.000
	Never went to school	18	1.000	.000	.000	.000	.000	.000	.000
	14 or under	455	.000	1.000	.000	.000	.000	.000	.000
	15	1917	.000	.000	1.000	.000	.000	.000	.000
	16	1223	.000	.000	.000	1.000	.000	.000	.000
	17	477	.000	.000	.000	.000	1.000	.000	.000
	18	382	.000	.000	.000	.000	.000	1.000	.000
	19 or over	1035	.000	.000	.000	.000	.000	.000	1.000
Frequency of Alcohol Intake	Low levels of drinking	2218	.000	.000					
	Moderate levels of drinking	2531	1.000	.000					
	Extreme levels of drinking	854	.000	1.000					
Frequency of Internet use	Very less Internet Use	1724	.000	.000					
	Moderate Internet Use	273	1.000	.000					
	Frequent Internet Use	3606	.000	1.000					
Age categories	60-75 years	4062	.000	.000					
	76-90 years	1454	1.000	.000					
	90 plus years	87	.000	1.000					
Respondent sex	Male	2519	.000						
	Female	3084	1.000						

Table 26. Significance of each independent variable with social isolation.

				95% C.I.for EXP(B)	
Variables	**df**	**Sig**	**Exp(B)**	**Lower**	**Upper**
Age categories	2	<.001			
Age categories (1)	1	<.001	1.270	1.105	1.460
Age categories (2)	1	<.001	3.597	1.880	6.885
Respondent sex (1)	1	.055	1.115	.998	1.247
Frequency of Internet use	2	<.001			
Frequency of Internet use (1)	1	.016	.717	.547	.939
Frequency of Internet use (2)	1	<.001	.589	.513	.677
Age education ended	7	<.001			

Age education ended (1)	1	.009	.238	.081	.694
Age education ended (2)	1	.376	.799	.485	1.315
Age education ended (3)	1	.162	.721	.457	1.140
Age education ended (4)	1	.108	.684	.431	1.087
Age education ended (5)	1	.030	.586	.361	.951
Age education ended (6)	1	.016	.546	.334	.893
Age education ended (7)	1	.002	.478	.300	.761
Frequency of Alcohol Intake	2	.172			
Frequency of Alcohol Intake (1)	1	.093	.903	.801	1.017
Frequency of Alcohol Intake (2)	1	.915	1.009	.854	1.193
Constant	1	<.001	3.062		

Of all the variables analysed, the p values of alcohol intake frequency and sex were not significant enough with values of 0.055 and 0.172 respectively both of which were greater than o.o5.

Table 27 Interpreting the binary logistic regression.

Category	**Variable**	**Exp (B)**	**Interpretation**
Age	Age category: 60 -75		Reference category
	Age categories (1)	1.270	Respondents who where in the age groups of '76-90' were 1.27 times more likely to experience social isolation when compared to people who were between 60-75 (p <0.01, Cl = 1.105 – 1.460)
	Age categories (2)	3.597	Respondents who were above 90 were 3.6 times more likely to experience social isolation when compared to people who were between 60-75 (p <0.01, Cl = 1.105 – 1.460)
Sex	Respondent sex: Male		Reference category
	Respondent sex (1)	1.115	Not significant (p > 0.05, p = 0.055, Cl = 0.998 - 1.247)
Internet use	Frequency of internet use: very less internet use		Reference category

	Frequency of Internet use (1)	0.717	Compared to the respondents who **rarely** used the internet, the people who used the internet **moderately** were 0.717 times more likely to experience social isolation (p = 0.016, CI = 0.547 – 0.939).
	Frequency of Internet use (2)	0.589	Compared to the respondents who **rarely** used the internet, the people who used the internet **frequently** were 0.589 times more likely to experience social isolation (p <0.001, CI = 0.513 – 0.677).
Levels of education	Age education ended: Not yet finished		Reference category
	Age education ended (1)	0.238	Compared to the people who were **yet to finish** their education, people who **never went** to school were 0.24 times more likely to experience social isolation (p =0.009, CI = 0.081 – 0.694).
	Age education ended (2)	0.799	Not significant, since p >0.05 (p = 0.376, CI = 0.485 – 1.315).
	Age education ended (3)	0.721	Not significant, since p >0.05 (p = 0.162, CI = 0.457 – 1.140).
	Age education ended (4)	0.684	Not significant, since p >0.05 (p = 0.108, CI = 0.431 – 1.087).
	Age education ended (5)	0.586	Compared to the people who were **yet to finish** their education, people who completed their education **at the age of 17** were 0.59 times more likely to experience social isolation (p = 0.030, CI = 0.361 – 0.951)
	Age education ended (6)	0.546	Compared to the people who were **yet to finish** their education, people who completed their education **at the age of 18** were 0.55 times more likely to experience social isolation (p = 0.016, CI = 0.334 – 0.893)
	Age education ended (7)	0.478	Compared to the people who were **yet to finish** their education, people who completed their education **at the ages of 19 or over** were 0.48 times more likely to experience social isolation (p = 0.002, CI = 0.300 – 0.761)
Alcohol consumption	Frequency of Alcohol Intake		Was not significant since the p value was greater than 0.05 (p = 0.172).

