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## Life Course Transitions and Changes in Alcohol Consumption Among Older Irish Adults: Results From The Irish Longitudinal Study on Ageing (TILDA).

### AUTHOR(S)

Alice E. Holton, Fiona Boland, Paul Gallagher, Tom Fahey, Roseanne Kenny, Gráinne Cousins

### CITATION

Holton, Alice E.; Boland, Fiona; Gallagher, Paul; Fahey, Tom; Kenny, Roseanne; Cousins, Gráinne (2018): Life Course Transitions and Changes in Alcohol Consumption Among Older Irish Adults: Results From The Irish Longitudinal Study on Ageing (TILDA).. figshare. Journal contribution.  
<https://hdl.handle.net/10779/rcsi.10797626.v1>

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# Journal of Aging and Health

## Life course transitions and changes in alcohol consumption among older Irish adults: Results from the Irish Longitudinal Study on Ageing (TILDA)

Journal:	<i>Journal of Aging and Health</i>
Manuscript ID	JAH-18-211.R1
Manuscript Type:	Original Article
Keywords:	alcohol, older adults, heavy episodic, life course transitions
Abstract:	<p>Objective: Determine if trajectories of older adults' alcohol consumption are influenced by transitions in relationship status, employment status and self-rated health.</p> <p>Methods: Volume and frequency of drinking were harmonised across first three waves of TILDA (N=4,295). Multilevel regression models used to model frequency, average weekly consumption and heavy episodic drinking.</p> <p>Results: Men and women drank more frequently over time, with frequency decreasing with age for women. Average weekly consumption decreased over time and with increasing age. Transitions in self-rated health, particularly those reflecting poorer health, were associated with lower frequency and weekly consumption. Heavy episodic drinking decreased with age. Men who were retired across all waves were more likely to engage in heavy episodic drinking at baseline.</p> <p>Discussion: Despite the decline in average weekly consumption and heavy episodic drinking, the observed quantities consumed and the increase in frequency of consumption suggests that older Irish adults remain vulnerable to alcohol-related harms.</p>

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### Supplementary File 1: Frequency and quantity measurements used at each wave and overview of alcohol harmonisation across three waves of TILDA

**Table S1: Alcohol frequency questions in each wave of TILDA**

Baseline	Wave 2	Wave 3
During the last <b>six months</b> , how often have you drunk any alcoholic beverages, like beer, cider, wine, spirits or cocktails?	During the last <b>12 months</b> how often have you drunk any alcohol beverages like beer, cider, wine, spirits or cocktails?	During the last <b>6 months</b> how often have you had drinks containing alcohol like beer, cider wine, spirits or cocktails?
Almost every day	Daily	Daily
Five or six days a week	Four to six days a week	Four to six days a week
Three or four days a week	Two to three days a week	Two to three days a week
Once or twice a week	Once a week	Once a week
Once or twice a month	Two to three days a month	Two to three days a month
Less than once a month	Once a month	Once a month
Not at all in the last 6 months	One or a couple of days per year	One or a couple of days per year

**Table S2: Quantity of alcohol at waves 1, 2 and 3**

Baseline	Wave 2	Wave 3																																																																																								
During the last six months, on the days you drink, about how many drinks do you have?	In the last 12 months on the days that you drink about how many drinks do you have?	From the pictures below please tick the box that represents the drink you would be most likely to drink?																																																																																								
	<p>PLEASE TICK ALL THAT APPLY TO YOU</p> <table border="1"> <thead> <tr> <th></th> <th>0</th> <th>1-2</th> <th>3-4</th> <th>5-6</th> <th>7-8</th> <th>9 OR MORE</th> </tr> </thead> <tbody> <tr> <td>Full pint of beer/ cider/ lager </td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>1/2 pint or glass of beer/ cider/ lager </td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Large can/ bottle of beer/ cider/ lager </td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td>Small can/ 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type="checkbox"/>	Pre-mixed spirit drink (e.g. Smirnoff Ice)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<p>PLEASE TICK ONE BOX</p> <table border="1"> <thead> <tr> <th>Full pint of beer/ cider/ lager</th> <th>Full pint of stout</th> <th>1/2 pint or glass of stout/beer/ cider/ lager</th> <th>Large glass of wine</th> <th>Measure of spirit</th> <th>Pre-mixed spirit drink (e.g. Smirnoff Ice)</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </tbody> </table> <p>Thinking about your drink of choice on average in the last 6 months on the days you drank about how many did you have?</p>	Full pint of beer/ cider/ lager	Full pint of stout	1/2 pint or glass of stout/beer/ cider/ lager	Large glass of wine	Measure of spirit	Pre-mixed spirit drink (e.g. Smirnoff Ice)							<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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### Harmonisation of alcohol frequencies across TILDA waves

Frequency response options were identical for waves 2 and 3, albeit it with different recall periods, with different baseline frequency response options. In order to address these differences, we sought to harmonise frequency of alcohol consumption across the three waves by applying the following categories “none”, “monthly/special occasions”, “weekly infrequent-not on a daily/almost daily basis”, and “weekly frequent – on a daily/ almost daily basis” (Table 3). This is consistent with Britton et al’s harmonisation of alcohol frequency across nine cohort studies in the United Kingdom (Britton et al., 2015).

**Table S3: Harmonized alcohol frequencies between TILDA waves**

Harmonised Frequency Categories	Baseline	Wave 2	Wave 3
<b>0. None</b>	Not at all in the last 6 months	Not at all in the last 12 months	Not at all in the last 12 months
<b>1. Monthly/special occasions</b>	Once or twice a month/ Less than once month	One or a couple of days a year/ once a month/ 2-3 days a month	One or a couple of days a year/ once a month/ 2-3 days a month
<b>2. Weekly infrequent (not on daily/ almost daily basis)</b>	Once or twice a week/ 3-4 days a week	Once a week / 2-3 days a week	Once a week/ 2-3 days a week
<b>3. Weekly frequent (on daily/ almost daily basis)</b>	Almost every day/ 5-6 days a week	Daily/4-6 days a week	Daily/4-6 days a week

### Harmonisation of average weekly alcohol consumption across TILDA waves

Baseline measurement involved a generic quantity x frequency (QF) measure, where participants reported how often they consumed alcohol in the past 6 months (F) and how many drinks they consumed on the days that they drank alcohol (Q). However, drinks were not defined in terms of standard drinks, as the actual measurement was not recorded (e.g. whether person normally drank pints or bottles or cans etc). Consequently a person who reported normally consuming two drinks, referring to two pints of beer would be calculated as two drinks or 20 grams alcohol as opposed to the correct quantity of four standard drinks or 40 grams alcohol. In contrast, wave2 used beverage-specific

