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# The impact of alcohol consumption on patterns of union formation in Russia 1998–2010: An assessment using longitudinal data

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*Using data from the Russian Longitudinal Monitoring Survey, 1998–2010, we investigated the extent to which patterns of alcohol consumption in Russia are associated with the subsequent likelihood of entry into cohabitation and marriage. Using discrete-time event history analysis we estimated for 16–50 year olds the extent to which the probabilities of entry into the two types of union were affected by the amount of alcohol drunk and the pattern of drinking, adjusted to allow for social and demographic factors including income, employment, and health. The results show that individuals who did not drink alcohol were less likely to embark on either cohabitation or marriage, that frequent consumption of alcohol was associated with a greater chance of entering unmarried cohabitation than of entering into a marriage, and that heavy drinkers were less likely to convert their relationship from cohabitation to marriage.*

**Keywords:** marriage; cohabitation; marital status; Russia; alcohol; health behaviours; longitudinal analysis

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## Introduction

Studies in several countries have shown that higher rates of alcohol consumption can affect the timing of marriage and are also associated with increased rates of cohabitation and union dissolution (Forthofer et al. 1996; Leonard and Rothbard 1999). Until now it has not been possible to ascertain whether similar patterns might be observed in Russia, a country known to have a distinctive drinking culture and rates of alcohol consumption that significantly reduce life expectancy (e.g., Leon et al. 2009; Shkolnikov et al. 2013).

In studies undertaken outside Russia it has long been noted that married people usually have better health and follow healthier lifestyles, including more moderate drinking patterns, than those who are unmarried (Gove 1973; Rosengren et al. 1989; Umberson 1992; Joung et al. 1995; Waite 1995). On the whole this finding is replicated in Russia: most cross-sectional studies have found that there too married people drink less frequently and are less likely to drink to excess (Bobak et al. 1999; Cockerham et al. 2006; Pridemore et al. 2010). Two reasons have been

suggested to explain why individuals who are heavy drinkers are more likely to be unmarried than married. One suggestion is that those who drink more heavily are less likely to enter marriage and more likely to exit from it. The other suggestion is that the change from one marital status to another may lead the individuals concerned to change their alcohol consumption (Leonard and Rothbard 1999). Longitudinal data are needed to distinguish which, if either, of these reasons is valid. In the study reported in this paper, we used data from the Russian Longitudinal Monitoring Survey (RLMS) for the years 1998–2010 to investigate the association between alcohol consumption and subsequent union formation or dissolution.

It will be helpful if we explain the terminology used throughout the paper. We use the terms ‘cohabitation’ to refer to non-marital cohabiting unions and ‘marriage’ to mean marital union. The terms ‘union formation’ or ‘entry to union’ refer to the start of either a cohabitation or a marriage. The term ‘unmarried’ refers to all those who are not in a registered marriage, and includes those in non-marital cohabiting unions. ‘Drinking frequency’

refers to the frequency of drinking alcohol, whereas ‘drinking pattern’ can refer to both drinking frequency and intensity of consumption, thereby capturing ‘binge drinking’ (heavy consumption in a short period) as well.

## Background

### *Alcohol consumption in Russia*

Comments on the heavy drinking by many Russians can be found from as early as the tenth century, and Russian culture has long been regarded in the popular imagination as revolving around intense bouts of excessive drinking, particularly by men (Nemtsov 2011). Early historical accounts of the amounts consumed and the patterns of consumption were based largely on travellers’ observations of the drinking habits of the urban elite, at royal celebrations or in Moscow taverns, but it is unclear how much heavy drinking occurred amongst men elsewhere in the country. In the 1700s, Peter I encouraged the practice of drinking large amounts of spirits by introducing daily vodka rations to the Navy, and accounts from that period helped to form the view, still prevalent today, that Russian men are heavy drinkers (Nemtsov 2011). Orlando Figes (2003), in his account of Russian cultural history, notes that the test of a ‘true’ Russian was the capacity to ‘be able to drink vodka by the bucketload’, an attitude which still prevails today. Over the twentieth century, Russian drinking continued to involve the consumption of large amounts of spirits, although there were sharp fluctuations, in part as a consequence of wars, but more particularly as a result of a series of prohibition laws. The first of these was passed in the early twentieth century (1914) and the last by Gorbachev in 1985. However, the scale of alcohol consumption in the Soviet Union across the twentieth century is difficult to estimate because the statistics on the subject released by the Soviet state, which manage to conceal any rise in consumption, are regarded as grossly misleading (Segal 1990; White 1996; Treml 1997). This fudging of the true picture can be partly attributed to the fact that excise duty on alcohol brought in significant income for the government, constituting 12–14 per cent of the total revenues received (Treml 1997). In the 1990s, after the fall of Communism, there was a sharp increase in hazardous levels and patterns of alcohol consumption, with a concomitant rise in alcohol-related illnesses, especially among men. This can be seen as a reaction to Gorbachev’s anti-

alcohol stance, but was also driven by the increasing availability of cheap spirits at a time of widespread socio-economic insecurity (Leon et al. 2009).

Today, the pattern of drinking in Russia still largely conforms to the traditional stereotype. Russia has a relatively high average annual alcohol consumption, at 15.7 litres of ethanol per adult, which is considerably higher than the European average of 12.2 litres (World Health Organisation 2011). In addition, the way that Russians drink alcohol is particularly hazardous for their health. Up to 75 per cent of all the alcohol is drunk in the form of spirits (Popova et al. 2007; Pomerleau et al. 2008; World Health Organisation 2011). Russia is the world’s greatest consumer of ‘hard liquor’. The country also has a tradition, particularly amongst its men, of periodic binging on vodka, with the express goal of becoming intoxicated (Nilssen et al. 2005; Perlman 2010). In a recent study conducted in the Urals, approximately 10 per cent of men reported going on ‘*zapoï*’ (a period of continuous drunkenness lasting several days) in the previous year (Tomkins et al. 2007). Finally, the practice of consuming *samogon*, a home-made spirit, and non-beverage alcohols, such as medical tinctures, is also relatively common (Bobrova et al. 2009; Gil et al. 2009). Accordingly, in Russia and elsewhere in Eastern Europe, alcohol consumption accounts for a higher proportion of disability-adjusted life years (DALYs) (the number of years lost owing to poor health, disability, or early death than in any other region of the world (Lim et al. 2012)). In addition, a comparative study of Eastern European countries has found that Russians are more likely to report that drinking leads to negative social consequences, such as family problems, than the inhabitants of any neighbouring countries (Bobak et al. 2004).

