

Worsening of Health and a Cessation or Reduction in Alcohol Consumption to Special Occasion Drinking Across Three Decades of the Life Course

Linda Ng Fat, Noriko Cable, and Nicola Shelton

Background: Ex-drinkers suffer from worse health than drinkers; however, whether a worsening of health is associated with a change in drinking status from early adulthood has not been previously investigated. We assess whether a worsening of health is associated with a cessation in consumption or reduction to special occasion drinking from early adulthood to middle age.

Methods: Multinomial logistic regression assessing whether a change in self-reported limiting long-standing illness (LLI) was associated with ceasing alcohol consumption, or a reduction to special occasion drinking compared with being a persistent drinker from age 23 in separate models at ages 33, 42, and 50. All models adjusted for sex, poor psychosocial health, education, marital status, and children in the household. Sample included participants from Great Britain followed longitudinally in the National Child Development Study from ages 23 to 33 ($N = 5,529$), 42 ($N = 4,787$), and 50 ($N = 4,476$).

Results: Developing an LLI from the previous wave was associated with ceasing alcohol consumption at ages 33 (odds ratio [ORs] = 2.71, 95% confidence interval [CI] = 1.16–4.93), 42 (OR = 2.44, 95%CI = 1.24–4.81), and 50 (OR = 3.33, 95%CI = 1.56–7.12) and a reduction to special occasion drinking at ages 42 (OR = 2.04, 95%CI = 1.40–2.99) and 50 (OR = 2.04, 95%CI = 1.18–3.53). Having a persistent LLI across 2 waves increased the odds of ceasing consumption at ages 42 (OR = 3.22, 95%CI = 1.06–9.77) and 50 (OR = 4.03, 95%CI = 1.72–9.44) and reducing consumption to special occasion drinking at ages 33 (OR = 3.27, 95%CI = 1.34–8.01) and 42 (OR = 2.25, 95%CI = 1.23–4.50). Persistent drinkers at older ages had the best overall health suffering less from previous poor health compared with those who reduced or ceased consumption at an earlier time point.

Conclusions: Developing an LLI was associated with a cessation in alcohol consumption and a reduction in consumption to special occasion drinking from early adulthood. Persistent drinkers who drank at least till 50 were the healthiest overall. Health selection is likely to influence nondrinking across the life course.

Key Words: Alcohol, Life Course, Limiting Longstanding Illness, Nondrinking.

IN EXPLAINING THE better health outcomes of moderate drinkers compared to nondrinkers in later life found in many epidemiological studies, Shaper and colleagues suggested that it was previous drinkers among ex-drinkers who were contributing to this pattern due to their preexisting poor health (Shaper et al., 1988; Wannamethee and Sharper, 1997). Many nondrinkers are ex-drinkers who have stopped drinking due to poor health, or problems related to alcohol itself, therefore preexisting poor health among ex-drinkers may be exaggerating the relative worse health outcomes of

nondrinkers. This is sometimes referred to as the “sick-quitter” bias.

It has been shown that ex-drinkers have higher rates of doctor-diagnosed illnesses including heart disease (Shaper et al., 1994), and a reduction in alcohol consumption was found to have a cross-sectional association with diabetes, hypertension, or anxiety (Liang and Chikritzhs, 2011). Female moderate drinkers in middle age were also found to have the best overall self-rated health among a cohort followed over time (Powers and Young, 2008). A different longitudinal study showed chronic health conditions to be associated with a reduction in excessive drinking among participants aged between 50 and 85 years (Newsom et al., 2012).

More recently, it has been shown that having a persistent limiting longstanding illness (LLI) from early adulthood was associated with being a persistent nondrinker from the early 20s to the 40s (Ng Fat et al., 2014). In this study, we address whether developing an LLI is associated with being an ex-drinker at 3 different ages of the life course from early adulthood using the same cohort.

To our knowledge, previous studies analyzing the relationship between poor health and nondrinking have used a mid-

From the Department of Epidemiology and Public Health (LNF, NC, NS), UCL, London, United Kingdom.

Received for publication July 14, 2014; accepted October 4, 2014.

Reprint requests: Linda Ng Fat, PhD, Department of Epidemiology and Public Health, UCL, 1-19 Torrington Place, London WC1E 6BT, UK; Tel.: 0207 679 8235; Fax: 020 3108 3354; E-mail: l.ngfat@ucl.ac.uk
Copyright © 2015 by the Research Society on Alcoholism.

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

DOI: 10.1111/acer.12596

dle-aged cohort only (Newsom et al., 2012; Powers and Young, 2008; Shaper et al., 1994) or were limited to cross-sectional data (Liang and Chikritzhs, 2011). If a relationship between a worsening of health and becoming an ex-drinker is found in early adulthood, this suggests that poor health may influence nondrinking throughout the life course. This indicates that it is not only a phenomenon that coexists with aging and a worsening of health. This may have implications for long-term abstainers as well as those who self-identify as being “lifetime abstainers,” who were found to have reported drinking alcohol in the past (Caldwell et al., 2006; Rehm et al., 2008). This study also explores whether there exists an association between a worsening of health and a reduction to special occasion drinking. It has been hypothesized that occasional drinkers, and not just nondrinkers, may also be subject to the sick-quitter bias as drinkers who are ill decrease and not just cease their consumption. The inclusion of occasional drinkers in abstainer category may be a source of bias where only a minority of studies have excluded occasional drinkers from the “nondrinker” reference category (Fillmore et al., 2007). To our knowledge, this has not been directly investigated. We hypothesize that a deterioration of health would be associated with a reduction to special occasion drinking or a cessation in consumption in all stages of the life course, and that persistent drinkers would have the best overall health.