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3 measurements for quantity (Q), with participants reporting the quantity of each specific beverage  
4 consumed on the days that they drank in the last 12 months. There were nine different beverage options.  
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6 However, a generic frequency measure (F) was applied, as opposed to a beverage specific frequency for  
7 each of the beverage options for quantity. The frequency measure at wave 3 was consistent with wave  
8  
9 2, relying on a generic frequency (F) measure, with the recall period referring to the last 6 months.  
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11 Unlike previous waves, quantity was assessed in relation to participants 'drink of choice'; participants  
12 reported which beverage they are most likely to drink – with 6 possible response options – and how  
13  
14 many of those specific drinks they consume on the days that they drink.  
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22 Participants "drink of choice", selected in wave 3, was used to harmonize quantity across baseline and  
23  
24 2. Baseline quantity was recoded according to drink of choice at wave 3 (i.e. the number of standard  
25 drinks contained in this drink were multiplied by the number of drinks reported at baseline). For  
26  
27 example if a person selected pints of beer as their drink of choice at wave three, we multiplied the  
28  
29 number of drinks reported at baseline by two, to correct for standard drinks. The number of standard  
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31 drinks contained in the drink of choice at wave 3 are summarised in Table 4 below.  
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37 **Table S4: Number of standard drinks contained in drink measurements included in wave 3**

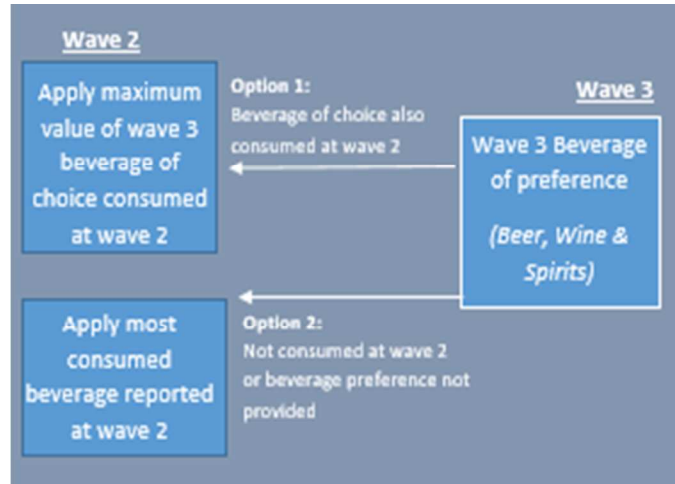
Wave 3 variable	Number of Standard drinks contained in one measure
Full pints beer/cider/lager Full pints stout	2
Half pints and glasses of beer/cider/lager/ stout	1
Large glass of wine at wave	2
Measure of spirits	1
Premixed drink	1

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5 Taking participants drink of choice from wave 3 (beer, wine or spirits) we calculated the average  
6 weekly volume of this drink at wave 2. For example, if an individual reported beer/cider as their drink  
7 of choice at wave 3, we recorded the maximum number of standard drinks of beer reported at wave 2.  
8  
9 This was then multiplied by frequency to determine the average weekly volume of alcohol consumed. If  
10 a participant did not report drinking their wave 3 drink of choice at wave 2 (N= 261), we selected their  
11 most consumed drink out of all the beverages (i.e. maximum quantity) at wave 2. For this analysis all  
12 beer variables (pints and half pints at wave 3 and pints, half pints, large and small cans from wave 2)  
13 were combined to investigate beer consumption. All wine variables (large glass from wave 3 and small  
14 glass, large glass and bottle of wine from wave 2) were combined to investigate wine consumption. All  
15 spirit and premixed variables were also combined to investigate spirits consumption (spirits and  
16 premixed variables from both waves 2 and 3). (Table 5 and Figure 1 below)  
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30 **Table S5: Wave 2 and 3 variables categorized according to beverages of choice (wine, beer spirits)**  
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Beverage of choice	Wave 2	Wave 3
<b>Wine</b>	Small glass of wine Large glass of wine Bottle of wine	Large glass of wine
<b>Beer</b>	Full pint Large can/bottle Half pint Small can/bottle	Full pint of beer/cider /lager Full pint of stout 1/2 pint of stout/beer/cider/lager
<b>Spirits</b>	Measure of spirits Premixed drinks	Measure of spirits Premixed drinks

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**Figure S1: Overview of method utilised to harmonise wave 2 average weekly alcohol consumption**

For Peer Review

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3 **Life course transitions and changes in alcohol consumption among older Irish adults: Results from**  
4 **the Irish Longitudinal Study on Ageing (TILDA)**  
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6

7  
8 **Abstract**  
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11 **Objective:** Determine if trajectories of older adults' alcohol consumption are influenced by the following  
12  
13 life course transitions, relationship status, employment status and self-rated health.  
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15

16  
17 **Methods:** Volume and frequency of drinking were harmonised across first three waves of TILDA  
18  
19 (N=4,295). Multilevel regression models used to model frequency, average weekly consumption and  
20  
21 heavy episodic drinking.  
22  
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24  
25 **Results:** Men and women drank more frequently over time, with frequency decreasing with age for  
26  
27 women. Average weekly consumption decreased over time and with increasing age. Transitions in self-  
28  
29 rated health, particularly those reflecting poorer health, were associated with lower frequency and weekly  
30  
31 consumption. Heavy episodic drinking decreased with age. Men who were retired across all waves were  
32  
33 more likely to engage in heavy episodic drinking at baseline.  
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36 **Discussion:** Despite the decline in average weekly consumption and heavy episodic drinking, the  
37  
38 observed quantities consumed and the increase in frequency of consumption suggests that older Irish  
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40 adults remain vulnerable to alcohol-related harms.  
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49 **Keywords:** Alcohol, older adults, heavy episodic & life course transitions  
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## 1. Introduction

Alcohol consumption has been identified as a major risk factor for the global burden of disease and mortality, with older adults experiencing a heightened susceptibility for alcohol-related harm (Knott et al., 2013; Lim et al., 2012; Rehm et al., 2017). Even at relatively low levels of alcohol consumption, older adults are vulnerable to alcohol-related harms due to age-related physiological and anatomical changes (Meier and Seitz, 2008). Furthermore, there is a high propensity for alcohol-medication interactions among older adults (Cousins et al., 2014; Holton et al., 2017). While alcohol consumption changes over the life-course, with a decline in the quantity consumed in older age (Britton et al., 2015; Grant et al., 2017), there is evidence of a cohort effect in the United Kingdom and the United States with older adults drinking more alcohol now relative to previous cohorts (Grant et al., 2017; Meng et al., 2014). It is therefore unsurprising that analysis of national UK statistics on alcohol-related mortality between 1991 and 2001 has shown that alcohol-related deaths among those aged 55 to 74 years has increased by 87% for men and 53% for women (Wadd and Papadopoulos, 2014). Similarly, evidence from the US and the UK has shown that alcohol-related hospital admissions are increasing among older adults (Mullins et al., 2017; Sacco et al., 2015; Wadd and Papadopoulos, 2014). As the proportion and age of the older population continue to rise the absolute numbers of older adults experiencing alcohol-related harms are likely to increase globally.