Discussions

The descriptive statistics for the social isolation index indicate that several ageing people in the UK are experiencing social isolation. The score is created based on various engagement variables that it becomes difficult to attain a higher score and the fact that there are 38 people with scores of 4 and 5 is an indication that these people are extremely isolated.

The results indicate that social isolation does tend to vary with age as has been indicated in studies so far. The chi^2 test informs us that the highest share of isolated people is from the age groups 60 – 75, however, this is mostly because the number of participants in this group is quite high compared to the other two. The proportion of socially isolated people in each category does keep increasing, with people in the age group of over 90 having the highest proportion of socially isolated people. This can also be inferred from the regression, where an individual who is over 90 is 3.6 times more likely to be isolated than one who is between 60-75.

The chi^2 test to test the association of social isolation with gender was in tandem with present-day studies. Different genders experienced social isolation in different ways with females having the highest proportion of isolated individuals. However, this factor was not significant enough to classify our dependent variable during the regression.

The results for internet use were mixed, which was in accordance with the literature reviewed. The chi^2 test indicated that amongst the isolated and non-isolated people, the majority of them were frequent internet users. The results of the regression indicated that people who use the internet moderately are more likely to be isolated than the ones who use it rarely or frequently.

The chi^2 test to check for the association between social isolation and education levels revealed that a significant share of the isolated people had completed their education at the ages of 15 and 16. However, the very same trend was observed amongst the people who weren't socially isolated also. The regression test results were insignificant for people who completed their education at 16 or below. The results suggest that people who completed their education at 19 or are still studying are less likely to be isolated than the ones who completed it at 18 and 17, although the difference isn't that pronounced.

The chi^2 test picked up associations between alcohol consumption and social isolation, however, this was not in line with expected values. Amongst the non-isolated most of them were moderate drinkers which were expected; however, this very same behaviour was observed amongst the isolated people also, with most of them being moderate drinkers. The alcohol consumption levels were also insignificant for classifying whether one was isolated or not.

Conclusion

This study was aimed at understanding if social isolation amongst the respondents in the ELSA study exhibited the same characteristics as which was seen in other studies worldwide. The study revealed the disproportionality among isolated and non-isolated people in various three age groups, and the fact that ageing exposes more people to isolation is something that needs to be addressed. Levels of internet use revealed mixed results, with people who used it moderately being the most vulnerable to isolation. The study could not find proper backing to support the claim that alcohol was a social lubricant, with the proportion of isolated and non-isolated people being not that great amongst moderate drinkers. As seen from the results, education levels also had associations with isolation with people who stopped their education in their mid-teens experiencing it the most. Social isolation has already proven to have adverse effects on the health of people and given that it is an under assessed condition in older people, it becomes more necessary for researchers to study this subject and understand how social isolation stems from (Nicholson, 2012).

Limitations and scopes for improvement

This study comes with its own set of limitations, the first one being the limited number of insights obtained through the study. The study done here is a cross sectional study rather than a longitudinal one. A longitudinal study might be able to give better insights on understanding social isolation and origins. Another limitation is that of the variable use concerning internet. The association of social isolation and internet was mixed amongst the various groups. A reason behind this could be that these groups could have been engaging with the internet in different ways. Given that researchers are trying to gauge the impact of social media on isolation among older people, it would be more beneficial to investigate specific internet activities rather than club all together(Primack et al., 2017). The next limitation is that pertaining to alcohol, the effects of alcohol have been known to aggravate with smoking or other socio-economic factors. However, since adding those variables seemed out of scope for this study, they were excluded. The binary logistic regression model created here was poor and accounted for only 5.6% of the variance, which implied that the variables selected weren't sufficient or appropriate enough to classify isolation levels which was an area that needed improvement.

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Appendix

Appendix A

Creating the social isolation index

The score was created by measuring the participation in clubs and the participants interaction with their families. One point was given if the participant was not part of any club, one was given if the participant was not living with anyone and a point each if they maintained less than monthly contact with their family, friends and children.