MATERIALS AND METHODS

Sample

The National Child Development Study (NCDS) (University of London et al., 1991) collected data on 17,414 babies born in Great Britain in 1958 and then followed them up at specific years, approximately once in each decade of their lives up to the present (Power and Elliott, 2006). Sources of data differed in each wave, having been collected from participants via face-to-face interviews or medical examinations, and from teachers or parents. This study focuses on self-reported data when members were aged 23 (1981), 33 (1991), 42 (2000), and 50 (2008). Data were limited to participants with drinking records at age 23, 33, 42, and 50 ($N = 7,086$) and complete cases on all variables ($N = 6,707$) as presented in Figure 1.

Ethical Information

Ethical approval for NCDS was obtained from relevant approval bodies in the United Kingdom at the time of data collection from the multicenter research ethics committees (MRECs) at age 42 (2000) and 50 (2002), and internally at age 33 which predates establishment of MRECs (1991) (Shepherd, 2012). Access to the data set for the academic purposes of secondary analysis was subject to the terms of an end user agreement as issued by the UK Data Service (2011), and further ethical approval was not needed.

Measures

Ex-Drinkers. Cohort members at age 33 were asked “How often do you usually have an alcoholic drink of any kind?” and were asked to select an option from “most days,” “1, 2, or 3 times/wk,” “1, 2 or 3 times/month,” “less often,” or “never.” These response options differed slightly at ages 33, 43, and 50, but each wave had the options

“less often/only on special occasions” and “never” at the bottom end of the scale. We refer to those who responded with these options as “special occasion drinkers” and “nondrinkers,” respectively.

Persistent drinkers are defined as those who recorded drinking at least more than on special occasions in each wave from age 23 (e.g., persistent drinkers at age 42 including participants who selected drinking more than on special occasions at age 23, 33, and 42). Participants who reduced to special occasion drinking were past persistent drinkers who selected drinking on “special occasion only” at a later wave (e.g., participants who reduced to special occasion drinking at age 42 were persistent drinkers at age 23 and age 33). Similarly, participants who ceased consumption were past persistent drinkers who selected “never” drinking at a successive wave (e.g., participants who ceased consumption at age 42 were persistent drinkers at age 23 and age 33). We compared persistent drinkers with those who reduced to special occasion drinking or who had ceased consumption at age 33, 42, and 50. Due to the definition of being a persistent drinker, special occasion and nondrinkers preceding the time point of the model were excluded (Fig. 1).

Changes in Health. Adapting previously used methods (Giordano and Lindstrom, 2010; Ng Fat et al., 2014), a change in LLI was assessed by taking binary responses to the question “Do you have any longstanding illness, disability or infirmity which limits your activities in any ways compared with people of your own age?” across 2 consecutive waves. This yielded a categorical variable with 4 response categories to indicate changes in health. These categories are as follows: (1) Participants who reported having no LLI across 2 consecutive waves (“No LLI”), (2) Participants who reported having no LLI, when they reported an LLI in the previous wave (“No longer LLI”), (3) Participants who reported having an LLI, when they reported no LLI in the previous wave (“Developed LLI”), and (4) Reporting an LLI in 2 consecutive waves (“Persistent LLI”). Three categorical variables for changes in LLI were derived at ages 23 to 33, 33 to 42, and 42 to 50. LLI has been shown to be a valid measure of mortality and morbidity even among young adults (Manor et al., 2001), having greater associations with physical functioning than mental health (Cohen et al., 1995). LLI has been found to be related to chronic conditions such as epilepsy, heart trouble, and rheumatism including in young adulthood (Manor et al., 2001).

Covariates. Estimates were adjusted for sex, highest qualification obtained (degree or higher/other/no qualification), marital status (single/married/separated, widowed or divorced), children under 16 years in the household, and poor psychosocial health (normal/poor) recorded at age 33, 42, and 50. These factors were found to be associated with a change in alcohol consumption or nondrinking (Hajema and Knibbe, 1998; Rodgers et al., 2000; Saarni et al., 2008).

Participants’ psychosocial health was assessed using the Malaise Inventory, a set of 24 yes/no self-completion questions (Rodgers et al., 1999) which were administered at ages 33, 42, and 50. Examples of questions included “Do you often get worried about things?” and “Do you usually wake unnecessarily early in the morning?” A cutoff point of “yes” to 8 or more questions was used to indicate poor psychosocial health (Rodgers et al., 1999). However, at age 50, only 9 items from the original 24 items were asked, and so a cutoff point of 4 or more points was used to indicate poor psychosocial health (ESDS Longitudinal, 2007).

Statistical Analysis

Multinomial logistic regression analysis was used to assess the odds of reducing consumption to special occasion drinking, or