Despite the effectiveness of interventions in reducing alcohol consumption in older drinkers (Kelly et al., 2017) studies have shown that clinicians rarely undertake screening or brief interventions to reduce alcohol consumption among older adults (Duru et al., 2010). Understanding how life-course transitions in relation to health, employment and partnership influence drinking patterns may be useful in informing targeted screening and interventions to reduce alcohol-related harm in later life. A recent study of the English Longitudinal Study of Ageing (ELSA) demonstrated the importance of life-course transitions in understanding changes in frequency and volume of alcohol consumed by older adults (Holdsworth et al., 2017). However, the influence of life-course transitions on changes in drinking patterns such as heavy

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3 episodic drinking remains unclear. Furthermore, gender is an important predictor of alcohol consumption  
4 across the life course, with men and women exhibiting different alcohol consumption patterns;  
5 traditionally, high-volume drinking is more prevalent among men, with women more likely to abstain  
6 from alcohol (Wilsnack et al 2009). Therefore, the aim of this study was to examine whether trajectories  
7 of older men and women's alcohol consumption (frequency, average weekly volume and heavy episodic  
8 drinking) are influenced by life course transitions, using the first three waves of the Irish Longitudinal  
9 Study of Ageing (TILDA).  
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## 20 **Methods**

### 21 *Sample*

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24 This study was conducted in the context of The Irish Longitudinal Study on Ageing (TILDA), a  
25 nationally representative population based survey of older community dwelling adults aged  $\geq 50$  years.  
26 Full details of the survey and its sampling procedure are described elsewhere (Cronin et al., 2013;  
27 Kearney et al., 2011). Patient interviews are repeated every two years, with a clinical assessment  
28 component repeated every four years. Baseline interviews were conducted between October 2009 and  
29 July 2011, wave 2 between April 2012 and January 2013, and wave 3 between March 2014 and October  
30 2015. Ethical approval for TILDA was approved by the Faculty of Health Sciences Research Ethics  
31 Committee at Trinity College Dublin and all participants gave informed written consent. For this study,  
32 participants aged  $\geq 50$  years at baseline who completed the alcohol questions (both quantity and  
33 frequency) at all three waves were included. Proxy interviews and participants residing in nursing homes  
34 or residential care were excluded from this analysis.  
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### 50 *Alcohol Consumption*

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52 Frequency of alcohol consumption was harmonised across the three waves, applying the following  
53 categories: "none", "monthly/special occasions", "weekly infrequent-not on a daily/almost daily basis",  
54 and "weekly frequent – on a daily/almost daily basis". This is consistent with Britton et al's  
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3 harmonisation of alcohol frequency across nine cohort studies in the United Kingdom (Britton et al.,  
4 2015). Average weekly alcohol consumption was also harmonised across waves, to number of standard  
5 drinks consumed per week, where one standard drink is equal to 10g alcohol. Further details are available  
6 in Supplementary File 1. Heavy episodic drinking was also derived in each wave with participants  
7 categorised as: “non-drinker”, “moderate drinker” (1-5 standard drinks per drinking occasion) or “heavy  
8 episodic drinker” ( $\geq 6$  standard drinks per drinking occasion).  
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### 18 *Life course transitions*

19 Three life course transitions were considered; relationship status, employment status and self-rated health.  
20 For relationship status we distinguished between those who were in a relationship in all waves, those not  
21 in a relationship in all waves, those entering a relationship between waves and those ending a relationship  
22 between waves. Employment transitions were categorised as employed at all waves, retired at all waves  
23 and retired between waves. For transitions in self-rated health we distinguished between those with  
24 excellent/good health at all waves, those with poor health at all waves, those who report their health  
25 deteriorating between waves, and those who report their health improving between waves. Similar to  
26 Holdsworth et al (2017), we categorised the more complex transitions which could not be captured by the  
27 groups above, as “other”. These residual transitions accounted for a small proportion of relationship and  
28 self-rated health transitions, and are therefore excluded from analysis. For the heavy episodic analysis  
29 however, due to the small numbers of participants in the categories entering a relationship between waves  
30 and ending a relationship between waves, for modelling purposes it was decided to merge them together  
31 with “other”. The “other” employment transitions were included in all analyses as they accounted for 17%  
32 of employment transitions for men and 38% for women. The following baseline sociodemographic  
33 measures were also recorded; place of residence (urban vs. rural), education and smoking status.  
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### *Statistical Analysis*

We used multilevel models, using responses from all three waves of TILDA, to investigate whether patterns of alcohol consumption varied over time for men and women. Each of the multilevel models had a two-level structure, with level one describing how participants' patterns of alcohol consumption vary over time (within-person) and level two describing between-person differences in drinking patterns over time. Frequency of consumption was measured using an ordered categorical variable, hence a multilevel ordered logistic regression analysis was conducted. Due to a positively skewed distribution of the data, average weekly alcohol consumption (i.e. number of standard drinks consumed per week) was analysed using a multilevel negative binomial regression. This analysis was restricted to participants who consumed alcohol in at least one of the three waves. Furthermore, after examining the distribution of weekly alcohol consumption, observations above the 95<sup>th</sup> percentile from each wave (i.e. the top 5% of extreme values) were excluded from this analysis. (Skog, 1985) Finally, heavy episodic drinking was analysed using a multilevel multinomial logistic regression. This analysis was also restricted to participants who consumed alcohol in at least one wave, with moderate drinkers set as the reference category. The measure of time in each model was wave, which was entered as a continuous variable. Furthermore, to assess whether the rate of change in drinking patterns varied over time according to life course transitions, we included an interaction term between transition variables and wave. Age at baseline was also included to account for age effects on drinking patterns over time. Each model was also adjusted for place of residence, education status and smoking status. All analysis was performed using Stata 14.0.

## Results

### *Sample Characteristics*

A total sample of 4,295 adults aged 50 years and older had complete alcohol data across all three waves (55% women: n=2,353) (Figure 1). Attrition analysis between waves suggest that attrition was biased ( $P<0.05$ ) towards those who at baseline were: older, non-drinkers, smokers, had lower education level, and fair/poor self-rated health. A description of included participants is presented in Table 1. The distribution of the frequency of drinking, average weekly consumption and heavy episodic drinking in each wave by gender is presented in Table 2. Men drank more frequently with a higher average weekly consumption and a greater propensity to engage in heavy episodic drinking relative to women at each wave. Despite these gender differences, the overall trend in frequency was similar among men and women, with daily or almost daily consumption increasing between wave 1 and wave 3. Furthermore, average weekly consumption and heavy episodic drinking reduced for both men and women between waves 1 and wave 3.