1. Participation in clubs and societies

Frequencies

Statistics

Sum of participation score based on 7 activities

N	Valid	7803
	Missing	1863
Mode		1.00
Range		8.00
Minimum		.00
Maximum		8.00

Sum of participation score based on 7 activities

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	2285	23.6	29.3	29.3
	1.00	2366	24.5	30.3	59.6
	2.00	1579	16.3	20.2	79.8
	3.00	913	9.4	11.7	91.5
	4.00	405	4.2	5.2	96.7
	5.00	164	1.7	2.1	98.8
	6.00	46	.5	.6	99.4
	7.00	13	.1	.2	99.6
	8.00	32	.3	.4	100.0
	Total	7803	80.7	100.0	
Missing	System	1863	19.3		
Total		9666	100.0		

2. Measuring relationship status

Frequencies

Statistics

Score to measure relationship status

N	Valid	9666
	Missing	0
Mode		.00
Range		1.00
Minimum		.00
Maximum		1.00

Score to measure relationship status

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	6964	72.0	72.0	72.0
	1.00	2702	28.0	28.0	100.0
	Total	9666	100.0	100.0	

3. Measuring how often people interact with friends

Frequencies

Statistics

RelationshipScoreFriend

N	Valid	7489
	Missing	2177
Mode		.00
Range		1.00
Minimum		.00
Maximum		1.00

RelationshipScoreFriend

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	6961	72.0	92.9	92.9
	1.00	528	5.5	7.1	100.0
	Total	7489	77.5	100.0	
Missing	System	2177	22.5		
Total		9666	100.0		

4. Measuring how often people interact with their children

Frequencies

Statistics

Score to indicate how often does respondent text children

N	Valid	6188
	Missing	3478
Mode		.00
Range		1.00
Minimum		.00
Maximum		1.00

Score to indicate how often does respondent text children

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	4289	44.4	69.3	69.3
	1.00	1899	19.6	30.7	100.0
	Total	6188	64.0	100.0	
Missing	System	3478	36.0		
Total		9666	100.0		

5. Measuring how often people interact with their family

Frequencies

Statistics

RelationshipScoreFamily

N	Valid	7364
	Missing	2302
Mode		.00
Range		1.00
Minimum		.00
Maximum		1.00

RelationshipScoreFamily

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	6046	62.5	82.1	82.1
	1.00	1318	13.6	17.9	100.0
	Total	7364	76.2	100.0	
Missing	System	2302	23.8		
Total		9666	100.0		

6. Measuring Social Isolation

Frequencies

Statistics

Score to indicate how socially isolated respondent is

N	Valid	9666
	Missing	0
Mode		.00
Range		5.00
Minimum		.00
Maximum		5.00

Score to indicate how socially isolated respondent is

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	.00	4420	45.7	45.7	45.7
	1.00	3783	39.1	39.1	84.9
	2.00	1164	12.0	12.0	96.9
	3.00	261	2.7	2.7	99.6
	4.00	35	.4	.4	100.0
	5.00	3	.0	.0	100.0
	Total	9666	100.0	100.0	

7. Converting the index into two categories

Frequencies

Statistics

Whether the respondent is socially isolated or not

N	Valid	9666
	Missing	0
Mode		1.00
Range		1.00
Minimum		.00
Maximum		1.00

Whether the respondent is socially isolated or not

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Isolated	4420	45.7	45.7	45.7
	Isolated	5246	54.3	54.3	100.0
	Total	9666	100.0	100.0	

Appendix B

Independent variables used

1. AgeCategories

Frequencies

Statistics

Age categories

N	Valid	7409
	Missing	2257
Mode		1.00
Range		2.00
Minimum		1.00
Maximum		3.00

Age categories

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	60-75 years	5193	53.7	70.1	70.1
	76-90 years	2023	20.9	27.3	97.4
	90 plus years	193	2.0	2.6	100.0
	Total	7409	76.7	100.0	
Missing	System	2257	23.3		
Total		9666	100.0		

2. DiSex (Sex of participant)

Frequencies

Statistics

Respondent sex

N	Valid	9666
	Missing	0
Mode		2
Range		1
Minimum		1
Maximum		2

Respondent sex

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	4298	44.5	44.5	44.5
	Female	5368	55.5	55.5	100.0
	Total	9666	100.0	100.0	

3. fffqend (Education levels)

Frequencies

Statistics

Age education ended (IFFW.FqEnd)

N	Valid	9560
	Missing	106
Mode		4
Range		7
Minimum		1
Maximum		8

Age education ended (IFFW.FqEnd)