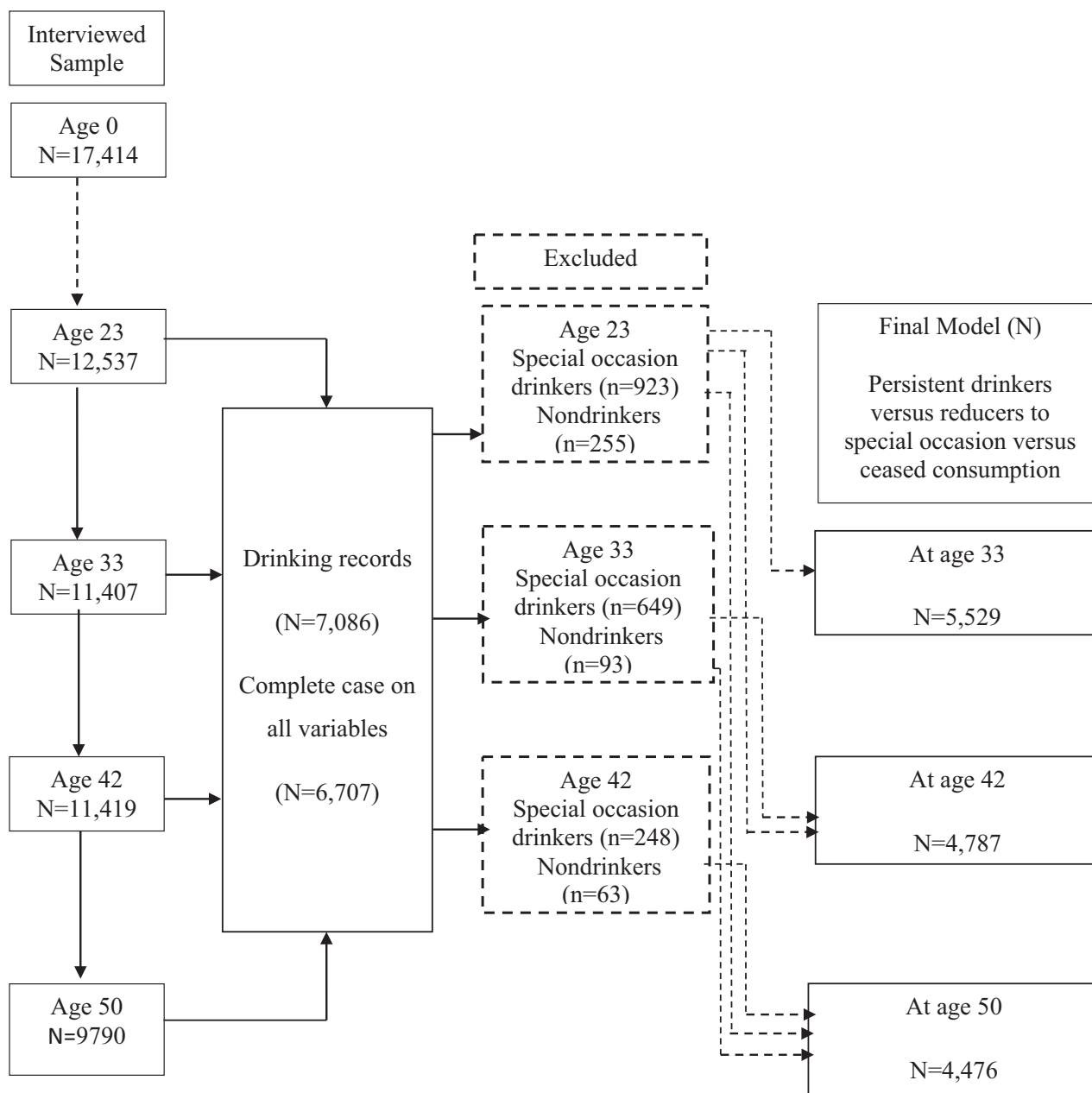


Fig. 1. Flow chart for sample sizes at ages 33, 42, and 50, The National Child Development Study 1958.

ceasing consumption, compared with persistent drinkers at age 33, 42, and 50. The main exposure of interest was a change in LLI. We were specifically interested in whether developing an LLI from the previous wave was simultaneously associated with a cessation or reduction in consumption, compared with persistent drinkers. We also repeated the analysis using LLI at a previous time point preceding the change in consumption, to assess effects of past health (e.g., for those who ceased consumption at age 42, 2 models were created one with changes in LLI at age 42 as the exposure, and another with changes in LLI at age 33 as the exposure). We hypothesize that developing an LLI from the previous wave would be associated with a reduction in consumption to special occasion drinking or a cessation in consumption and that persistent drinkers would have better health overall. Sex, highest qualification, marital status, psychosocial health, and children in the household were adjusted for at the same time point as the change in LLI in

each model, for example, models assessing changes in LLI at age 42 as the exposure, adjusted for education at age 42, models using changes in LLI at age 33 adjusted for education at age 33, and so forth. Analyses were restricted to complete cases on all variables and carried out using STATA 12 (StataCorp., 2011).

We also ran the same analyses, however, rather than restrict analyses to participants with 4 waves of data; we assessed changes in health and changes in consumption across 2 time points only.

RESULTS

The proportion of persistent drinkers who ceased consumption was 2% at age 33 ($n = 93$), 1% at age 42 ($n = 63$), and 3% at age 50 ($n = 53$) (Table 1). A higher proportion of

participants who ceased consumption had developed an LLI at age 33 (10%), 42 (21%), and 50 (19%) than those who reduced to special occasion drinking (5, 16, and 14%, respectively) and persistent drinkers (3, 16, and 13%, respectively). Those who had ceased consumption or reduced to special occasion drinking had a higher proportion with no qualifications than persistent drinkers at each time point. Those who ceased had higher rates of having poor psychosocial health (8% at age 33, 27% at age 42, and 30% at age 50) than those who reduced to special occasion drinking (6, 16, and 25%, respectively) and persistent drinkers (4, 10, and 11%, respectively) at all time points. The proportion of previous drinkers who reduced consumption to special occasion drinking was 12% at age 33 (*n* = 649), 5% at age 42 (*n* = 248), and 3% at age 50 (*n* = 126).

Persistent drinkers who developed an LLI from the previous wave did not have increased odds of reducing consumption to special occasion drinking at age 33 (OR = 0.93, 95% CI = 0.56–1.14), but had increased odds at age 42 (OR = 2.04, 95% CI = 1.40–2.99) and age 50 (OR = 2.04, 95% CI = 1.18–3.53) (Table 2). Having a persistent LLI from the previous wave increased the odds of reducing to special occasion drinking at age 33 (OR = 3.27, 95% CI = 1.34–8.01) and age 42 (OR = 2.25, 95% CI = 1.23–4.50). Assessing past health, no longer having an LLI at age 33 (OR = 2.48, 95% CI = 1.38–4.43), and developing an LLI at age 33 (OR = 2.86, 95% CI = 1.76–4.63) was associated with a reduction to special occasion drinking at age 42. There

was no significant association with previously having an LLI and persistent drinkers who reduced to special occasion drinking or ceased consumption at age 50.