**INSERT FIGURE 1 HERE**

**INSERT TABLE 1 & 2 HERE**

### *Frequency of Alcohol Consumption*

Results from the adjusted multilevel ordered logistic regression model of frequency at baseline and over time (between waves) are presented in Table 3. Baseline estimates refer to variables fitted without an interaction with wave; those with an odds ratio (OR)  $<1$  indicate that participants with this characteristic drank less frequently relative to the reference category at baseline, whereas those with an OR  $>1$  drank more frequently. Estimates associated with interactions between transition variables and wave indicate whether the rate of change in frequency of drinking varies over time relative to the reference category of

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3 the transitions variables (i.e. in a relationship at all waves, in employment at all waves and reporting  
4 excellent/good health at all waves). As wave was associated with an increase in frequency (i.e. OR >1),  
5 an interaction estimate of OR>1 indicates that participants with this characteristic experienced a steeper  
6 increase in drinking frequency over time, compared to the reference category. An interaction estimate of  
7 OR<1 suggests that participants with this characteristic experienced a smaller increase in drinking  
8 frequency over time.  
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18 Frequency of drinking increased for both men (OR: 1.25; 95% CI:1.07-1.47) and women (OR:1.25; 95%  
19 CI:1.06-1.48) over time. In contrast, frequency significantly declined with increasing age among women  
20 (OR: 0.91; 95% CI: 0.88-0.94), but not men. In relation to life course transitions, relationship status and  
21 employment transitions had little influence on the frequency of drinking for both sexes. Self-rated health  
22 was associated with frequency at baseline and over time. Men with improving self-rated health reported  
23 drinking less frequently at baseline in comparison to men with continual good health (OR: 0.28; 95% CI:  
24 0.10 – 0.77). Furthermore, the interaction with time indicates that men with continual poor health  
25 experienced a smaller increase in frequency of drinking over time relative to those in continual good  
26 health (OR: 0.69; 95% CI: 0.48 – 0.99). Women who experience poor health, or a deterioration or  
27 improvement in health across waves drank less frequently at baseline relative to those with excellent or  
28 good health. There were no interaction effects with time among women. For both men and women,  
29 frequency of drinking increased among those with higher levels of education and a history of smoking. In  
30 contrast, frequency decreased among rural dwelling adults compared to urban dwelling.  
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#### 51 *Average weekly consumption*

52 Results from the adjusted multilevel negative binomial model investigating average weekly consumption  
53 in standard drinks are summarised in Table 4. In contrast to frequency trends, average weekly  
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3 consumption declined significantly over time for both men (IRR: 0.93; 95% CI: 0.89-0.97) and women  
4 (IRR: 0.94; 95% CI: 0.90-0.99). Average weekly consumption also declined significantly with age for  
5 both men (IRR: 0.98; 95% CI: 0.97-0.99) and women (IRR: 0.97; 95% CI: 0.96-0.98). There was no  
6 evidence that transitions in relationship and employment status influenced average weekly consumption.  
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8 Baseline estimates for self-rated health show that men who experience a deterioration or improvement in  
9 health report drinking significantly less at baseline relative to those with continual good health. For  
10 women, those reporting continual poor health or improvements in health drank significantly less at  
11 baseline relative to women with continual good health. There was no evidence of a difference in the rate  
12 of change in quantity consumed over time among men or women. For both men and women, average  
13 weekly consumption was significantly greater among those with higher levels of education and a history  
14 of smoking, but lower among rural dwelling adults compared to urban dwelling.  
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28 Sensitivity analyses were also considered to assess the potential risk of misclassification bias, particularly  
29 in relation to the 'other' category for transitions. Due to the small number of participants in this category  
30 for relationship status, and self-rated health any sensitivity analysis was underpowered. We did however  
31 explore the effect of re-categorisation of "other/missing" on employment transitions among men and  
32 women for frequency and weekly-quantity. Due to the small number of men in various categories, the  
33 models did not run and we could only conduct this sensitivity analysis for women. In total, six categories  
34 were assessed for this analysis: employed all waves, retired all waves, looks after home or family all  
35 waves, looks after home or family between waves, retires between waves and other/missing. Overall, no  
36 differences in the results obtained from the original models were observed however, women who reported  
37 looking after their home or family in all waves were significantly more likely to consume less frequently  
38 (OR: 0.30; P=0.02) and smaller amounts throughout the week (IRR: 0.70; P=0.03) compared to those  
39 employed in all waves.  
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### *Heavy episodic drinking*

A higher proportion of men reported heavy episodic drinking compared to women across all waves. For example, 57% of men at wave 1 reported heavy episodic consumption compared to 23% of women (Table 2). Results from the adjusted multilevel multinomial regression estimating heavy episodic drinking are presented in Table 5. Baseline estimates refer to variables fitted without an interaction with wave. Those with an  $OR < 1$  indicate that participants with this characteristic had a decreased odds of being a non-drinker (or a heavy episodic drinker) compared to the reference category (moderate drinker) at wave 1. Those with an  $OR > 1$  had an increased odds of being a non-drinker (or a heavy episodic drinker). Estimates associated with interactions between transition variables and wave indicate whether the rate of change in the odds of being a non-drinker (or a heavy episodic drinker) varies over time relative to the reference category of the transition variables. As wave was associated with a decrease in odds (i.e.  $OR < 1$ ) of being a non-drinker (and a heavy episodic drinker), compared to a moderate drinker, an interaction estimate of  $OR > 1$  indicates that participants with this characteristic experienced a smaller decline in odds of being a non-drinker (or a heavy episodic drinker) over time, compared to the reference category. An interaction estimate of  $OR < 1$  suggests that participants with this characteristic experienced a steeper decrease in odds of being a non-drinker (or a heavy episodic drinker) over time.

The odds of abstaining (non-drinkers), relative to drinking moderately, reduced across waves for both men ( $OR: 0.48$ ; 95% CI: 0.30-0.78) and women ( $OR: 0.61$ ; 95% CI: 0.41-0.92). Significant age effects were only observed among women, with the odds of abstaining increasing with age ( $OR: 1.05$ ; 95% CI: 1.02 -1.07). For men, relationship status was not significant at baseline but the interaction with wave shows that men who were not in a relationship at each wave had a smaller decline in the odds of abstaining over time, relative to those in a relationship at each wave ( $OR: 2.30$ ; 95% CI: 1.39 -3.82). For self-rated health, the odds of abstaining at baseline were greater for men whose health improved across waves, and for women with continual poor health, relative to those with continual good health. There was



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3 no evidence of a change over time. The odds of abstaining also reduced with higher levels of education  
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5 for both men and women.  
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9 The odds of engaging in heavy episodic drinking, relative to moderate drinking, decreased significantly  
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11 across waves for men (OR: 0.66; 95% CI: 0.53-0.82) but not women. Heavy episodic drinking decreased  
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13 significantly with age among both men (OR: 0.81; 95% CI: 0.79-0.84) and women (OR: 0.91; 95% CI:  
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15 0.89 -0.93). Employment transitions influenced heavy episodic drinking among men but not women.  
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17 Baseline estimates for employment transitions, suggest that the odds of heavy episodic drinking at  
18  
19 baseline were greater for men who were retired across all waves relative to those in employment  
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21 throughout the study period. Furthermore, the interaction with wave showed a smaller decline in odds of  
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23 heavy episodic drinking for those who retire during the study relative to those in employment across  
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25 waves (OR: 1.48; 95% CI: 1.03 -2.15). Previous and current smokers also had increased odds of engaging  
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27 in heavy episodic drinking among men and women. In contrast, rural dwelling men and women were  
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29 significantly less likely to engage in heavy episodic drinking.  
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## Discussion