The consumption of alcohol has become normalized and incorporated into everyday life in Russia, with the expectations surrounding drinking heavily informed by traditional notions of masculinity and femininity (Van Gundy et al. 2005; Pietilä and Rytönen 2008b; Bobrova et al. 2010; Saburova et al. 2011; Hinote and Webber 2012). Heavy drinking is more common in youth and middle age, and among the unemployed, those with low education, and those in poorer households (Carlson and Vagero 1998; Chenet et al. 1998; Bobak et al. 1999; Tomkins et al. 2007; Jukkala et al. 2008; Perlman 2010; Cook et al. 2011). However, the greatest disparity is between the sexes: men drink more frequently, consume more spirits, and are several times more likely to binge drink (Bobak et al. 1999; Malyutina et al. 2001; Nicholson et al. 2005; Pomerleau et al. 2008; Bobrova

et al. 2010). Heavy drinking is considered more socially acceptable for men than for women (Van Gundy et al. 2005) and is perceived to play an important role in the social and business life of men, acting as a form of stress management (Mustonen 1997; Ashwin 2006; Pietilä and Rytönen 2008a; Saburova et al. 2011). In this normative setting heavy drinking amongst men may be seen as an indicator of social ‘normality’, a coping strategy, but among women as indicative of a form of dysfunctionality.

### *Patterns of union formation in Russia*

Patterns of union formation in Russia have traditionally followed the model of early, universal marriage identified as characteristic of the region in the 1960s (Hajnal 1965). Even recently, when compared with Western Europeans, Russians have tended to marry at younger ages: the mean age at first marriage for Russian women was 22 years in 1999, when it was 25 in the UK and 27 in Denmark (United Nations Economic Commission for Europe [UNECE] 2012). For most of the twentieth century, the chances of getting married at some point in life remained high in Russia, while rates of cohabitation stayed low (Philipov and Jasilioniene 2010). The period covered by our study, 1998–2010, was, however, characterized by a shift towards a pattern of decreasing rates of marriage, while rates of cohabitation began to increase. Marriage rates had begun to decline in the 1980s and they fell sharply in the 1990s. Over the same time span rates of cohabitation increased in all relevant age groups, counterbalancing most of the decline in marriage (Vishnevsky 2006; Kostova 2007; Hoem et al. 2009). Despite the increasing popularity of cohabitation as a precursor to marriage—in the 1990s, half of all first unions began as cohabitation—a registered marriage remains the preferred setting for childbearing in Russia (Philipov and Jasilioniene 2010). On the other hand, divorce rates in the country have long exceeded those in Western nations (Avdeev and Monnier 2000; Mills 2004; Jasilioniene 2007) and there is a correspondingly high re-marriage rate. Therefore marriage, divorce, re-marriage, and cohabitation are all common occurrences in the lives of Russia’s inhabitants (Avdeev and Monnier 2000; Mills 2004).

Two main explanations of recent trends in Russian cohabitations, marital unions, and dissolutions have been put forward. According to the ‘crisis’ explanation, the economic and social upheaval associated with the break-up of the Soviet Union led couples to postpone marriage and to greater union instability

(see, e.g., Vannoy et al. 1999). In contrast, the ‘ideational change’ explanation suggests that the shift from marriage to cohabitation reflects a late blossoming of the individualistic values associated with what has become known as the second demographic transition (e.g., Zakharov 2008). Proponents of the second demographic transition theory argue that as countries develop socially and economically, people become increasingly individualistic, which leads to more diverse, non-traditional forms of union, with an increased risk of divorce and separation (Van de Kaa 1987; Lesthaeghe 1995). On their own, neither the ‘crisis’ nor the ‘ideational’ explanations can adequately explain the changing patterns of union formation seen in Russia. The ‘crisis’ explanation has the flaw that cohabitation had started to become popular before the fall of communism (Gerber and Berman 2010), and might have been restrained by Soviet housing allocation rules, which favoured married couples (Zavisca 2012). The ‘ideational’ explanation is not wholly satisfactory either, because many of the traditional elements of Russian social behaviour—such as early marriage and young and nearly universal childbearing—are still in place and are not consistent with those characteristic of the second demographic transition (Philipov and Jasilioniene 2010). Indeed, the immediate post-Soviet period (early 1990s) saw an even greater emphasis on traditional gender stereotypes within the family (Watson 1993), and comparative studies have shown that there is more support for traditional gender roles in Russia than in other European countries (Motiejunaite and Kravchenko 2008). Further, conditions in society that would favour the proposed ideological ‘development’, such as nominal female equality in education and the labour force, were achieved many decades ago in Russia (Gerber and Berman 2010), but no corresponding change in patterns of union formation had resulted.

For decades, Russia has been distinguished from many Western European countries by a pattern of early, universal childbearing and reliance on abortion as a means of birth control. Despite substantial reductions during the 1990s, the country’s abortion rate remains the highest of all Eastern European countries (Sedgh et al. 2007; UNICEF 2013), and was twice as high as in the UK in 2011 (England & Wales Department of Health 2012; UNICEF 2013). In the Soviet era women turned to abortion because modern contraception was neither easily available nor promoted by the State, and the practice has continued into the post-Soviet period for cultural and practical reasons. Despite trends towards birth postponement (Frejka and Zakharov 2012), the

mean age at first birth remains much lower in Russia than in other European countries: in 2009 the Russian figure was 24.6 years, compared to 27.6 years in the UK and 30.1 years in Italy (UNECE 2012). Fertility in Russia declined rapidly in the 1990s, marking a shift towards a one-child family norm, but rates of voluntary childlessness have remained relatively low (Philipov and Jasilioniene 2010).

In Russia, pre-marital pregnancy is a strong determinant of entry to marriage (Cartwright 2000; Jasilioniene 2007; Kostova 2007; Alich 2009; Gerber and Berman 2010). ‘Shotgun weddings’ persist owing to a combination of the belief that child-bearing within marriage is to be preferred and a low level of effective contraceptive use. The use of modern contraception has not increased much in the post-Soviet period (Perlman and McKee 2009), and because women are traditionally reluctant to abort their first pregnancy (Kulakov et al. 1996), pre-marital pregnancy is likely to remain a driver of entry into marriage. Factors routinely found to be associated with union formation elsewhere, such as employment status or income (Jalovaara 2012), have been shown to have inconsistent associations, or no association at all, with union formation in Russia (Gerber and Berman 2010). Studies show that in Russia there are some disparities in type of union by level of education: cohabitation and non-marital childbearing are concentrated amongst less-educated groups, leading some to suggest that non-marital unions reflect a ‘pattern of (social and economic) disadvantage’ (Kostova 2007; Alich 2009; Gerber and Berman 2010; Perelli-Harris and Gerber 2011; Potârca et al. 2012).