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not yet finished	139	1.4	1.5	1.5
	Never went to school	36	.4	.4	1.8
	14 or under	749	7.7	7.8	9.7
	15	2752	28.5	28.8	38.5
	16	2367	24.5	24.8	63.2
	17	838	8.7	8.8	72.0
	18	803	8.3	8.4	80.4
	19 or over	1876	19.4	19.6	100.0
	Total	9560	98.9	100.0	
Missing	Item not applicable	35	.4		
	System	71	.7		
	Total	106	1.1		
Total		9666	100.0		

4. AlcoholIntake (Frequency of alcohol use)

Original Variable:

Frequencies

Statistics

Alcohol Intake levels

N	Valid	7515
	Missing	2151
Mode		5.00
Range		7.00
Minimum		1.00
Maximum		8.00

Alcohol Intake levels

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not at all in the last 12 months	1059	11.0	14.1	14.1
	Once or twice a year	1839	19.0	24.5	38.6
	Once every couple of months	619	6.4	8.2	46.8
	Once or twice a month	935	9.7	12.4	59.2
	Once or twice a week	1998	20.7	26.6	85.8
	Almost every day	1065	11.0	14.2	100.0
	Total	7515	77.7	100.0	
Missing	System	2151	22.3		
Total		9666	100.0		

Recoded Variable:

Frequencies

Statistics

Frequency of Alcohol Intake

N	Valid	7515
	Missing	2151
Mode		2.00
Range		2.00
Minimum		1.00
Maximum		3.00

Frequency of Alcohol Intake

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Low levels of drinking	2898	30.0	38.6	38.6
	Moderate levels of drinking	3552	36.7	47.3	85.8
	Extreme levels of drinking	1065	11.0	14.2	100.0
	Total	7515	77.7	100.0	
Missing	System	2151	22.3		
Total		9666	100.0		

5. InternetUseFreq (Frequency of internet use)

Original variable:

Frequencies

Statistics

On average, how often do you use the internet or email?

N	Valid	7992
	Missing	1674

On average, how often do you use the internet or email?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Every day, or almost every day	4760	49.2	59.6	59.6
	At least once a week (but not every day)	899	9.3	11.2	70.8
	At least once a month (but not every week)	272	2.8	3.4	74.2
	At least once every 3 months	70	.7	.9	75.1
	Less than every 3 months	112	1.2	1.4	76.5
	Never	1879	19.4	23.5	100.0
	Total	7992	82.7	100.0	
Missing	Not answered (9)	205	2.1		
	Schedule not applicable	1469	15.2		
	Total	1674	17.3		
Total		9666	100.0		

Recoded variable:

Frequencies

Statistics

Frequency of Internet use

N	Valid	7992
	Missing	1674
Mode		3.00
Range		2.00
Minimum		1.00
Maximum		3.00

Frequency of Internet use

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Very less Internet Use	1991	20.6	24.9	24.9
	Moderate Internet Use	342	3.5	4.3	29.2
	Frequent Internet Use	5659	58.5	70.8	100.0
	Total	7992	82.7	100.0	
Missing	System	1674	17.3		
Total		9666	100.0		

Appendix C: Chi-square tests

1. Social isolation*Age categories

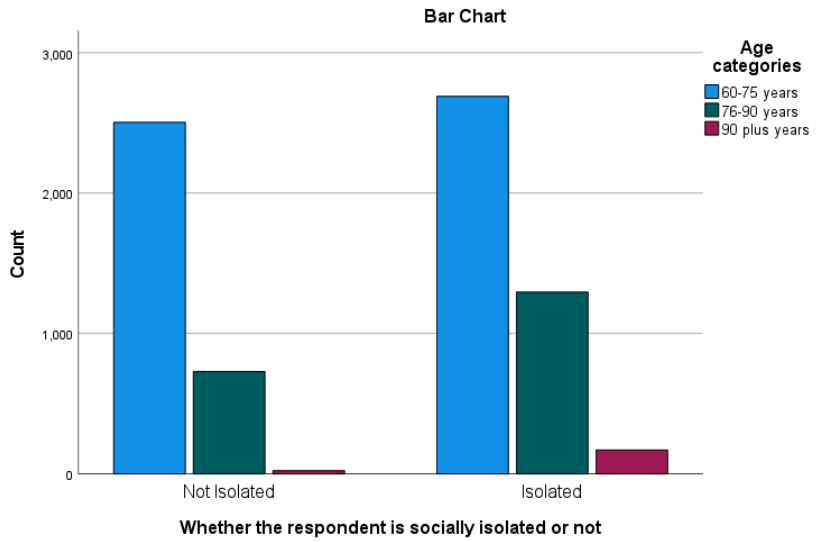
Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Whether the respondent is socially isolated or not * Age categories	7409	76.7%	2257	23.3%	9666	100.0%