Drinkers who developed an LLI from the previous wave had more than twice the odds of ceasing consumption compared with those who had not developed an LLI by age 33 (OR = 2.71, 95% CI = 1.16–4.93), 42 (OR = 2.44, 95% CI = 1.24–4.81), and 50 (OR = 3.33, 95% CI = 1.56–7.12) (Table 3). Participants with a persistent LLI across 2 waves had increased odds of ceasing consumption at age 42 (OR = 3.22, 95% CI = 1.06–9.77) and 50 (OR = 4.03, 95% CI = 1.72–9.44). Past health was also associated with a cessation in alcohol consumption at a later time point. Developing an LLI at age 33 was associated with ceasing consumption at age 42 (OR = 3.16, 95% CI = 1.28–6.77) and age 50 (OR = 3.93, 95% CI = 1.62–9.56). Having a persistent LLI at age 42 was associated with a cessation in consumption at age 50 (OR = 3.64, 95% CI = 1.21–11.00). All models adjusted for sex, highest qualification, marital status, and children under 16 years in the household at the same time point changes in LLI were recorded.

Tables 4 and 5 present results from multinomial logistic regression, restricted to participants with 2 consecutive waves of data, rather than across 4 waves as in Tables 2 and 3. Similar to results restricted to 4 consecutive waves of data, drinkers who developed an LLI from the previous wave were more likely to reduce consumption to special occasional drinking at ages 42 (OR = 1.93, 95%

Table 1. Demographic Characteristics of Participants Who Have Ceased Alcohol Consumption, Reduced to Special Occasion Drinking, or Continued Drinking from Age 23, National Child Development Study 1958

	Age 33			Age 42			Age 50		
	Persistent drinkers % (n)	Reduced to special occasion drinking % (n)	Ceased consumption % (n)	Persistent drinkers % (n)	Reduced to special occasion drinking % (n)	Ceased consumption % (n)	Persistent drinkers % (n)	Reduced to special occasion drinking % (n)	Ceased consumption % (n)
Total	(4,787)	(649)	(93)	(4,476)	(248)	(63)	(4,297)	(126)	(53)
Sex									
Male	55 (2,631)	33 (214)	39 (36)	56 (2,500)	40 (100)	49 (31)	56 (2,414)	45 (57)	55 (29)
Female	45 (2,156)	67 (435)	61 (57)	44 (1,976)	60 (148)	51 (32)	44 (1,883)	55 (69)	45 (24)
Limiting longstanding illness (LLI) since previous wave									
No LLI	93 (4,475)	92 (594)	87 (81)	89 (3,977)	75 (186)	68 (43)	85 (3,635)	71 (89)	57 (30)
No longer LLI	3 (126)	4 (26)	3 (3)	2 (79)	5 (13)	5 (3)	5 (225)	7 (9)	9 (5)
Developed LLI	3 (165)	3 (22)	10 (9)	8 (343)	16 (39)	21 (13)	6 (275)	13 (17)	19 (10)
Persistent LLI	0 (21)	1 (7)	–	2 (77)	4 (10)	– (4)	4 (162)	9 (11)	15 (8)
Malaise inventory score									
Poor Psychosocial Health	4 (214)	6 (41)	8 (7)	10 (430)	16 (40)	27 (17)	11 (475)	25 (32)	30 (16)
Highest qualification									
Degree	17 (808)	7 (47)	14 (13)	21 (955)	11 (28)	22 (14)	24 (1,025)	17 (21)	6 (3)
Other	72 (3,443)	76 (494)	70 (65)	69 (3,076)	69 (172)	57 (36)	66 (2,851)	68 (86)	79 (42)
No qualifications	11 (536)	17 (108)	16 (15)	10 (445)	19 (48)	21 (13)	10 (421)	15 (19)	15 (8)
Marital Status									
Single	18 (876)	13 (84)	14 (13)	12 (541)	13 (31)	22 (14)	10 (419)	12 (15)	13 (7)
Married	72 (3,432)	78 (503)	77 (72)	74 (3,296)	72 (179)	48 (30)	73 (3,141)	70 (88)	58 (31)
Separated/ widowed/divorced	10 (479)	10 (62)	9 (8)	14 (639)	15 (38)	30 (19)	17 (737)	18 (23)	28 (15)
Children in household									
Yes	66 (3,148)	81 (528)	67 (62)	76 (3,400)	79 (196)	65 (41)	76 (3,255)	75 (94)	91 (48)

Table 2. Multinomial Logistic Regression on the Odds of Reducing Alcohol Consumption to Special Occasion Drinking (SO) Versus Being a Persistent Drinker (PD) (reference), and Change in Limiting Longstanding Illness (LLI)^{a,b} at Ages 33, 42, and 50, The National Child Development Study 1958

—————> Persistent drinker to special occasion drinker (n)^c

23 years				33 years			42 years			50 years		
PD vs. SO at age 33 (N=5529) ^c				PD vs. SO at age 42 (N=4787) ^{c,d}			PD vs. SO at age 50 (N=4476) ^{c,d,e}					
	n	OR	p-value (95% CI)	n	OR	p-value (95% CI)	n	OR	p-value (95% CI)	n	OR	p-value (95% CI)
No LLI	594	1		211	1		102	1		89	1	
No longer LLI	26	1.62	0.033 (1.04, 2.52)	14	2.48	0.002 (1.38, 4.43)	4	1.96	0.200 (0.70, 5.49)	9	1.52	0.246 (0.75, 3.07)
Developed LL	22	0.92	0.740 (0.56, 1.41)	22	2.86	<0.001 (1.76, 4.63)	16	1.65	0.078 (0.94, 2.89)	17	2.04	0.011 (1.18, 3.53)
Persistent LLI	7	3.27	0.009 (1.34, 8.01)	1	1.20	0.861 (0.16, 9.07)	10	2.25	0.023 (1.23, 4.50)	11	1.96	0.053 (0.99, 3.86)

Figures in bold are significant at the 0.05 level.

^aAll models adjusted for poor psychosocial health, highest educational qualification, marital status, and children in the household at the time point of the model.