### *Alcohol and union formation*

Alcohol consumption may affect union formation in a number of ways. Research on the topic has tended to concentrate on entry into marriage, rather than into cohabitation. Types of behaviour, including heavy drinking, can be incorporated into existing rational choice models of mate selection (Fu and Goldman 1996). For example, heavy drinking may be thought to reflect an individual’s cultural tastes, values, and lifestyle, and thus positively or negatively affect their attractiveness to potential partners. Another possibility is that an individual who drinks heavily may currently have poor health, or may be perceived to be at risk of poor health in the future, making him, or her, less desirable as a partner. One review of alcohol and the ‘marriage effect’ (the consistent finding that unmarried people

drink more heavily than the married) has suggested that excessive consumption of alcohol may encourage both early and late entry into marriage (Leonard and Rothbard 1999), and that the effect of consumption on entry to marriage will vary according to age. The few longitudinal studies which have been conducted to explore the relationship between alcohol consumption and marriage have shown associations that are inconsistent between studies. Two studies from the USA, which followed adolescents into adulthood, found that heavier drinking or alcohol abuse was associated with an early age of marriage (Newcomb and Bentler 1987; Forthofer et al. 1996). A possible scenario in explanation of this finding is that heavy drinking, perhaps combined with forms of anti-social behaviour, led to an early exit from schooling, an early sexual debut, and early parenthood which prompted early marriage. However, other longitudinal studies have found that heavy drinking was associated with delayed entry into marriage (Fu and Goldman 1996; Waldron et al. 2011). This may indicate that heavy drinkers also have personal problems, such as an unwillingness to make a lasting commitment, or that they are viewed as being undesirable spouses, so that they take longer, on average, to find a marriage partner. A further study was unable to find any effect of drinking habits on the timing of marriage once socio-economic factors had been adjusted for (Martino et al. 2004).

The question of whether the relationship between alcohol consumption and cohabitation differs from that between alcohol consumption and marriage has not been thoroughly investigated. In European cross-sectional studies, individuals who cohabit were found to be more likely to be heavy drinkers than those who were married (Plant et al. 2008; Li et al. 2010). The authors speculated that this could be either because heavy drinkers are selected into cohabitation (Plant et al. 2008; Li et al. 2010) or because they are less likely to move on from cohabitation into marriage. However, these two hypotheses have not been investigated thoroughly and the mechanisms involved remain unclear. Horwitz and White (1998) investigated drinking before cohabitation and marriage and found no evidence that cohabiters were heavy drinkers before they moved in with their partners (Horwitz and White 1998). The effects of alcohol consumption on entry into cohabitation or marriage has not been investigated using data from Eastern Europe or (before our study) Russia, where patterns of both drinking and union formation are substantially different from those seen in Western countries.

## Methods

### Data

Our analysis used data from the Russian Longitudinal Monitoring Survey (RLMS) (Higher School of Economics et al. 1992–present), a Russian household panel survey started in the early 1990s to monitor the effect of the political transition from Soviet to post-Soviet Russia on health and well-being. The study was designed as a repeated cross-sectional survey but because of the way the follow-up procedure was organized, the data also permit longitudinal analysis. The survey was carried out in ‘waves’, taken in successive years. We used cross-sectional data from waves 8 to 19 (1998–2010) to construct longitudinal data by observing individuals from one wave (wave  $t - 1$ ) to the subsequent wave (wave  $t$ ) across the series of waves until they fell out of observation and were lost to follow-up. Waves 5–7 (1994–97) of the RLMS survey could not be used in our study because data on cohabitation were not collected in those years.

Full details of the design and sampling framework of the RLMS are available on the project website (<http://www.cpc.unc.edu/projects/rllms-hse>). To date, the survey project has comprised two phases. Data from phase 1 (waves 1–4, 1992–94) were not included in this study since they are widely regarded as unrepresentative. Phase 2 comprised waves 5 onwards, and spanned the years 1994 to the present. At the beginning of the second phase, in 1994, a three-stage probability sample was drawn in an attempt to construct a nationally representative sample. Thirty-eight Russian population centres were chosen as primary sampling units (PSUs), the probability of their inclusion being proportional to their size, and villages or census districts were randomly chosen from the PSUs as secondary sampling units (SSUs). From each SSU, the addresses of ten households were randomly chosen from local household registers (in urban areas, the registers were developed by the survey team) and where possible all adult members of each selected household were interviewed. The total selected sample consisted of 4,718 households. At least one interview was completed for 84.3 per cent of these households, although the response rate was lower in the Moscow and St Petersburg regions, where it reached only 60.2 per cent. At the beginning of phase 2 (wave 5), data had been collected on 3,975 households and 8,893 adults. For each of the selected households, interviewers collected data on its composition, and attempted to

interview every adult resident of the household, using a more detailed individual questionnaire. After the first round of interviews the interviewers returned to the same households approximately annually. Where possible, people leaving the household between annual ‘waves’ were followed up, and their new household recruited into the study. When, in a later wave, new people were found to have moved into one of the addresses selected for the initial sample they were invited to join the study. According to the RLMS survey team, the population sampled in wave 5 in 1994 were comparable to the population enumerated in the 1989 census of Russia in distribution of household size, sex ratio, age distribution, and proportion living in urban and rural areas. Our own analysis showed that crude marriage rates within the RLMS population were slightly higher than those published by the Russian government statistics agency but followed the same pattern of increases and decreases over the survey period.

### Analysis sample

Both men and women were included in our longitudinal study if they had completed an individual interview as part of any two consecutive waves of the RLMS (wave  $t - 1$  and wave  $t$ ), and were aged between 16 and 50 at the time they first entered observation at wave  $t - 1$ . We refer to the wave in which the outcome was measured as wave/time  $t$ , and the preceding wave as wave/time  $t - 1$ . Waves further back in relation to the outcome are called wave  $t - 2$ , wave  $t - 3$ , and so on. Our study focused on the population not married at wave  $t - 1$ . Whether an individual was included in the analysis sample depended on which aspect of union formation was being investigated. For example, for the analysis of entry to union (either cohabitation or marriage) we included all those who were never married, divorced, or widowed (and not cohabiting) at  $t - 1$ , and then followed them to the next wave  $t$ . For the analysis of conversion of cohabitation to marriage we included all those cohabiting at wave  $t - 1$  and followed them to wave  $t$ . The waves over which the individual could be followed are referred to as ‘the follow-up period’, and the first wave in which they were seen is termed ‘the start of the follow-up period’. We restricted our analysis to those aged 16–50 years at the start of the follow-up period because most union formation occurs at these ages.