This study highlights the complexity of drinking behaviours among older adults, with different trends emerging depending on the drinking behaviour studied. Men drank more frequently, with a higher average weekly consumption and a greater propensity to engage in heavy episodic drinking relative to women. Similar to previous studies our analysis confirmed a decline in average weekly consumption and heavy episodic drinking over time and with increasing age for both men and women (Brennan et al., 2011; Britton et al., 2015; Castro-Costa et al., 2008; Holdsworth et al., 2017; Shaw et al., 2011). Despite the observed decline in heavy episodic drinking, a significant proportion of men (52%) and women (22%) continued to engage in heavy episodic drinking at wave 3. These estimates are similar to those observed among older English adults in 2016, with 51% of adults aged 50 years and older engaging in heavy episodic drinking in the previous 12 months (Holley-Moore and Beach, 2016 ). However, Breslow *et al.* identified a lower prevalence of heavy episodic drinking among older adults in America, with estimates ranging between 22.4% for men and 7.5% for women (Breslow et al., 2017). These estimates reflect the fact that the EU region has the highest level of alcohol consumption in the world (OECD, 2014), with Ireland having the fifth highest level of alcohol consumption in Europe. We also observed a reduction in abstinence over time for both men and women. The rate of abstinence identified in our study is similar to that reported in England and Scotland, countries which have been identified as having the lowest rate of abstinence in a recent international comparison of alcohol consumption among the over 50s (Gell et al., 2015). However, our findings may be subject to attrition bias, as non-drinkers were significantly more likely to be lost at follow-up.

Frequency of drinking increased over time for both men and women, with a higher proportion of men reporting daily or almost daily consumption; approximately one in five men reported daily or almost daily drinking at wave 3, compared to one in ten women. Furthermore, frequency of drinking decreased with age among women but not men. These findings are consistent with other longitudinal studies of ageing from Brazil (Wagner et al., 2014) and America (Molander et al., 2010). A recent analysis of nine UK-

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3 based prospective cohorts also found that frequent drinking increased with age, particularly among older  
4 men (Britton et al., 2015). Evidence from the English Longitudinal Study on Aging (ELSA) reported  
5 conflicting results, with a decrease in the frequency of alcohol consumed over times (Holdsworth et al.,  
6 2017).  
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14 Transitions in self-rated health had the greatest influence of drinking behaviours. Older men whose health  
15 improved during the study period drank less often at baseline, when their health was poor, compared to  
16 those with continual good health. Similarly, those with continual poor health reported a smaller increase  
17 in frequency over time compared to those with continual good health. Women with continual poor health,  
18 deteriorating health or improved health across the observation period also drank less often at baseline  
19 compared to women with continual good health. These results are consistent with the association between  
20 onset of illness and a reduction in regular alcohol consumption to special occasions drinking (Fat et al.,  
21 2015). Findings in relation to average weekly consumption were similar; men with deteriorating or  
22 improved health drank significantly less at baseline compared to those with continual good health, and  
23 women with continual poor health and improved health across the observation period drank significantly  
24 less at baseline. Abstinence was also higher at baseline among men whose health improved over the  
25 course of the study, and for women with continual poor health. These findings regarding a reduction in  
26 frequency and quantity among older men and women with poorer health, relative to those with continual  
27 good health, may reflect behavioural changes on the basis of medical advice to reduce alcohol  
28 consumption or concerns for their health. Recent studies have identified health precautions as one of the  
29 most commonly cited reasons for reducing alcohol consumption among older adults (Britton and Bell,  
30 2015; Khan et al., 2006).  
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51 Unlike previous studies, relationship status had limited impact on drinking behaviours (Holdsworth et al.,  
52 2017; Reczek et al., 2016; Selin et al., 2009). However, this finding should be interpreted with caution, as  
53 due to our relatively short duration of follow-up a small number of participants transitioned between  
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3 relationships, therefore we may have been underpowered to detect an effect for transitions in relationship  
4 status. Consistent with previous studies our findings in relation to the influence of retirement on drinking  
5 behaviours were mixed (Kuerbis and Sacco, 2012). There was no evidence of an effect on frequency of  
6 drinking or average weekly consumption. However, we did observe an effect on heavy episodic drinking,  
7 such that those who were retired throughout the observation period were significantly more likely to  
8 engage in heavy episodic drinking relative to those in continual employment. In addition, those who  
9 retired during the course of the study had a smaller decline in their rate of heavy episodic drinking relative  
10 to those in employment. Thus our findings would suggest that retirement is associated with heavy  
11 episodic drinking. It may be that after retirement people have more social occasions and less  
12 responsibilities which may affect their drinking behaviour (Britton and Bell, 2015). However, this  
13 harmful pattern of heavy episodic drinking among retired men may not persist as recent studies have  
14 shown that although drinking may increase upon retirement these increases may decrease over time  
15 (Halonen et al., 2017; Zins et al., 2011) with one study suggesting that people return to pre-retirement  
16 drinking habits within 4 to 8 years (Halonen et al., 2017).  
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33 Consistent with previous studies we also found that better educated men and women, as well as current  
34 and former smokers, drank more and more frequently (Brennan et al., 2010; Grittner et al., 2013; Halonen  
35 et al., 2017; Holdsworth et al., 2017; Moore et al., 2005). Britton and Bell (2015) analysis of the  
36 Whitehall II cohort study also identified an increase in consumption among those with higher  
37 socioeconomic positions. While these findings support concerns of an increase in consumption among  
38 more affluent older adults, it is important to note that we observed lower levels of heavy episodic drinking  
39 among Irish men and women with third level education relative to those with a primary education. This  
40 suggests that while those with higher education levels are drinking more frequently and a higher number  
41 of standard drinks per week, they are less likely to engage in heavy episodic drinking. We also found that  
42 men and women residing in rural areas drank less and less frequently relative to their urban dwelling  
43 counterparts. They were also less likely to engage to engage in heavy episodic drinking.  
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3 When interpreting our findings the following limitations should be considered. All alcohol measures were  
4 self-report which has the potential to produce underestimates of the amount of alcohol consumed  
5 (Livingston and Callinan, 2015), as older adults are more likely to underreport heavy consumption  
6 (Kuerbis et al., 2014). Furthermore, while considerable care was taken to harmonise the frequency and  
7 quantity alcohol measures across the three waves of TILDA, the results may be subject to  
8 misclassification bias. Our assessment of life course transitions lacks important contextual information.  
9 For example, while we are able to identify if participants retired during the study period, we had no  
10 information on pre-retirement workplace stress or job satisfaction, factors which have been shown to  
11 influence alcohol consumption in retirement (Kuerbis and Sacco, 2012). Similarly, we could not ascertain  
12 if retirement was voluntary or involuntary. This is relevant as a longitudinal analysis of the impact of  
13 retirement on Dutch workers found that involuntary retirement was associated with an increase in  
14 smoking and a reduction in drinking less over time. The authors concluded that people may use alcohol  
15 and smoking as a means of coping with involuntary retirement (Henkens et al., 2008). In addition, our  
16 analysis investigated transitions in self-rated health, future studies could explore transitions in mental  
17 health status as a recent analysis of the Whitehall II cohort in England identified that mental health  
18 influenced changes in alcohol consumption (Bell and Britton, 2014). It is also important to note that the  
19 relatively short duration of follow-up (approximately four years) limits exposure to transitions. For  
20 example, most participants reported remaining in a relationship at each wave, with small numbers  
21 experiencing any transition. Therefore, our study may have been underpowered to detect the influence of  
22 transitions in relationship status on alcohol consumption. Furthermore, due to the various complex  
23 transitions in employment and small sample sizes in certain groups, we were limited in our exploration of  
24 the reasons for changes in alcohol consumption among those in the 'other' category, for example those  
25 who became disabled over the follow-up period. Future analysis with a larger sample size may help  
26 further explore these complex transitions.  
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## 53 54 55 **Conclusions** 56 57