^bLimiting longstanding illness was derived from 2 consecutive waves of data corresponding to time frame between the dotted lines.

^cExcluded 923 special occasion drinkers and 255 nondrinkers at age 23.

^dExcluded an additional 649 special occasion drinkers and 93 nondrinkers at age 33.

^eExcluded an additional 248 special occasion drinkers and 63 nondrinkers at age 42.

Table 3. Multinomial Regression on the Odds of Ceasing Alcohol Consumption (N)

Versus Being a Persistent Drinker (PD) (reference), and Change in Limiting Longstanding Illness (LLI)^{a,b} at Ages 33, 42, and 50, The National Child Development Study 1958

—————> Persistent drinker to non-drinker (n)^c

23 years				33 years			42 years			50 years		
PD vs. N at age 33 (N=5529) ^c				PD vs. N at age 42 (N=4787) ^{c,d}			PD vs. N at age 50 (N=4476) ^{c,d,e}					
	n	OR	p-value (95% CI)	n	OR	p-value (95% CI)	n	OR	p-value (95% CI)	n	OR	p-value (95% CI)
No LLI	81	1		55	1		38	1		30	1	
No longer LLI	3	1.40	0.571 (0.44, 4.52)	1	0.65	0.669 (0.07, 3.90)	2	2.48	0.222 (0.58, 10.64)	5	2.30	0.092 (0.87, 6.02)
Developed LL	9	2.71	0.007 (1.16, 4.93)	7	3.16	0.007 (1.28, 6.77)	9	1.98	0.088 (0.90, 4.34)	10	3.33	0.002 (1.56, 7.12)
Persistent LLI	—	—	—	—	—	—	4	3.64	0.022 (1.21, 11.00)	8	4.03	0.001 (1.72, 9.44)

Figures in bold are significant at the 0.05 level.

^aAll models adjusted for poor psychosocial health, highest educational qualification, marital status, and children in the household at the time point of the model.

^bLimiting longstanding illness was derived from 2 consecutive waves of data corresponding to time frame between the dotted lines.

^cExcluded 923 special occasion drinkers and 255 nondrinkers at age 23.

^dExcluded an additional 649 special occasion drinkers and 93 nondrinkers at age 33.

^eExcluded an additional 248 special occasion drinkers and 63 nondrinkers at age 42.

Table 4. Multinomial Regression on the Odds of Reducing Alcohol Consumption to Special Occasion Drinking Versus Being a Persistent Drinker (reference group) from the Previous Wave (Continued in Table 5)^a, The National Child Development Study 1958

	Age 33 (N = 7,581)			Age 42 (N = 7,666)			Age 50 (N = 7,402)		
	n = 897	OR	p-Value (95% CI)	n = 523	OR	p-Value (95% CI)	n = 363	OR	p-Value (95% CI)
Sex (Female)	586	2.37	<0.001 (2.04–2.75)	336	2.09	<0.001 (1.73–2.52)	234	2.01	<0.001 (1.60–2.51)
Limiting longstanding illness (LLI) since previous wave									
No LLI	809	1		398	1		257	1	
No longer LLI	31	1.33	0.160 (0.89–1.98)	21	2.43	<0.001 (1.50–3.91)	22	1.19	0.444 (0.76–1.87)
Developed LLI	41	1.16	0.408 (0.82–1.64)	85	1.93	<0.001 (1.49–2.51)	52	1.89	<0.001 (1.37–2.60)
Persistent LLI	16	3.31	<0.001 (1.80–6.08)	19	2.01	0.007 (1.21–3.34)	32	1.92	0.002 (1.28–2.87)
Poor psychosocial health	79	1.34	0.032 (1.03–1.76)	91	1.31	0.036 (1.02–1.70)	81	1.59	0.001 (1.21–2.09)
Highest qualification									
Degree	59	1		56	1		53	1	
Other	659	2.17	<0.001 (1.64–2.87)	361	1.74	<0.001 (1.30–2.33)	223	1.41	0.029 (1.04–1.92)
No qualifications	179	3.18	<0.001 (2.31–4.36)	106	2.47	<0.001 (1.76–3.48)	87	2.35	<0.001 (1.64–3.36)
Marital status									
Single	137	1		67	1		39	1	39
Married	673	0.83	0.122 (0.65–1.05)	364	0.79	0.140 (0.58–1.08)	255	0.88	0.486 (0.62–1.26)
Separated/widowed/divorced	87	0.68	0.013 (0.50–0.92)	92	0.83	0.276 (0.58–1.17)	69	0.80	0.283 (0.53–1.20)
Children in household	706	1.78	<0.001 (1.45–2.18)	403	1.11	0.421 (0.87–1.41)	76	1.05	0.730 (0.80–1.37)

Figures in bold are significant at the 0.05 level.

^aEach model is based on having data on 2 consecutive waves of data only.

Table 5. Multinomial Regression on the Odds of Ceasing Alcohol Consumption Versus Being a Persistent Drinker (Reference Group) from the Previous Wave^a, The National Child Development Study 1958