*Outcome variable: union status*

For each individual, marital status at wave  $t - 1$  was grouped into four 'union status' categories: 'never married and not cohabiting', 'currently cohabiting', 'divorced', and 'widowed'. Each individual was then categorized as being in one of five potential outcome categories at the subsequent wave  $t$ , the four just listed or a fifth, 'married' category. We could then cross-tabulate the 'original' (wave  $t - 1$ ) and 'destination' (wave  $t$ ) categories, to provide for 20 potential transitions over the period between waves. For four of these transitions no individual changed union status, leaving 16 potential transitions from one state to another, although two of these—a move from being either divorced or widowed to being never married—were logically impossible. After data cleaning, 62 out of 27,228 of the follow-up periods fell into these two 'impossible' categories, and as irresolvable inconsistencies they were excluded from the analysis. For different sections of the analysis we grouped together marital status outcomes at wave  $t - 1$  and wave  $t$ . For example, for the analysis of entry to union, marriage and cohabitation were combined at wave  $t$ . This is explained in more detail in the Statistical Methods section below.

*Alcohol variables*

*Alcohol use at the previous survey wave (wave  $t - 1$ ).* At each wave of the RLMS, participants were asked about the frequency with which they drank alcohol, the types of beverage they consumed, and the maximum daily volume of each alcoholic beverage they had consumed in the 30 days before they were interviewed. The information on an individual's drinking habits at wave  $t - 1$  was used to derive two alcohol consumption variables for the period beginning with that interview in wave  $t - 1$  and ending at the interview for the next wave (wave  $t$ ) of the survey. The first variable, an individual's 'drinking frequency', was categorized into five groups according to the number of times they had had an alcoholic drink in the 30 days before their interview at  $t - 1$ . The groups were: 'non-drinker', 'had a drink 2–3 times in the month', 'drank once a week', 'drank 2–3 times a week', and 'drank 4 or more times a week'. For women, the last two categories (2–3 and 4+ drinks) had to be combined owing to small numbers. The second variable for alcohol consumption, 'drinking pattern', classified individuals into 'binge drinkers', 'non-binge drinkers', or 'non-drinkers'. Adopting a criterion used in

previous studies conducted in Russia (Malyutina et al. 2001; Bobak et al. 2004), we defined binge drinking as the consumption of more than 80 g of ethanol in a single type of beverage on a single occasion. These two alcohol consumption variables were used in separate models because they were highly correlated.

*Changes in alcohol consumption.* It might be supposed that a sudden change in alcohol consumption would have a greater effect on an individual's union status than the individual's usual drinking pattern. To assess this particular hypothesis we conducted further analyses using a subset of observations with data from three waves (referred to as waves  $t - 2$ ,  $t - 1$ , and  $t$ ), and fitted models that were simultaneously adjusted for drinking frequency and pattern at  $t - 2$  and for substantial changes in drinking frequency and pattern between waves  $t - 2$  and  $t - 1$ . Categorical variables were created to indicate a 'substantial increase', 'decrease', or 'relative stability' between successive waves in 'drinking frequency' or in 'drinking pattern' (defined above). Change in 'drinking frequency' was indicated by a shift either upwards or downwards by at least two of our 'drinking frequency' categories—for example, a move from being a non-drinker to drinking once per week, or from drinking 4 or more times per week to drinking 1–3 times per month. Individuals who did not shift by at least two categories were classified as 'stable'. A 'change in drinking pattern' was indicated by a move from being a 'non-drinker' to being a 'binge drinker', and the opposite was taken to indicate a decreased pattern of drinking; all other cases were classified as having a 'stable' drinking pattern.

*Other variables.* All covariate data were self-reported in the RLMS surveys and were taken to apply from the point they were reported (wave  $t - 1$ ) to the next wave of the survey (wave  $t$ ). We know from previous studies that the following factors could be associated with drinking pattern and union formation and so act as confounders of the true association: age, education, employment, income, health, and pregnancy. With the exception of age (the only variable operative before the start of alcohol consumption), all these factors could be influenced by alcohol consumption and so mediate between alcohol consumption and union formation. Treating these potential mediating variables as confounders in the model could have resulted in

over-adjustment and obscure some of the effect of alcohol on union formation. However, not adjusting for them ran the risk of leaving residual confounding. Because we were not sure whether these variables were confounders, mediators, or both, we entered them into the models in a stepwise fashion and took extra care in interpreting the effects adjusted for them.

Respondent's age at the start of the follow-up period was assigned to a 5-year age group. Calendar time was measured as the year when the survey was conducted. Education was assigned to one of three categories: 'incomplete secondary'; 'secondary, specialist, and professional', which included those who completed secondary education, and those who then went on to undertake specialist education, professional, and vocational-technical training (forms of applied professional training conducted in colleges, not universities); and 'university and above'. Employment status was also assigned to one of three categories: 'unemployed', 'employed', and 'other', the last including groups such as students and housewives. Household income was adjusted to allow for household size using an OECD (Organization for Economic Cooperation and Development)-modified scale (Hagenaars et al. 1994), and then assigned to the appropriate decile within the overall range of income. The self-assessed health of respondents, which they had reported on a five-point scale from 'very poor' to 'very good', was grouped into three categories: 'very poor and poor', 'fair', and 'good and very good'. A binary variable indicated whether the person interviewed had children under the age of 16 living with them. For women a binary variable indicating their current pregnancy status was also included. To take account of place, a categorical variable divided Russia into four 'areas' based partly on geography and partly on level of urbanization: respondents were classified as living either in the 'metropolitan areas' of Moscow and St Petersburg, or in 'Central, Urals, North, and North-west', 'Volga and the North Caucasus', or 'Siberia and the Far East'.