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3 While the observed decline in average weekly consumption and heavy episodic drinking is positive, there  
4 is still cause for concern as approximately one in two men and one in five women aged 50 years and older  
5 engage in heavy episodic drinking. This, coupled with the observed increase in frequency of consumption  
6 over time, suggests that older Irish adults remain vulnerable to alcohol-related harms. Understanding how  
7 the influence of time, age and life-course transitions varies depending on the drinking behaviour may  
8 inform future targeted interventions aimed at reducing alcohol-related harm in older adults.  
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18 This work was supported by the Royal College of Surgeons in Ireland under the Clement Archer PhD  
19 Scholarship  
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23 Conflict of Interests: None declared  
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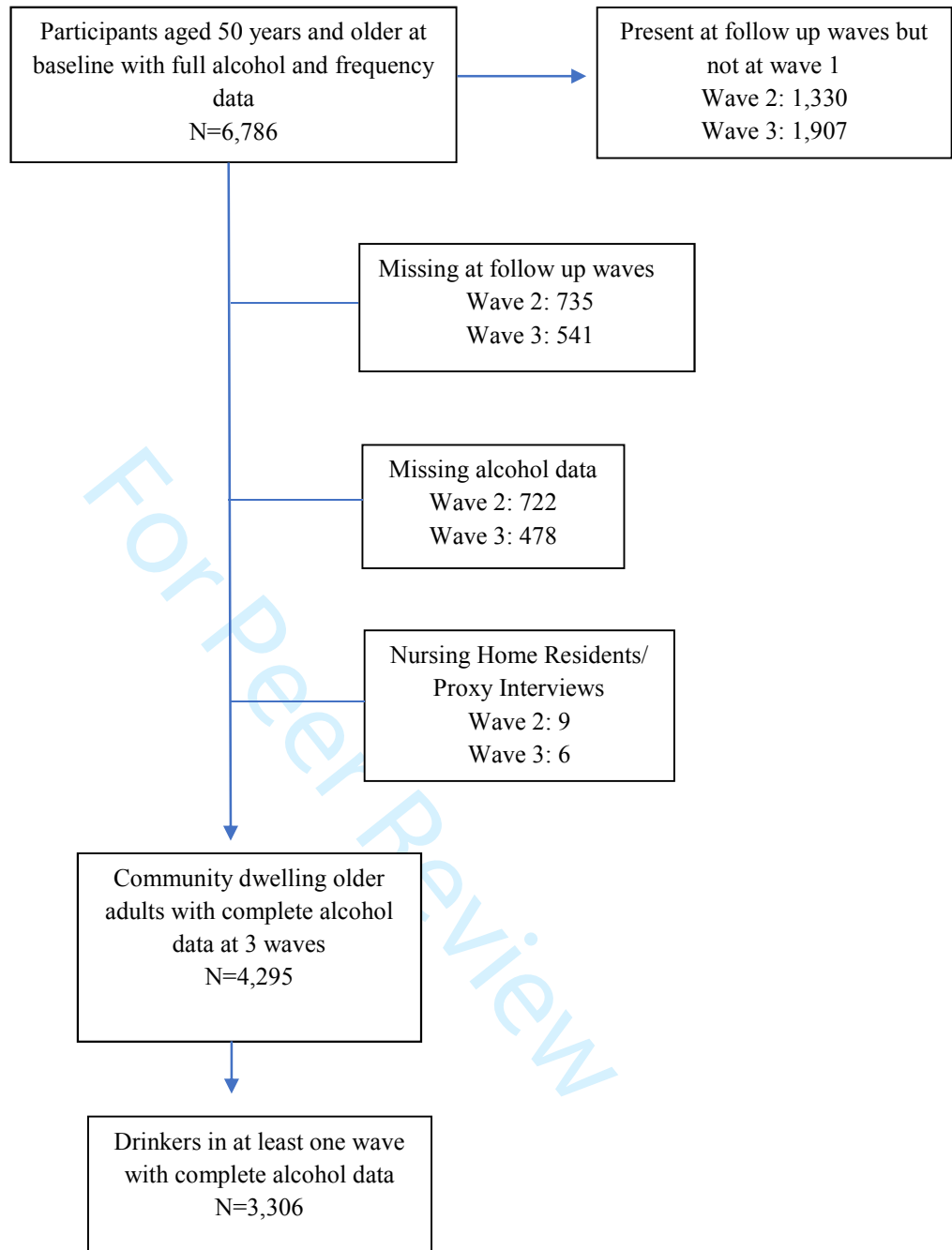
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**Figure 1:** Illustrating selection of longitudinal sample from The Irish Longitudinal Study on Ageing (TILDA)

**Table 1: Distribution of study variables by gender**

	Men		Women	
	All participants (N=1942)	Drinkers in at least one wave (N=1538)	All participants (N=2353)	Drinkers in at least one wave (N=1768)
<b>Mean age at Baseline (standard deviation)</b>	62.8 (8.7)	62.0 (8.3)	62.1 (8.4)	61.3 (8.2)
<b>Relationship</b>				
In relationship all waves	1499 (77%)	1217 (79%)	1555 (66%)	1176 (67%)
Out of relationship all waves	380 (19.6%)	271 (18%)	685 (29%)	507 (29%)
Enters relationship between waves	10 (0.5%)	8 (0.5%)	11 (0.5%)	8 (0.45%)
Relationship ends between waves	48 (2.5%)	37 (2%)	98 (4.2%)	75 (4%)
Other/missing	5 (0.3%)	5 (0.3%)	4 (0.2%)	2 (0.1%)
<b>Employment</b>				
Employed in all waves	578 (30%)	486 (32%)	522 (22%)	440 (25%)
Retired in all waves	769 (40%)	565 (37%)	484 (21%)	356 (20%)
Retires between waves	257 (13%)	212 (14%)	440 (19%)	325 (18%)
Other/missing	338 (17%)	275 (18%)	907 (38%)	647 (37%)

<b>Self-rated health</b>				
Excellent/ Good health all waves	1369 (71%)	1106 (72%)	1682 (72%)	1309 (74%)
Poor health all waves	118 (6%)	85 (6%)	149 (6%)	95 (5%)
Health deteriorates between waves	131 (7%)	100 (6.5%)	168 (7%)	107 (6%)
Health improves between waves	189 (10%)	141 (9%)	210 (9%)	153 (9%)
Other/missing	135 (7%)	106 (7%)	144 (6%)	104 (6%)
<b>Area</b>				
Urban	1033 (53%)	834 (54%)	1109 (47%)	965 (55%)
Rural	908 (47%)	703 (46%)	1242 (53%)	801 (45%)
<b>Education</b>				
None/Primary	481 (25%)	341 (22%)	458 (20%)	283 (16%)
Secondary	806 (42%)	643 (42%)	1015 (43%)	754 (43%)
Third Level	655 (34%)	554 (36%)	880 (37%)	731 (41%)
<b>Smoking</b>				
Never Smoker	728 (38%)	554 (36%)	1269 (54%)	889 (50%)
Former Smoker	940 (48%)	748 (49%)	759 (32%)	625 (35%)