Whether the respondent is socially isolated or not * Age categories Crosstabulation

			Age categories			
			60-75 years	76-90 years	90 plus years	Total
Whether the respondent is socially isolated or not	Not Isolated	Count	2504	728	23	3255
		% within Whether the respondent is socially isolated or not	76.9%	22.4%	0.7%	100.0%
		% within Age categories	48.2%	36.0%	11.9%	43.9%
	Isolated	Count	2689	1295	170	4154
		% within Whether the respondent is socially isolated or not	64.7%	31.2%	4.1%	100.0%
		% within Age categories	51.8%	64.0%	88.1%	56.1%
Total		Count	5193	2023	193	7409
		% within Whether the respondent is socially isolated or not	70.1%	27.3%	2.6%	100.0%
		% within Age categories	100.0%	100.0%	100.0%	100.0%



Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	170.904[a]	2	<.001
Likelihood Ratio	184.866	2	<.001
Linear-by-Linear Association	163.145	1	<.001
N of Valid Cases	7409		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 84.79.

2. Social Isolation * Respondent sex

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Whether the respondent is socially isolated or not * Respondent sex	9666	100.0%	0	0.0%	9666	100.0%

Whether the respondent is socially isolated or not * Respondent sex Crosstabulation

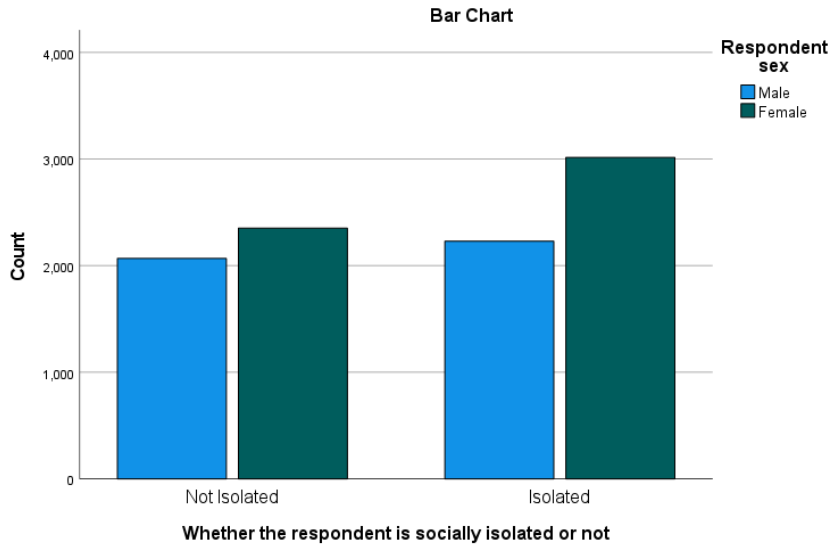
			Respondent sex		
			Male	Female	Total
Whether the respondent is socially isolated or not	Not Isolated	Count	2068	2352	4420
		% within Whether the respondent is socially isolated or not	46.8%	53.2%	100.0%
	Isolated	Count	2230	3016	5246
		% within Whether the respondent is socially isolated or not	42.5%	57.5%	100.0%
Total		Count	4298	5368	9666
		% within Whether the respondent is socially isolated or not	44.5%	55.5%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	17.785[a]	1	<.001		
Continuity Correction[b]	17.612	1	<.001		
Likelihood Ratio	17.781	1	<.001		
Fisher's Exact Test				<.001	<.001
Linear-by-Linear Association	17.783	1	<.001		
N of Valid Cases	9666				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 1965.36.

b. Computed only for a 2x2 table



3. Social Isolation* Education Levels

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Whether the respondent is socially isolated or not * Age education ended (IFFW.FqEnd)	9560	98.9%	106	1.1%	9666	100.0%

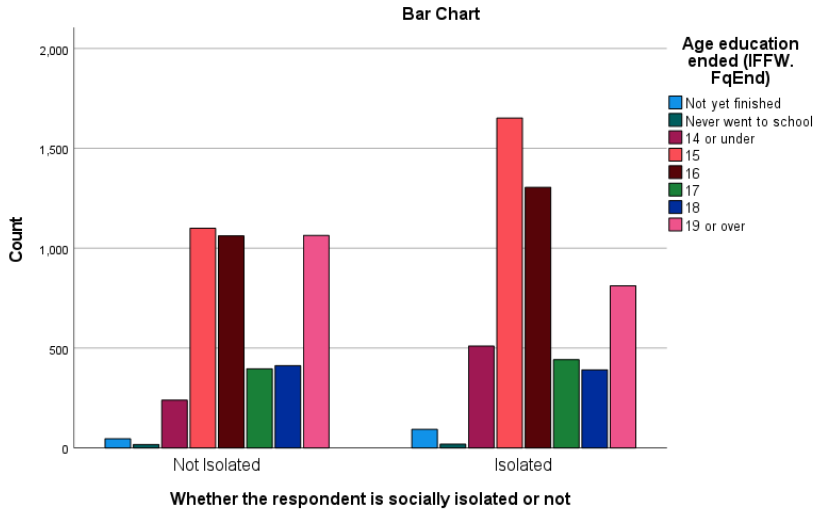
Whether the respondent is socially isolated or not * Age education ended (IFFW.FqEnd) Crosstabulation