### Statistical methods

We modelled the data using discrete-time hazard models (Fahrmeir 1998) in which the probability of moving between one union state at wave  $t - 1$  and another union state at a succeeding wave of the RLMS survey,  $t$ , was expressed conditionally on the union state at time  $t - 1$ , and on the values taken by other relevant covariates at time  $t - 1$  and in some

cases covariates at time  $t - 2$ . We fitted several logistic and multinomial logistic regression models. For model 1 we used logistic regression to model entry into either cohabitation or marriage by those individuals who had previously never married or who were divorced or widowed and not cohabiting. For model 2 we used a multinomial logistic regression to model the competing risks of people embarking on either cohabitation or marriage, and for model 3 we applied a multinomial logistic regression to model the likelihood that a cohabiting individual would convert their relationship from a cohabiting union to marriage. We chose to model these particular transitions because they occurred most frequently within the sample population. For the different models, we used subsets of individuals according to whether they were 'at risk' of making the relevant transitions at wave  $t - 1$ . We also combined union status variables at time  $t$  and time  $t - 1$ , as follows. For models 1 and 2, only those unmarried and not cohabiting (never married, divorced, widowed) at the start of the period of observation (wave  $t - 1$ ) were included. These individuals comprised 76 per cent of the total sample of the 'unmarried'; the remaining 24 per cent were in cohabiting unions. For model 1 the outcomes of the change of state were dichotomized into those in which an individual 'remained in the same state', that is, did not form a union, and those who 'entered a union' by beginning to cohabit or by getting married. For model 2 we used the same subset of unmarried, with three possible outcomes: remaining in the unmarried, non-cohabiting state, entering cohabitation, or entering marriage. For the third model, representing the conversion of cohabitation into marriage, only those cohabiting at the start of the follow-up period were included, and the permitted outcomes of the analysis were restricted to 'no change' if the individual remained cohabiting, 'marriage', or 'neither of these'. For model 2, the competing risks of entering either into cohabitation or marriage, a multinomial logistic regression model of the following form was fitted:

$$\begin{aligned} \text{logit}\{p(\text{state} = s \text{ at time } t | \text{state } s' : \text{unmarried} \\ \text{and not cohabiting at time } t - 1, X_{t-1}) \\ = \mu_{ss'} + \beta_{ss'} X_{t-1}, t = 9, \dots, 19 \end{aligned}$$

where  $\mu$  (the expected value) of  $s$  can be equal to 'married', 'cohabiting', or 'never married',  $X_{t-1}$  is the vector of covariate values at time point  $t - 1$ , which will typically also include the values taken by the baseline covariates, and  $\beta$  is the corresponding vector of coefficients. A similar model was fitted



for conversion of cohabitation into marriage: it substituted ‘unmarried and not cohabiting’ for ‘cohabiting’ and made  $s$  equal to ‘still cohabiting’, ‘married’, or ‘neither of these’.

In a further analysis to explore the effect of changes in alcohol consumption on union formation, we used a subsample of our data set, restricted to those individuals for whom there were data from three successive waves of the RLMS survey ( $t - 2$ ,  $t - 1$ , and  $t$ ). The models of entry into a union and that of the conversion from cohabitation into marriage were refitted, and now included ‘drinking frequency at  $t - 2$ ’ as a predictor, as well as ‘change in drinking frequency’ to indicate whether or not an individual’s drinking frequency had altered significantly between time  $t - 2$  and time  $t - 1$ , as follows:

$$\begin{aligned} \text{logit}\{p(\text{entry to union by time } t \mid \text{at risk of entry to} \\ \text{union at } t - 1 \text{ and } t - 2, X_{t-1}, X_{t-2}) \\ = \mu + \beta_1 X_{t-1} + \beta_2 X_{t-2}, t = 6, \dots, 18 \end{aligned}$$

where  $X_{t-1}$  represents covariates and ‘change in drinking frequency’ at time  $t - 1$  and  $X_{t-2}$  represents ‘drinking frequency’ at time  $t - 2$ . If a significant effect associated with the ‘change in drinking frequency’ variable was found, it would suggest that a recent change in drinking frequency was a predictor of union formation over and above an individual’s baseline ‘drinking frequency’, as measured at time  $t - 2$ . The same models were also fitted with ‘drinking frequency’ substituted for ‘drinking pattern’ and ‘change in drinking frequency’ for ‘change in drinking pattern’.

Because of the conditional structure of the model, the log likelihood components from each time point were independent and, assuming that the model holds, they could be summed to allow a single overall fit using standard regression. This method is described as ‘pooled logistic regression’ in epidemiological and demographic studies (D’Agostino et al. 1990; Grundy and Kravdal 2008). The procedure pools the subjects at risk and the events across all periods of observation, which means that one individual in the panel study may contribute to several periods of observation. Invariance of the regression parameters over time and age was assessed by testing for interactions with age and calendar time using likelihood ratio tests. Because the RLMS uses a multi-stage sampling design we calculated robust standard errors, which used information on PSUs as a cluster variable. In some cases observations were included from individuals living in the same household, and we therefore

adjusted the standard errors to allow for dependence induced at the household level. Because of the different drinking habits of men and women we analysed data for the sexes separately.

After developing the models using complete cases, with all items of data available, we explored the effect of missing data by fitting multiple imputation (MI) models under the missing-at-random (MAR) assumption (Carpenter and Kenward 2013). According to this assumption, the probability of ‘missingness’—that is, that a piece of data has been omitted from the record of an individual—is entirely dependent on and explained by the observed data. We never know if this is a valid assumption, but its application will usually reduce any bias in our models caused by differences between those individuals for whom items of data are missing and those whose data are complete, and may increase the precision of our models by allowing the inclusion of those with missing data in addition to those for whom the data are complete. To determine which variables to include in the MI models, we fitted stepwise logistic regression models that would predict loss to follow-up from time  $t - 1$  to time  $t$  using backward selection to deselect any covariates that were insignificant at the 5 per cent level. In addition to those variables in the models we had constructed as part of our earlier analyses, we included covariates of socio-economic status, such as occupational class and asset ownership. We also included indicators of life satisfaction, household size, and whether or not an individual was a smoker. Variables that remained significant after backward selection were included in the MI models. After creating multiple imputed data sets, the analysis was rerun once more and the resulting models combined using Rubin’s rules (Rubin 1976), which take into account variation both within and between data sets. The MI procedure was implemented using STATA commands *ice* and *mim*. After the MI procedure all missing values were imputed, including missing values on the outcome at time  $t$  (attributable to attrition) and missing values on covariates at time  $t - 1$ . Finally, the models based on MI were compared with the analysis of the cases for which all the data were complete. If no non-trivial difference was found between the MI and ‘complete case’ analysis we could be more confident of its results, although never completely so, that differences between individuals with ‘complete’ and those with ‘incomplete’ data were not causing biased estimates of the association between alcohol consumption and union formation.