Current Smoker	274 (14%)	236 (15%)	325 (14%)	254 (14%)
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**Table 2: Frequency of drinking, average weekly consumption in standard drinks and heavy episodic drinking, by wave and gender**

Frequency	Men			Women		
	Baseline	Wave 2	Wave 3	Baseline	Wave 2	Wave 3
Non-Drinkers	393 (20%)	294 (15%)	354 (18%)	634 (27%)	438 (19%)	519 (22%)
Monthly/Special Occasion	323 (17%)	375 (19%)	360 (19%)	635 (27%)	789 (34%)	735 (31%)
Weekly infrequent	949 (49%)	896 (46%)	862 (44%)	896 (38%)	857 (36%)	855 (26%)
Weekly Frequent	277 (14%)	377 (19%)	366 (19%)	188 (8%)	269 (11%)	244 (10%)
<b>Average weekly consumption in standard drinks</b>	12.6 (12.0)	10.0 (9.7)	10.7 (10.5)	5.2 (5.9)	4.2 (4.2)	4.7 (5.5)
<b>Heavy episodic drinking</b>	874 (57%)	701 (46%)	799 (52%)	406 (23%)	214 (12%)	396 (22%)



**Table 3: Adjusted multilevel ordered logistic regression for drinking frequency**

	<b>Men (N= 1,942)</b>	<b>Women (N= 2,353)</b>
	<b>Odds Ratio (95% CI)</b>	<b>Odds Ratio (95% CI)</b>
Wave	1.25 (1.07-1.47)**	1.25 (1.06-1.48)*
Age at Baseline	0.96 (0.92-1.00)	0.91 (0.88-0.94)***
<b>Relationship transitions (ref. in relationship all waves)</b>		
Out of Relationship all waves	0.84 (0.38-1.87)	0.89 (0.48-1.65)
Enters Relationship between waves	0.07 (0.001- 7.27)	2.12 (0.04-122.41)
Relationship ends between waves	1.73 (0.24-12.72)	1.41 (0.37- 5.40)
<b>Relationship x wave</b>		
Out of relationship all waves	0.83 (0.65-1.02)	0.90 (0.77-1.10)
Enters relationship between waves	1.71 (0.48-6.13)	0.37 (0.10-1.35)
Relationship ends between waves	0.87 (0.49-1.53)	1.03 (0.69-1.53)
<b>Employment (Ref. Employed at all waves)</b>		
Retired all waves	0.96 (0.38-2.43)	1.23 (0.49-3.08)
Retires between waves	0.97 (0.35-2.68)	0.78 (0.32-1.87)
Other transitions	0.77 (0.30-1.97)	0.69 (0.33-1.442)
<b>Employment x wave</b>		

Retired all waves	1.10 (0.89-1.36)	1.09 (0.86- 1.39)
Retires between waves	1.30 (0.98-1.72)	1.13 (0.89-1.45)
Other transitions	1.16 (0.89-1.50)	0.99 (0.81-1.22)
<b>Self-Rated Health (Ref. Excellent to good health all waves)</b>		
Poor health all waves	0.30 (0.09-1.06)	0.06 (0.02-0.16)***
Health deteriorates between waves	0.61 (0.19-2.00)	0.15 (0.06-0.41)***
Health improves between waves	0.28 (0.10-0.77)**	0.22 (0.09-0.54)***
<b>Self-Rated Health x wave</b>		
Poor health all waves	0.69 (0.48-0.99)*	1.36 (0.98-1.88)
Health deteriorates between waves	0.87 (0.63-1.20)	1.06 (0.79-1.44)
Health improves between waves	1.02 (0.77-1.36)	0.99 (0.76-1.30)
<b>Area (Ref. Urban)</b>		
Rural	0.47 (0.28-0.79)**	0.17 (0.11-0.26)***
<b>Education (ref. None/Primary)</b>		
Secondary	3.51 (1.80-6.87)***	5.52 (3.05-10.01)***
Third Level	17.87 (8.65- 36.92)***	18.74 (9.79-35.86)***
<b>Smoker (Ref. Non-Smoker)</b>		
Previous Smoker	3.24 (1.86-5.66)***	14.46 (8.74- 23.94)***
Current Smoker	12.54 (5.49-28.63)***	8.73 (4.40-17.33)***

Significance levels: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

**Table 4: Adjusted multilevel negative binomial model for average weekly alcohol consumption**

	<b>Men (N=1,379)</b>	<b>Women (N=1,590)</b>
	<b>Incidence Rate Ratios (95% CI)</b>	<b>Incidence Rate Ratios (95% CI)</b>
Wave	0.93 (0.89-0.97)**	0.94 (0.90-0.99)*
Age at Baseline	0.98 (0.97-0.99)**	0.97 (0.96-0.98)***
<b>Relationship (ref. in relationship all waves)</b>		
Out of Relationship all waves	1.24 (1.06-1.63)	0.86 (0.71-1.04)
Enters Relationship between waves	1.30 (0.41-4.18)	0.89 (0.21-3.80)
Relationship ends between waves	1.14 (0.65-2.00)	0.89 (0.57- 1.39)
<b>Relationship x wave</b>		
Out of relationship all waves	0.95 (0.89-1.02)	1.01 (0.96-1.07)
Enters relationship between waves	0.99 (0.71-1.38)	0.97 (0.62-1.53)
Relationship ends between waves	1.00 (0.84-1.18)	0.96 (0.84-1.11)
<b>Employment (Ref. Employed at all waves)</b>		
Retired all waves	1.12 (0.87-1.42)	1.02 (0.77-1.34)
Retires between waves	0.97 (0.74-1.26)	1.03 (0.80-1.34)
Other transitions	0.99 (0.77-1.28)	0.93 (0.75- 1.17)
<b>Employment x wave</b>		
Retired all waves	0.99 (0.94-1.05)	1.05 (0.97-1.13)
Retires between waves	1.04 (0.97-1.12)	1.00 (0.93-1.07)
Other transitions	1.02 (0.95-1.09)	1.02 (0.96-1.08)
<b>Self-Rated Health (Ref. Excellent to good health all waves)</b>		

Poor health all waves	0.74 (0.51-1.08)	0.61 (0.42-0.89)*
Health deteriorates between waves	0.69(0.49-0.97)*	0.93 (0.66-1.31)
Health improves between waves	0.69 (0.52-0.91)*	0.60(0.44- 0.81)**
<b>Self-Rated Health x wave</b>		
Poor health all waves	0.93 (0.83-1.04)	0.93(0.83-1.05)
Health deteriorates between waves	0.96 (0.87-1.07)	0.93 (0.84-1.04)
Health improves between waves	0.94 (0.86-1.03)	0.99 (0.90-1.08)
<b>Area (Ref. Urban)</b>		
Rural	0.85 (0.75-0.98)*	0.67 (0.58-0.76)***
<b>Education (ref. None/Primary)</b>		
Secondary	1.34 (1.12-1.61)**	1.37 (1.12-1.69)**
Third Level	1.47 (1.22- 1.78)***	1.62 (1.30-2.00)***
<b>Smoker (Ref. Non-Smoker)</b>		
Previous Smoker	1.39 (1.20-1.61)***	1.70 (1.46-1.97)***
Current Smoker	1.57 (1.27-1.94)***	1.2 (1.04-1.60)*