			Age education ended (IFFW.FqEnd)								
			Not yet finished	Never went to school	14 or under	15	16	17	18	19 or over	Total
Whether the respondent is socially isolated or not	Not Isolated	Count	46	17	239	1100	1062	396	412	1064	4336
		% within Whether the respondent is socially isolated or not	1.1%	0.4%	5.5%	25.4%	24.5%	9.1%	9.5%	24.5%	100.0%
	Isolated	Count	93	19	510	1652	1305	442	391	812	5224
		% within Whether the respondent is socially isolated or not	1.8%	0.4%	9.8%	31.6%	25.0%	8.5%	7.5%	15.5%	100.0%
Total		Count	139	36	749	2752	2367	838	803	1876	9560
		% within Whether the respondent is socially isolated or not	1.5%	0.4%	7.8%	28.8%	24.8%	8.8%	8.4%	19.6%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	205.941[a]	7	<.001
Likelihood Ratio	207.525	7	<.001
Linear-by-Linear Association	194.817	1	<.001
N of Valid Cases	9560		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 16.33.



4. Social isolation * Frequency of alcohol intake

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Whether the respondent is socially isolated or not * Frequency of Alcohol Intake	7515	77.7%	2151	22.3%	9666	100.0%

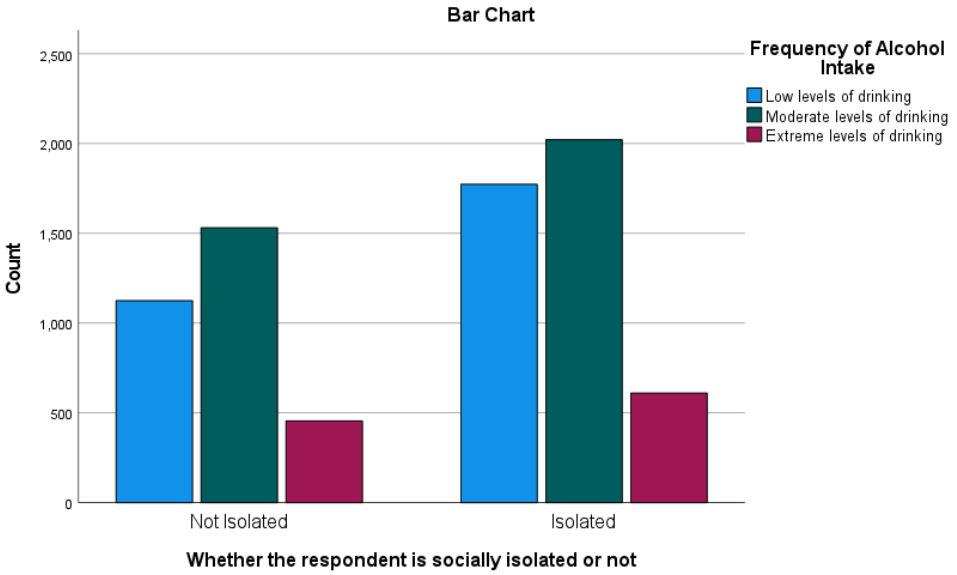
Whether the respondent is socially isolated or not * Frequency of Alcohol Intake Crosstabulation

			Frequency of Alcohol Intake			
			Low levels of drinking	Moderate levels of drinking	Extreme levels of drinking	Total
Whether the respondent is socially isolated or not	Not Isolated	Count	1125	1531	455	3111
		% within Whether the respondent is socially isolated or not	36.2%	49.2%	14.6%	100.0%
	Isolated	Count	1773	2021	610	4404
		% within Whether the respondent is socially isolated or not	40.3%	45.9%	13.9%	100.0%
Total		Count	2898	3552	1065	7515
		% within Whether the respondent is socially isolated or not	38.6%	47.3%	14.2%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12.964[a]	2	.002
Likelihood Ratio	12.998	2	.002
Linear-by-Linear Association	9.246	1	.002
N of Valid Cases	7515		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 440.88.