	Age 33			Age 42			Age 50		
	n = 143	OR	p-Value (95% CI)	n = 133	OR	p-Value (95% CI)	n = 133	OR	p-Value (95% CI)
Sex (Female)	87	2.14	<0.001 (1.52–3.04)	72	1.36	0.091 (0.95–1.93)	73	1.26	0.205 (0.88–1.79)
Limiting longstanding illness (LLI) since previous wave									
No LLI	121	1		86	1		80	1	
No longer LLI	6	1.65	0.242 (0.71–3.82)	5	2.40	0.064 (0.95–6.06)	9	1.49	0.268 (0.73–2.99)
Developed LLI	14	2.50	0.002 (1.39–4.49)	31	2.66	<0.001 (1.70–4.16)	28	2.98	<0.001 (1.89–4.72)
Persistent LLI	2	2.24	0.275 (0.53–9.50)	11	4.06	<0.001 (2.04–8.07)	16	2.66	0.001 (1.48–4.74)
Poor Psychosocial Health	15	1.46	0.193 (0.83–2.59)	41	2.32	<0.001 (1.53–3.51)	38	1.90	0.002 (1.26–2.88)
Highest qualification									
Degree	16	1		19	1		14	1	
Other	91	1.22	0.472 (0.71–2.10)	79	1.06	0.81 (0.64–1.77)	83	1.82	0.040 (1.02–3.24)
No qualifications	36	2.64	0.002 (1.43–4.89)	35	1.85	0.039 (1.03–3.31)	36	2.93	0.001 (1.55–5.54)
Marital status									
Single	31	1		25	1		16	1	
Married	97	0.90	0.678 (0.55–1.47)	72	0.55	0.029 (0.32–0.94)	78	0.74	0.287 (0.42–1.29)
Separated/widowed/divorced	15	0.73	0.342 (0.38–1.40)	36	1.01	0.974 (0.58–1.75)	39	1.15	0.640 (0.63–2.10)
Children in household	91	0.83	0.378 (0.54–1.26)	88	0.87	0.545 (0.57–1.35)	114	0.70	0.160 (0.42–1.14)

Figures in bold are significant at the 0.05 level.

^aEach model is based on having data on 2 consecutive waves of data only.

CI = 1.49–2.51) and 50 (OR = 1.89, 95%CI = 1.37–2.60) (Table 4). Also, drinkers were more likely to cease consumption at age 33 (OR = 2.50, 95%CI = 1.39–4.49), 42 (OR = 2.66, 95%CI = 1.70–4.16), and 50 (OR = 2.98, 95%CI = 1.89–4.72) (Table 5), which is similar to findings based on 4 consecutive waves of data.

DISCUSSION

Associations were found between developing an LLI and cessation of alcohol consumption at ages 33, 42, and 50. Results are consistent with other studies which show that ex-drinkers have worse health (Green and Polen, 2001; Wan-

namethee and Sharper, 1997) and have higher probability of ceasing consumption with a medical diagnosis in middle age (Liang and Chikritzhs, 2011; Newsom et al., 2012). Similar associations were found between developing an LLI and reducing consumption to special occasion drinking, at age 42 and 50. This implies that the sick-quitter bias may also relate to occasional drinkers in middle age where often these people are grouped together with nondrinkers (Fillmore et al., 2007). This has implications for both long-term abstainers as well as those who self-identify as being “lifetime abstainers,” who were found to have drunk alcohol in the past (Caldwell et al., 2006; Rehm et al., 2008) because our study suggests that a worsening of health or preexisting poor health is asso-

ciated with a cessation or reduction in alcohol consumption to special occasion drinking across the life course.

These findings complement previous findings that poor health is associated with nondrinking from an early age (Ng Fat and Shelton, 2012), and persistent poor health with being a persistent nondrinker (Ng Fat et al., 2014), suggesting that there are direct effects of poor health on nondrinking. This study also shows the relationship between a worsening of health and nondrinking is not only a phenomenon that occurs as people age, because the association was present across the life course. Poor health may be a direct reason for nondrinking, for example, because of medication that has to be taken due to having an illness (National Institute on Alcohol Abuse and Alcoholism, 2007), or interaction with the health condition which discourages the use of alcohol. Alternatively poor health may have an indirect influence on nondrinking being a factor relating to social disadvantage, which has also been found to be related to nondrinking (Jefferis et al., 2007; Ng Fat and Shelton, 2012). These direct and indirect factors may explain why consistent associations between poor health and nondrinking are found in different cohorts, and with older (Newsom et al., 2012; Powers and Young, 2008; Wannamethee and Shaper, 1991) and younger participants (Ng Fat and Shelton, 2012; Ng Fat et al., 2014) including in this study in relation to ex-drinking. Evidence suggests that moderate alcohol consumption and lower cardiovascular disease risk are not causally related (Holmes et al., 2014), countering the conclusions of many J-curve studies. Health selection effects into nondrinking may be why a consistent J-curve has been found in later life across numerous observational studies and conditions (Fekjær, 2013), however further research is needed to specify the underlying health conditions across the life course among nondrinkers.

Having a persistent LLI across 2 consecutive waves also had an association with ceasing consumption at ages 42 and 50 and reducing consumption to special occasion drinking at age 33 and 42. This may reflect a gradual reduction in alcohol consumption to nondrinking with a longstanding illness over the time span, particular because previous LLI was associated with a cessation or reduction even ahead of the event occurring. Having an LLI in past waves was associated with a reduction to special occasion drinking at age 42, but no such association existed with past LLI and a reduction to special occasion drinking at age 50. This suggests that those who persistently drink into middle age have better health overall including past health, than those who reduced consumption to special occasion drinking at an earlier time point. People who persistently drink appear to be healthier than those who had to reduce consumption to special occasion drinking earlier on. Further analysis is required to see whether this pattern continues past age 50 and the extent to which the duration of health conditions and their severity affect drinking on a continuous scale.

The use of self-reported health as a measure of physical health may be biased toward participant's self-perception of their health or their mental health. However, LLI was

found to have greater associations with physical functioning than mental health (Cohen et al., 1995) being related to chronic conditions such as epilepsy, heart trouble, and rheumatism even in young adulthood (Manor et al., 2001). Persistent LLI from childhood was also found to be associated with childhood disability in young adulthood (Power et al., 2000). We also adjusted for a measure of psychosocial health to account for mental health. Poor psychosocial health had independent associations with ceasing consumption at ages 42 and 50 and reducing to special occasion drinking at age 50 (results not presented). This is not surprising given that nondrinkers have poorer psychosocial health than drinkers (Baum-Baicker, 1985; Lucas et al., 2010) including in early adulthood (Caldwell et al., 2002; Leifman et al., 1995; Pape and Hammer, 1996; Power et al., 1998). Many alcoholics, who may have had to cease alcohol consumption due to problems with their alcohol use or physical problems as a consequence of problematic alcohol use, have underlying mental health problems (Guest and Holland, 2011) which may be why we find independent associations of physical health and poor psychosocial health and ex-drinking. More complex models are required to tease out the individual effects of physical and psychosocial health on nondrinking because our data adjusted for psychosocial health at a single time point only.