## Results

### *A description of the sample used in our main analysis*

In the pooled data taken from waves 8 to 19 of the RLMS we were able to observe a total of 15,326 periods between wave  $t - 1$  and wave  $t$  for unmarried men and 18,390 such periods for unmarried women at wave  $t - 1$  (here 'unmarried' refers to never married, divorced, widowed, and cohabiting). The sample used to construct our first and second

models, from those unmarried at wave  $t - 1$ , consisted of 20,853 observation periods, drawn from the records of 7,505 individuals who could be followed from wave  $t - 1$  to wave  $t$ . Forty-five per cent of sample members were male. The sample used to construct our third model, used to study those cohabiting at wave  $t - 1$ , consisted of 8,137 observation periods between wave  $t - 1$  and wave  $t$ , drawn from 3,532 individuals, 47 per cent of whom were male.

Table 1 shows the characteristics of the pooled sample of 'unmarried' men and women at wave  $t - 1$ ,

**Table 1** Characteristics of the pooled sample of follow-up periods from wave  $t - 1$  to wave  $t$  of the RMLS, including unmarried and cohabiting men and women aged 16–49 years. Russia 1998–2010

Characteristic at wave $t - 1$	Unmarried and not cohabiting at wave $t - 1$		Cohabiting wave $t - 1$	
	Men	Women	Men	Women
<i>Total number of follow-up periods</i>	11,545	14,034	3,781	4,356
Age (mean age in years)	24.7	28.4	32.5	31.2
16–24	63.7	48.9	20.7	28.7
25–34	21.3	19.9	40.2	36.5
35–49	15.1	31.2	39.1	34.8
Unmarried status				
Never married	84.1	62.2	–	–
Divorced	14.7	29.5	–	–
Widowed	1.2	8.3	–	–
Education				
Incomplete secondary	43.3	26.3	45.7	36.5
Secondary, specialist, and professional	47.4	55.9	43.8	48.3
University and above	9.3	17.8	10.5	15.2
Employment				
Unemployed	16.1	9.7	14.9	11.3
Employed	44.3	55.9	78.3	62.9
Other	39.6	34.4	6.8	25.8
Self-assessed health				
Very poor or poor	4.7	5.9	4.1	5.6
Average	37.6	52.8	50.7	62.2
Good or very good	57.7	41.3	45.1	32.2
Pregnant				
No	n/a	99.5	n/a	95.8
Yes	n/a	0.6	n/a	4.2
Area of Russia				
Central, Ural, North-west	36.0	38.3	37.7	39.6
Moscow and St Petersburg	13.3	12.7	11.4	11.0
Volga and North Caucasus	32.3	31.0	24.4	22.9
Siberia and Far East	18.4	18.0	26.5	26.5
Drinking frequency				
Non-drinker	42.8	49.4	22.1	37.1
1–3 times per month	24.0	34.8	28.3	38.2
Once per week	16.0	10.9	22.3	15.3
2–3 times per week	12.6	3.9	19.7	8.0
4+ times per week	4.7	0.9	7.6	1.4
Drinking pattern				
Non-drinker	42.6	49.3	22.1	37.0
Non-binge drinker	27.3	38.4	24.2	42.6
Binge drinker	30.1	12.3	53.7	20.4

Note: Unless otherwise stated the figures shown are percentages of the total sample of periods for males or females.

Source: RMLS 1998–2010.

and compares the 'unmarried and not cohabiting' with the 'unmarried and cohabiting'. The majority of the 'unmarried and not cohabiting' were aged less than 25 years, and this was particularly true for the men. The mean age of those not cohabiting, for both sexes combined, was 26.7 years, whereas those who were 'cohabiting and not married' tended to be older, with a mean age of 31.8 years. Among the 'unmarried and not cohabiting', men were more likely than women to be young, to have never married, not to have completed their secondary education, and to be unemployed. The most common employment status for the 'unmarried and not cohabiting' was 'other', which usually meant they were students. The majority of those in the sample who were cohabiting were employed. In line with previous cross-sectional studies conducted in Russia (Bobak et al. 1999; Jukkala et al. 2008), women were found to be significantly more likely to be non-drinkers, and those who did

drink were less likely than men to drink frequently and to indulge in binge drinking. In our sample of unmarried individuals 43 per cent of men and 50 per cent of women reported that they had not had an alcoholic drink in the 30 days before their interview. Amongst the 'cohabiting' individuals in the sample, approximately half the men reported binge drinking in the previous 30 days, but just 20 per cent of the women.

### Union formation

Tables 2 and 3 show the odds ratios derived from the logistic regression of 'entry into either a cohabitation or a marriage' according to the drinking habits of men and women before they formed the new union. Table 2 shows the odds ratios by frequency of consumption, and Table 3 by its pattern. Both tables show results for all of the

**Table 2** Adjusted odds ratios for union formation among unmarried people of each sex according to their drinking frequency, showing full coefficients. Russia 1998–2010

Variable at previous wave ( $t - 1$ )	Odds ratios for having formed a union by (time $t$ ) (figures in parentheses show 95 per cent confidence interval)	
	Men	Women
<i>N</i> of follow-up periods	8,563	11,164
<i>Drinking frequency</i>		
Non-drinker	0.77 (0.62–0.96)	0.78 (0.67–0.91)
1–3 times per month	1.00 (1.00–1.00)	1.00 (1.00–1.00)
Once per week	0.96 (0.75–1.21)	1.22 (1.00–1.50)
2–3 times per week/(women 2+ times per week)	1.09 (0.85–1.39)	1.41 (1.06–1.88)
4+ times per week (men only)	1.08 (0.75–1.55)	–
Test for trend	$p = 0.007$	$p < 0.001$
<i>Age (ref: 16–24 years)</i>		
25–34 years	1.11 (0.89–1.38)	0.82 (0.66–1.02)
35+ years	0.71 (0.52–0.95)	0.36 (0.27–0.46)
<i>Marital status (ref: never married)</i>		
Divorced and widowed	1.88 (1.44–2.46)	1.37 (1.11–1.71)
<i>Education (ref: incomplete secondary)</i>		
Secondary, specialist, and professional	1.00 (0.84–1.19)	0.83 (0.71–0.97)
University and above	0.93 (0.71–1.22)	0.75 (0.61–0.92)
Household income deciles (continuous variable)	1.06 (1.02–1.09)	1.02 (0.99–1.04)
<i>Employment status (ref: employed)</i>		
Unemployed	1.22 (0.98–1.52)	0.79 (0.64–0.98)
Other (students, housewives, etc.)	0.28 (0.21–0.38)	0.41 (0.33–0.52)
<i>Area (ref: central, Ural, North, North-west)</i>		
Moscow and St Petersburg	0.77 (0.58–1.04)	0.93 (0.73–1.19)
Volga and North Caucasus	0.92 (0.75–1.13)	0.91 (0.77–1.07)
Siberia and the Far East	1.11 (0.87–1.42)	1.07 (0.89–1.29)
<i>Self-assessed health (ref: very poor/poor)</i>		
Fair	0.97 (0.63–1.50)	1.06 (0.78–1.44)
Good/very good	0.99 (0.64–1.53)	1.00 (0.73–1.38)
Pregnant	n/a	6.36 (3.56–11.35)
Children <16 years resident	2.08 (1.34–3.24)	1.30 (1.09–1.56)

Source: As for Table 1.