5. Social isolation * Frequency of internet use

Crosstabs

Case Processing Summary

	Cases					
	Valid		Missing		Total	
	N	Percent	N	Percent	N	Percent
Whether the respondent is socially isolated or not * Frequency of Internet use	7992	82.7%	1674	17.3%	9666	100.0%

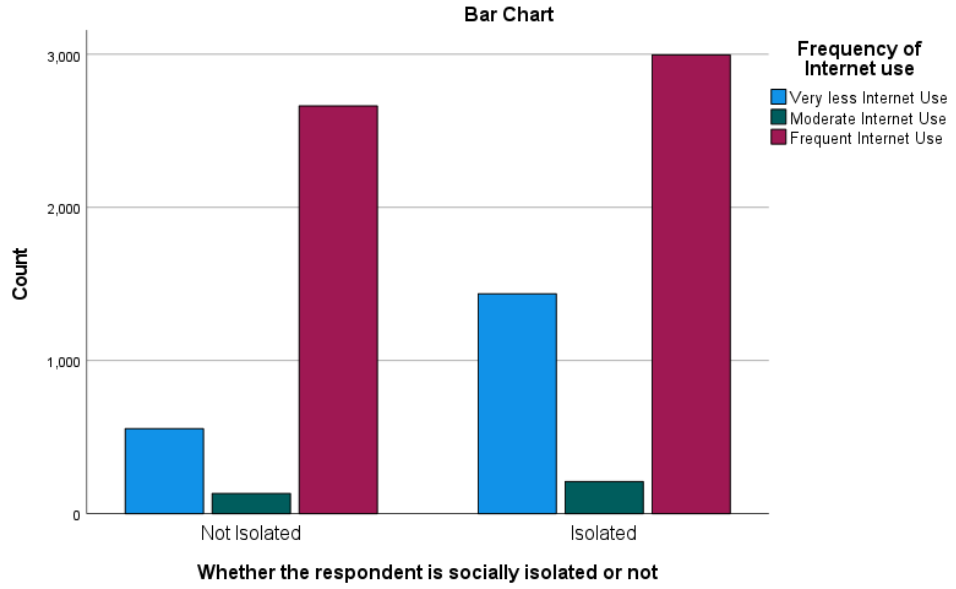
Whether the respondent is socially isolated or not * Frequency of Internet use Crosstabulation

			Frequency of Internet use			
			Very less Internet Use	Moderate Internet Use	Frequent Internet Use	Total
Whether the respondent is socially isolated or not	Not Isolated	Count	555	132	2663	3350
		% within Whether the respondent is socially isolated or not	16.6%	3.9%	79.5%	100.0%
	Isolated	Count	1436	210	2996	4642
		% within Whether the respondent is socially isolated or not	30.9%	4.5%	64.5%	100.0%
Total		Count	1991	342	5659	7992
		% within Whether the respondent is socially isolated or not	24.9%	4.3%	70.8%	100.0%

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	224.212[a]	2	<.001
Likelihood Ratio	231.439	2	<.001
Linear-by-Linear Association	224.015	1	<.001
N of Valid Cases	7992		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 143.36.



Appendix D: Logistic regression

Case Processing Summary

Unweighted Cases[a]		N	Percent
Selected Cases	Included in Analysis	5603	58.0
	Missing Cases	4063	42.0
	Total	9666	100.0
Unselected Cases		0	.0
Total		9666	100.0

a. If weight is in effect, see classification table for the total number of cases.

Dependent Variable Encoding

Original Value	Internal Value
Not Isolated	0
Isolated	1

Categorical Variables Codings

			Parameter coding						
		Frequency	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Age education ended (IFFW.FqEnd)	Not yet finished	96	.000	.000	.000	.000	.000	.000	.000
	Never went to school	18	1.000	.000	.000	.000	.000	.000	.000
	14 or under	455	.000	1.000	.000	.000	.000	.000	.000
	15	1917	.000	.000	1.000	.000	.000	.000	.000
	16	1223	.000	.000	.000	1.000	.000	.000	.000
	17	477	.000	.000	.000	.000	1.000	.000	.000
	18	382	.000	.000	.000	.000	.000	1.000	.000
	19 or over	1035	.000	.000	.000	.000	.000	.000	1.000
Frequency of Alcohol Intake	Low levels of drinking	2218	.000	.000					
	Moderate levels of drinking	2531	1.000	.000					
	Extreme levels of drinking	854	.000	1.000					
Frequency of Internet use	Very less Internet Use	1724	.000	.000					
	Moderate Internet Use	273	1.000	.000					
	Frequent Internet Use	3606	.000	1.000					
Age categories	60-75 years	4062	.000	.000					
	76-90 years	1454	1.000	.000					
	90 plus years	87	.000	1.000					
Respondent sex	Male	2519	.000						
	Female	3084	1.000						