Strengths and Limitations

Strengths of this study include the use of responses recorded by participants at separate time points, meaning the health and drinking status at an earlier time frame is not subject to problems with retrospective recall. The use of a sample where all participants are the same age also means that associations found are not a factor related to differences in ages.

There were many limitations of this study. All estimates were adjusted for sex; however, we could not test for an interaction, because the number of ex-drinkers was small. Another limitation is missing data. Analysis was restricted to participants with drinking recorded from 4 consecutive waves and complete cases on all variables which resulted in small numbers of participants who ceased consumption. Participants who were lost to attrition have been found to consist of more males and those who are socially disadvantaged (Hawkes and Plewis, 2006); therefore, our sample was reduced to a slightly wealthier and healthier sample. However, missing data within covariates were small, for example, item nonresponse within changes in LLI, our main exposure variable, accounted for just 0.2%. Therefore, we concluded that multiple imputation of the missing values would have had little effect if we were to delete the imputed outcomes as has been recommended (von Hippel, 2007). In addition, we conducted analysis using a sample where participants only had to have 2 waves of drinking data recorded, therefore suffering from less attrition than a sample restricted to those

with 4 waves of data (Tables 4 and 5). In these analyses which assessed the relationship between changes in health with binary changes in consumption across 2 time points, results were essentially the same for the key exposure variables of interest; there were only changes to the magnitude of the effect.

Some studies suggest that it is mainly past heavy drinkers who have ceased consumption contributing to the sick-quitter effect, having poor health characteristics more on a par with heavy drinkers (Saarni et al., 2008; Shaper et al., 1988; Wannamethee and Sharper, 1997). Due to the use of frequency questions, information on the volumes drunk was not analyzed. Further research should assess whether the effects of health on a change in consumption are greater for heavier drinkers, how it might influence a gradual reduction, and whether these changes are maintained later on in life. This was beyond the scope of this study. A further limitation is that questions on drinking frequency differed wave-to-wave, and ambiguity between responses such as “less often” and “on special occasion only” at age 23 may have occurred when these options were included as separate categories. We chose responses most closely resembling less frequent drinking or abstaining, being at the bottom of the scale. It is these lowest frequency groups that are used as the “nondrinker” comparison group against drinkers. As mentioned earlier, further analysis should be conducted to show the health effects of drinking on a continuous scale.

SUMMARY AND CONCLUSION

In summary, developing an LLI was associated with a cessation in alcohol consumption at age 33, 42, and 50 and a reduction to special occasion drinking at age 42 and 50 while adjusting for social and demographic factors. Drinkers who reduce consumption to special occasion drinking or cease consumption at age 42 also appear to suffer more greatly from poor health previously than drinkers who persistently drink at least till age 50. The relationship between a worsening of health and ex-drinking is present across the life course. Health selection is likely to influence nondrinking across the life course; this may contribute to the worse health outcomes of nondrinkers relative to drinkers later on in life.

ACKNOWLEDGMENTS

We thank colleagues in UCL including Dr. James Kneale, and Professor Sir Michael Marmot, and participants from the Kettil Brunn Society conference and Society for Social Medicine for their helpful feedback. We acknowledge the UK Data Archive, Centre for Longitudinal Studies for the production and availability of the National Child Development Study. Alcohol Research UK (ARUK) and UCL Impact provided a scholarship to fund LNF’s PhD (grant number: RS 10/03). The funding body played no part in the research protocol, data analyses, data interpretation, or writing of the report. The authors’ work is independent of

the funders. The views expressed in this article are those of the authors and do not necessarily reflect those of the funders.