**Table 3** Adjusted odds ratios for union formation among unmarried people of each sex according to their drinking pattern, showing full coefficients. Russia 1998–2010

Variable at previous wave ( $t - 1$ )	Odds ratios for having formed a union by time $t$ (figures in parentheses show 95 per cent confidence interval)	
	Men $N = 8,563$	Women $N = 11,164$
	OR (95 per cent CI) for being in union at follow-up (time $t$ )	
<i>Drinking pattern</i>		
Non-drinker	0.82 (0.66–1.01)	0.74 (0.64–0.86)
Non-binge drinker	1.0 [ref]	1.0 [ref]
Binge drinker	1.06 (0.87–1.30)	1.00 (0.83–1.22)
Test for trend	$p = 0.012$	$p < 0.001$
<i>Age (ref: 16–24 years)</i>		
25–34 years	1.11 (0.90–1.35)	0.82 (0.67–1.00)
35+ years	0.71 (0.53–0.94)	0.35 (0.28–0.44)
<i>Marital status (ref: never married)</i>		
Divorced and widowed	1.87 (1.47–2.39)	1.40 (1.15–1.71)
<i>Education (ref: incomplete secondary)</i>		
Secondary, specialist, and professional	1.00 (0.85–1.19)	0.82 (0.71–0.95)
University and above	0.94 (0.72–1.21)	0.75 (0.61–0.91)
Household income deciles (continuous variable)	1.06 (1.03–1.09)	1.02 (1.00–1.04)
<i>Employment status (ref: employed)</i>		
Unemployed	1.22 (0.99–1.50)	0.78 (0.64–0.95)
Other	0.28 (0.21–0.38)	0.41 (0.33–0.51)
<i>Area (ref: central, Ural, North, North-west)</i>		
Moscow and St Petersburg	0.78 (0.59–1.04)	0.94 (0.75–1.18)
Volga and North Caucasus	0.92 (0.76–1.11)	0.90 (0.78–1.05)
Siberia and the Far East	1.11 (0.89–1.38)	1.06 (0.89–1.26)
<i>Self-assessed health (ref: very poor/poor)</i>		
Fair	0.97 (0.64–1.46)	1.06 (0.79–1.44)
Good/very good	0.99 (0.66–1.49)	1.00 (0.74–1.36)
Pregnant	n/a	6.35 (3.73–10.84)
Children <16 resident	2.10 (1.45–3.06)	1.29 (1.09–1.52)

Source: As for Table 1.

covariates included in the model. Since there was little change in the odds ratios when the covariates were added in a stepwise fashion, we show only the results mutually adjusted for all the other variables in the model.

The most significant of the results in the tables is that those individuals of both sexes who were non-drinkers reduce their odds of entering a partnership by 20–25 per cent. Table 2 shows that as the frequency of an individual's drinking increased, so the odds of their entering a union also increased significantly. Tables 2 and 3 also show that the odds of entering a union between time  $t - 1$  and time  $t$  were significantly higher for those men and women who, at time  $t - 1$ , were aged less than 35, or were divorced or widowed. The odds were higher for women with low levels of education than for those with higher levels. Both men and women who were not part of the labour market, that is, those in the 'other' employment category, had a greater

likelihood of remaining single between waves  $t - 1$  and  $t$  than those who were in employment. Amongst women, pregnancy was associated with a six-fold increase in the odds of entering a union. For both sexes, having a child or children under the age of 16 increased the likelihood of entering a union. The associations with the covariates shown in Tables 2 and 3 are broadly in line with findings from the Gender and Generations Survey (GGS) and other sources (Kostova 2007; Gerber and Berman 2010). We tested for interactions but found no evidence of one between the alcohol variables and any of the following: original union status at time  $t - 1$ , age, calendar time, and the other variables in the model using likelihood ratio tests. Broadly the same pattern of associations was seen for both men and women.

Table 4 shows the odds of the competing risks of entering cohabitation or marriage by wave  $t$  for those who were not in a union at wave  $t - 1$ ,

**Table 4** Multinomial adjusted odds ratios for competing risks of cohabitation and marriage, among single people of each sex aged 16–49 years, according to drinking frequency and pattern. Russia 1998–2010

	Odds ratios for transition from one union status at time $t - 1$ to another status by time $t^1$ (figures in parentheses show 95 per cent confidence interval)			Odds ratios for transition from one union status at time $t - 1$ to another status by time $t^2$ (figures in parentheses show 95 per cent confidence interval)		
	Cohabiting vs. single	Married vs. single	Cohabiting vs. married	Cohabiting vs. single	Married vs. single	Cohabiting vs. married
Drinking behaviour at previous wave (time $t - 1$ )	Men					
<i>Drinking frequency</i>						
Non-drinker	0.64 (0.46–0.90)	0.65 (0.47–0.88)	0.99 (0.63–1.56)	0.73 (0.51–1.03)	0.67 (0.49–0.92)	1.09 (0.69–1.71)
1–3 times/month	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]
Once/week	1.34 (0.94–1.91)	0.70 (0.47–1.05)	1.90 (1.14–3.19)	1.29 (0.91–1.84)	0.69 (0.46–1.03)	1.87 (1.12–3.14)
2–3 times/week	1.38 (0.94–2.04)	0.86 (0.57–1.30)	1.60 (0.92–2.78)	1.32 (0.89–1.96)	0.85 (0.56–1.28)	1.55 (0.89–2.71)
4+ times/week	1.83 (1.05–3.18)	0.41 (0.17–1.02)	4.44 (1.56–12.64)	1.74 (1.00–3.02)	0.42 (0.17–1.04)	4.14 (1.45–11.85)
Test for trend	$p = 0.033$	$p = 0.056$	$p = 0.005$	$p = 0.051$	$p = 0.061$	$p = 0.008$
<i>Drinking pattern</i>						
Non-drinker	0.57 (0.41–0.79)	0.74 (0.54–1.01)	0.77 (0.50–1.20)	0.63 (0.46–0.88)	0.77 (0.56–1.07)	0.82 (0.52–1.29)
Non-binge drinker	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]
Binge drinker	1.19 (0.87–1.62)	0.93 (0.67–1.29)	1.28 (0.83–1.97)	1.10 (0.81–1.49)	0.95 (0.69–1.33)	1.15 (0.75–1.78)
Test for trend	$p = 0.268$	$p = 0.677$	$p = 0.271$	$p = 0.545$	$p = 0.777$	$p = 0.521$
Follow-up periods ( $N$ )		8,592			8,592	
	Women					
<i>Drinking frequency</i>						
Non-drinker	0.66 (0.51–0.85)	0.77 (0.60–0.99)	0.86 (0.60–1.21)	0.67 (0.52–0.87)	0.76 (0.59–0.99)	0.88 (0.62–1.25)
1–3 times/month	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]
Once/week	1.03 (0.72–1.49)	1.13 (0.75–1.68)	0.92 (0.54–1.54)	0.97 (0.68–1.40)	1.10 (0.73–1.64)	0.89 (0.53–1.50)
2+ times/week	2.11 (1.40–3.18)	0.75 (0.38–1.48)	2.81 (1.35–5.83)	1.90 (1.25–2.90)	0.67 (0.34–1.34)	2.82 (1.34–5.96)
Test for trend	$p < 0.001$	$p = 0.401$	$p = 0.006$	$p = 0.003$	$p = 0.272$	$p = 0.007$
<i>Drinking pattern</i>						
Non-drinker	0.62 (0.48–0.79)	0.74 (0.58–0.94)	0.84 (0.60–1.17)	0.65 (0.51–0.83)	0.78 (0.61–0.99)	0.84 (0.60–1.17)
Non-binge drinker	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]
Binge drinker	1.14 (0.82–1.60)	0.77 (0.50–1.19)	1.48 (0.88–2.50)	1.04 (0.75–1.46)	0.76 (0.49–1.19)	1.37 (0.81–2.31)
Test for trend	$p = 0.440$	$p = 0.241$	$p = 0.137$	$p = 0.804$	$p = 0.228$	$p = 0.239$
$N$ of follow-up periods		11,202			11,202	