Block 0: Beginning Block

Classification Table[a,b]

Observed			Predicted: Whether the respondent is socially isolated or not		Percentage Correct
			Not Isolated	Isolated	
Step 0	Whether the respondent is socially isolated or not	Not Isolated	0	2254	.0
		Isolated	0	3349	100.0
	Overall Percentage				59.8

a. Constant is included in the model.

b. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 0	Constant	.396	.027	211.223	1	<.001	1.486

Variables not in the Equation

			Score	df	Sig.
Step 0	Variables	Age categories	86.965	2	<.001
		Age categories(1)	52.805	1	<.001
		Age categories(2)	27.966	1	<.001
		Respondent sex(1)	8.957	1	.003
		Frequency of Internet use	153.302	2	<.001
		Frequency of Internet use (1)	.373	1	.542
		Frequency of Internet use (2)	143.194	1	<.001
		Age education ended (IFFW.FqEnd)	107.874	7	<.001
		Age education ended (IFFW.FqEnd)(1)	3.275	1	.070
		Age education ended (IFFW.FqEnd)(2)	33.511	1	<.001
		Age education ended (IFFW.FqEnd)(3)	18.146	1	<.001
		Age education ended (IFFW.FqEnd)(4)	.526	1	.468
		Age education ended (IFFW.FqEnd)(5)	3.126	1	.077
		Age education ended (IFFW.FqEnd)(6)	5.824	1	.016
		Age education ended (IFFW.FqEnd)(7)	59.242	1	<.001
		Frequency of Alcohol Intake	10.655	2	.005
		Frequency of Alcohol Intake(1)	6.853	1	.009
		Frequency of Alcohol Intake(2)	.627	1	.428
	Overall Statistics		228.030	14	<.001

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

		Chi-square	df	Sig.
Step 1	Step	237.807	14	<.001
	Block	237.807	14	<.001
	Model	237.807	14	<.001

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	7314.220[a]	.042	.056

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than .001.

Classification Table[a]

			Predicted		
			Whether the respondent is socially isolated or not		
	Observed		Not Isolated	Isolated	Percentage Correct
Step 1	Whether the respondent is socially isolated or not	Not Isolated	583	1671	25.9
		Isolated	486	2863	85.5
	Overall Percentage				61.5

a. The cut value is .500

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B) Lower	Upper
Step 1[a]	Age categories			23.781	2	<.001			
	Age categories(1)	.239	.071	11.333	1	<.001	1.270	1.105	1.460
	Age categories(2)	1.280	.331	14.940	1	<.001	3.597	1.880	6.885
	Respondent sex(1)	.109	.057	3.696	1	.055	1.115	.998	1.247
	Frequency of Internet use			56.025	2	<.001			
	Frequency of Internet use (1)	-.333	.138	5.827	1	.016	.717	.547	.939
	Frequency of Internet use (2)	-.529	.071	55.957	1	<.001	.589	.513	.677
	Age education ended (IFFW.FqEnd)			40.735	7	<.001			
	Age education ended (IFFW.FqEnd)(1)	-1.437	.547	6.909	1	.009	.238	.081	.694
	Age education ended (IFFW.FqEnd)(2)	-.225	.254	.782	1	.376	.799	.485	1.315
	Age education ended (IFFW.FqEnd)(3)	-.327	.233	1.959	1	.162	.721	.457	1.140
	Age education ended (IFFW.FqEnd)(4)	-.379	.236	2.583	1	.108	.684	.431	1.087
	Age education ended (IFFW.FqEnd)(5)	-.535	.247	4.687	1	.030	.586	.361	.951
	Age education ended (IFFW.FqEnd)(6)	-.606	.251	5.822	1	.016	.546	.334	.893
	Age education ended (IFFW.FqEnd)(7)	-.738	.237	9.683	1	.002	.478	.300	.761
	Frequency of Alcohol Intake			3.519	2	.172			
	Frequency of Alcohol Intake(1)	-.102	.061	2.814	1	.093	.903	.801	1.017
	Frequency of Alcohol Intake(2)	.009	.085	.011	1	.915	1.009	.854	1.193
	Constant	1.119	.240	21.812	1	<.001	3.062		

a. Variable(s) entered on step 1: Age categories, Respondent sex, Frequency of Internet use, Age education ended (IFFW.FqEnd), Frequency of Alcohol Intake.