REFERENCES

- Baum-Baicker C (1985) The psychological benefits of moderate alcohol consumption: a review of the literature. *Drug Alcohol Depend* 15:305–322.
- Caldwell TM, Rodgers B, Jorm AF, Christensen H, Jacomb PA, Korten AE, Lynskey MT (2002) Patterns of association between alcohol consumption and symptoms of depression and anxiety in young adults. *Addiction* 97:583–594.
- Caldwell TM, Rodgers B, Power C, Clark C, Stansfeld SA (2006) Drinking histories of self-identified lifetime abstainers and occasional drinkers: findings from the 1958 British Birth Cohort Study. *Alcohol Alcohol* 41:650–654.
- Cohen G, Forbes J, Garraway M (1995) Interpreting self reported limiting long term illness. *BMJ* 16:722–724.
- ESDS Longitudinal (2007) 1970 British Cohort Study Malaise Inventory Teaching Resource. Available at: <http://www.esds.ac.uk/longitudinal/resources/malaise/background.asp>. Accessed September 9, 2012.
- Fekjær HO (2013) Alcohol—a universal preventive agent? A critical analysis. *Addiction* 108:2051–2057.
- Fillmore KM, Stockwell T, Chikritzhs T, Bostrom A, Kerr W (2007) Moderate alcohol use and reduced mortality risk: systematic error in prospective studies and new hypotheses. *Ann Epidemiol* 17:S16–S23.
- Giordano GN, Lindstrom M (2010) The impact of changes in different aspects of social capital and material conditions on self-rated health over time: a longitudinal cohort study. *Soc Sci Med* 70:700–710.
- Green CA, Polen MR (2001) The health and health behaviors of people who do not drink alcohol. *Am J Prev Med* 21:298–305.
- Guest C, Holland M (2011) Co-existing mental health and substance use and alcohol difficulties – why do we persist with the term “dual diagnosis” within mental health services? *Adv Dual Diagn* 4:162–172.
- Hajema K-J, Knibbe RA (1998) Changes in social roles as predictors of changes in drinking behaviour. *Addiction* 93:1717–1727.
- Hawkes D, Plewis I (2006) Modelling non-response in the National Child Development Study. *J R Stat Soc* 169:479–491.
- Holmes MV, Dale CE, Zuccolo L, Silverwood RJ, Guo Y, Ye Z, Prieto-Merino D, Dehghan A, Trompet S, Wong A, Cavadino A, Drogan D, Padmanabhan S, Li S, Yesupriya A, Leusink M, Sundstrom J, Hubacek JA, Pikhart H, Swerdlow DI, Panayiotou AG, Borinskaya SA, Finan C, Shah S, Kuchenbaecker KB, Shah T, et al. (2014) Association between alcohol and cardiovascular disease: Mendelian randomisation analysis based on individual participant data. *BMJ* 349:g4164.
- von Hippel PT (2007) Regression with missing Ys: an improved strategy for analyzing multiply imputed data. *Sociol Methodol* 37:83–117.
- Jefferis BJMH, Manor O, Power C (2007) Social gradients in binge drinking and abstaining: trends in a cohort of British adults. *J Epidemiol Community Health* 61:150–153.
- Leifman H, Kühnlhorn E, Allebeck P, Andréasson S, Romelsjö A (1995) Abstinence in late adolescence—antecedents to and covariates of a sober lifestyle and its consequences. *Soc Sci Med* 41:113–121.
- Liang W, Chikritzhs T (2011) Reduction in alcohol consumption and health status. *Addiction* 106:75–81.
- Lucas N, Windsor TD, Caldwell TM, Rodgers B (2010) Psychological distress in non-drinkers: associations with previous heavy drinking and current social relationships. *Alcohol Alcohol* 45:95–102.
- Manor O, Matthews S, Power C (2001) Self-rated health and limiting longstanding illness: inter-relationships with morbidity in early adulthood. *Int J Epidemiol* 30:600–607.
- National Institute on Alcohol Abuse and Alcoholism (2007) Harmful Interactions: Mixing Alcohol with Medicines. National Institutes of Health, Bethesda, MD.
- Newsom JT, Huguet N, McCarthy MJ, Ramage-Morin P, Kaplan MS, Bernier J, McFarland BH, Oderkirk J (2012) Health behavior change follow-

- ing chronic illness in middle and later life. *The Journals of Gerontology J Gerontol B Psychol Sci Soc Sci* 67:279–288.
- Ng Fat L, Cable N, Marmot M, Shelton N (2014) Persistent long-standing illness and non-drinking over time, implications for the use of lifetime abstainers as a control group. *J Epidemiol Community Health* 68:71–77.
- Ng Fat L, Shelton N (2012) Associations between self-reported illness and non-drinking in young adults. *Addiction* 107:1612–1620.
- Pape H, Hammer T (1996) Sober adolescence—predictor of psychosocial maladjustment in young adulthood? *Scand J Psychol* 37:362–377.
- Power C, Elliott J (2006) Cohort profile: 1958 British birth cohort (National Child Development Study). *Int J Epidemiol* 35:34–41.
- Power C, Li L, Manor O (2000) A prospective study of limiting longstanding illness in early adulthood. *Int J Epidemiol* 29:131–139.
- Power C, Rodgers B, Hope S (1998) U-shaped relation for alcohol consumption and health in early adulthood and implications for mortality. *Lancet* 352:877.
- Powers JR, Young AF (2008) Longitudinal analysis of alcohol consumption and health of middle-aged women in Australia. *Addiction* 103:424–432.
- Rehm J, Irving H, Ye Y, Kerr WC, Bond J, Greenfield TK (2008) Are lifetime abstainers the best control group in alcohol epidemiology? On the stability and validity of reported lifetime abstinence. *Am J Epidemiol* 168:866–871.
- Rodgers B, Korten AE, Jorm AF, Jacomb PA, Christensen H, Henderson S (2000) Non-linear relationships in associations of depression and anxiety with alcohol use. *Psychol Med* 30:421–432.
- Rodgers B, Pickles A, Power C, Collishaw S, Maughan B (1999) Validity of the Malaise Inventory in general population samples. *Soc Psychiatry Psychiatr Epidemiol* 34:333–341.
- Saarni SI, Joutsenniemi K, Koskinen S, Suvisaari J, Pirkola S, Sintonen H, Poikolainen K, Lönnqvist J (2008) Alcohol consumption, abstaining, health utility, and quality of life — a general population survey in Finland. *Alcohol Alcohol* 43:376–386.
- Shaper AG, Wannamethee G, Walker M (1988) Alcohol and mortality in British men: explaining the U-shaped curve. *Lancet* 332:1267–1273.
- Shaper AG, Wannamethee G, Walker M (1994) Alcohol and coronary heart disease: a perspective from the British regional heart study. *Int J Epidemiol* 23:482–494.
- Shepherd P (2012) 1958 National Child Development Study, Ethical Review and Consent, London. Centre for Longitudinal studies, London.
- StataCorp (2011) Stata Statistical Software: Release 12. StataCorp LP, College Station, TX.
- UK Data Service (2011) End User Licence Conditions [Online]. Available at: <http://ukdataservice.ac.uk/get-data/how-to-access/conditions.aspx>. Accessed March 2, 2011.
- University of London, Institute of Education & Centre for Longitudinal Studies (1991) National Child Development Study: Sweep 5, 1991. UK Data Service, Colchester, Essex.
- Wannamethee G, Shaper AG (1991) Men who do not drink: a report from the British Regional Heart Study. *Int J Epidemiol* 17:201–210.
- Wannamethee G, Sharper AG (1997) Lifelong teetotalers, ex-drinkers and drinkers: mortality and the incidence of major coronary heart disease events in middle-aged British men. *Int J Epidemiol* 26:523–531.