Significance levels: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

**Table 5: Adjusted multilevel multinomial logistic regression estimating heavy episodic consumption**

	Men (N=1,538)		Women (N=1,768)	
	Non-drinkers <i>versus moderate</i> drinkers	Heavy episodic <i>versus moderate</i> drinkers	Non-drinkers <i>versus moderate</i> drinkers	Heavy episodic <i>versus moderate</i> drinkers
Wave	0.48 (0.30-0.78) **	0.66 (0.53-0.82)***	0.61 (0.41-0.92)*	0.95 (0.76-1.18)
Age at Baseline	0.98 (0.94-1.02)	0.81 (0.79-0.84)***	1.05 (1.02-1.07)***	0.91 (0.89-0.93)***
<b>Relationship(ref. in relationship all waves)</b>				
Out of Relationship all waves	0.52 (0.16-1.64)	0.98 (0.43-2.22)	1.15 (0.54-2.45)	0.91 (0.48-1.73)
Other transitions and missing	0.12 (0.01-2.85)	0.59 (0.11-3.20)	0.61 (0.12-3.13)	1.35 (0.36-5.07)
<b>Relationship x wave</b>				
Out of relationship all waves	2.30 (1.39-3.82)**	1.16 (0.84-1.59)	1.10 (0.76-1.59)	1.11 (0.86-1.45)
Other transitions and missing	3.54 (0.96-13.06)	1.86 (0.97-3.58)	1.27 (0.58-2.77)	1.00 (0.58-1.74)
<b>Employment (Ref. Employed at all waves)</b>				
Retired all waves	1.43 (0.38-5.39)	2.39 (1.03-5.55)*	1.61 (0.50-5.17)	2.12 (0.88-5.09)
Retires between waves	2.33 (0.49-11.07)	0.66 (0.25-1.73)	2.31 (0.74-7.23)	1.84 (0.79-4.28)
Other transitions	1.11 (0.57-2.26)	1.30 (0.52-3.23)	1.13 (0.42-3.05)	0.66 (0.32-1.36)
<b>Employment x wave</b>				
Retired all waves	0.96 (0.54-1.70)	0.98 (0.73-1.30)	0.66 (0.37-1.17)	0.78 (-.55-1.10)
Retires between waves	0.69 (0.32-1.49)	1.48 (1.03-2.15)*	0.67 (0.38-1.18)	0.76 (0.54-1.07)
Other transitions	1.13 (0.57-2.26)	1.08 (0.76-1.54)	1.02 (0.63-1.65)	1.22 (0.91-1.63)

<b>Self-Rated Health (Ref. Excellent to good health all waves)</b>				
Poor health all waves	0.96 (0.18-5.06)	0.45 (0.13-1.62)	4.23 (1.25-14.36)*	1.09 (0.29-4.13)
Health deteriorates between waves	2.41 (0.45-12.95)	0.74 (0.23-2.41)	1.55 (0.45-5.33)	0.87 (0.26-2.92)
Health improves between waves	3.98 (1.06-14.93)*	0.80 (0.29-2.18)	2.35 (0.85-6.48)	0.38 (0.12-1.11)
<b>Self-Rated Health x wave</b>				
Poor health all waves	2.06 (1.01-4.2)	1.40 (0.85-2.30)	0.72 (0.39-1.32)	0.58 (0.32-1.06)
Health deteriorates between waves	0.78 (0.34-1.78)	1.01 (0.64-1.60)	1.04 (0.58-1.88)	0.90 (0.54-1.50)
Health improves between waves	0.88 (0.47-1.64)	0.99 (0.67-1.47)	0.97 (0.59-1.78)	1.15 (0.74-1.78)
<b>Area (Ref. Urban)</b>				
Rural	1.09 (0.66-1.81)	0.59 (0.40-0.87)**	1.93 (1.35-2.76)***	0.45 (0.32-0.62)***
<b>Education (ref. None/Primary)</b>				
Secondary	0.43 (0.24-0.79)**	0.72 (0.43-1.21)	0.42 (0.26-0.67)***	0.90 (0.56-1.46)
Third Level	0.20 (0.10-0.40)***	0.25 (0.15-0.43)***	0.26 (0.16-0.44)***	0.60 (0.37-0.99)
<b>Smoker (Ref. Non-Smoker)</b>				
Previous Smoker	1.06 (0.62-1.82)	2.59 (1.71-3.92)***	0.43 (0.28-0.64)***	1.99 (1.41-2.81)***
Current Smoker	1.26 (0.58-2.72)	4.35 (2.40-7.88)***	0.71 (0.42-1.21)	2.38 (1.48-3.84)***

Reference category: moderate drinkers. Significance levels: \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

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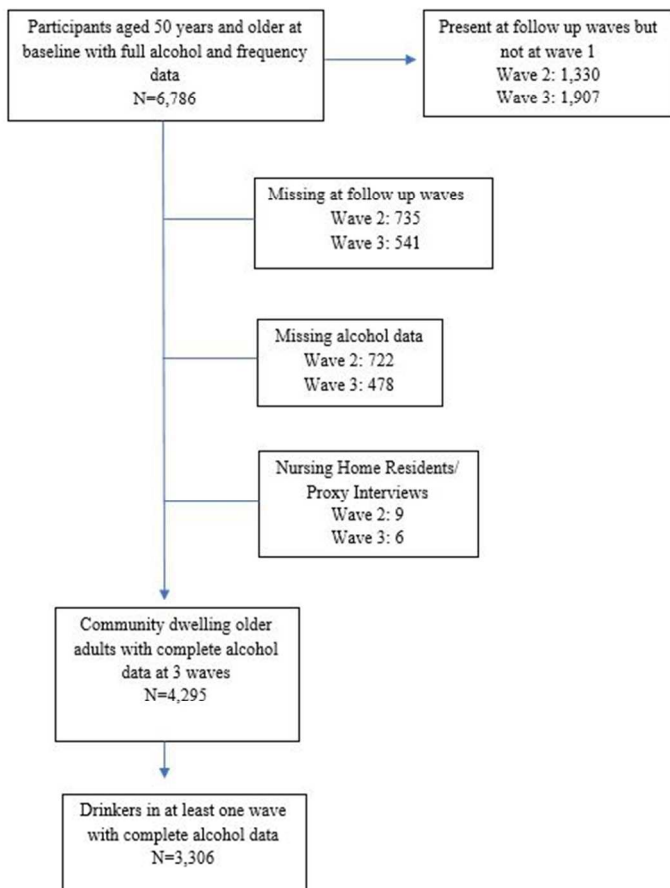


Figure 1: Illustrating selection of longitudinal sample from The Irish Longitudinal Study on Ageing (TILDA)

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