<sup>1</sup>Adjusted for age, calendar time, and original union status.<sup>2</sup>Adjusted for age, calendar time, original union status, education, income and employment, self-assessed health, children, area of Russia, and (for women only) pregnancy.

Source: As for Table 1.

**Table 5** Multinomial adjusted odds ratios for competing risks of entry into marriage or separation, among cohabiting individuals of each sex aged 16–49 years, according to two measures of alcohol consumption, Russia, 1998–2010

	Odds ratios for transition from one union status at time $t - 1$ to another status by time $t^1$ (figures in parentheses show 95 per cent confidence interval)		Odds ratios for transition from one union status at time $t - 1$ to another status by time $t^2$ (figures in parentheses show 95 per cent confidence interval)	
	Single vs. cohabiting	Married vs. cohabiting	Single vs. cohabiting	Married vs. cohabiting
Drinking at previous wave (time $t - 1$ )	Men			
<i>Drinking frequency</i>				
Non-drinker	1.36 (0.88–2.09)	1.30 (0.97–1.73)	1.36 (0.88–2.09)	1.34 (1.00–1.79)
1–3 times/month	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]
Once/week	0.65 (0.39–1.09)	0.93 (0.69–1.27)	0.64 (0.38–1.08)	0.90 (0.66–1.22)
2–3 times/week	1.32 (0.84–2.09)	0.82 (0.59–1.15)	1.29 (0.81–2.05)	0.80 (0.57–1.12)
4+ times/week	1.51 (0.84–2.72)	0.90 (0.57–1.44)	1.41 (0.78–2.55)	0.89 (0.55–1.42)
Test for trend	$p = 0.890$	$p = 0.013$	$p = 0.964$	$p = 0.004$
<i>Drinking pattern</i>				
Non-drinker	1.25 (0.80–1.94)	1.10 (0.82–1.47)	1.27 (0.81–1.99)	1.21 (0.90–1.62)
Non-binge drinker	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]
Binge drinker	0.91 (0.62–1.35)	0.70 (0.54–0.90)	0.91 (0.61–1.36)	0.75 (0.58–0.96)
Test for trend	$p = 0.118$	$p < 0.001$	$p = 0.099$	$p < 0.001$
Follow-up periods ( $N$ )		2,759		2,759
	Women			
<i>Drinking frequency</i>				
Non-drinker	1.07 (0.82–1.39)	1.30 (1.03–1.64)	1.07 (0.81–1.40)	1.26 (0.99–1.62)
1–3 times/month	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]
Once/week	1.25 (0.88–1.76)	1.02 (0.74–1.41)	1.28 (0.91–1.82)	1.02 (0.74–1.41)
2+ times/week	1.02 (0.67–1.56)	0.65 (0.42–1.02)	1.03 (0.68–1.58)	0.63 (0.41–0.99)
Test for trend	$p = 0.775$	$p = 0.002$	$p = 0.702$	$p = 0.004$
<i>Drinking pattern</i>				
Non-drinker	1.01 (0.78–1.32)	1.27 (1.01–1.60)	1.02 (0.77–1.34)	1.27 (0.99–1.61)
Non-binge drinker	1.0 [ref]	1.0 [ref]	1.0 [ref]	1.0 [ref]
Binge drinker	1.00 (0.73–1.37)	0.78 (0.57–1.06)	1.02 (0.74–1.42)	0.82 (0.60–1.13)
Test for trend	$p = 0.932$	$p = 0.001$	$p = 0.985$	$p = 0.006$
Follow-up periods ( $N$ )		3,223		3,223

<sup>1</sup>Adjusted for age and calendar time.<sup>2</sup>Adjusted for age, calendar time, education, income and employment, self-assessed health, children, area of Russia, and (for women only) pregnancy.

Source: As for Table 1.

according to their alcohol consumption. The adjusted results show that for both men and women there was a significant positive association between the frequency with which alcohol was consumed and the odds of entering cohabitation rather than marriage ( $p = 0.008$  and  $0.007$ , respectively). The odds of cohabitation relative to marriage were 4 times higher for men drinking at least 4 times a week than for men drinking 1–3 times a month; for women, the odds were only twice as high. There was, however, no evidence of an interaction between frequency of drinking and sex of the drinker ( $p = 0.18$ ). Like Table 2, Table 4 also indicates that the chance of entering any kind of relationship was significantly lower for non-drinkers than for non-binge drinkers. There were no significant interactions between any of the variables related to

drinking and age, marital status at time  $t - 1$ , calendar time, or any of the other variables in the model.

#### Conversion from cohabitation to marriage

For both sexes, the odds of converting from cohabitation to marriage were highest amongst ‘non-drinkers’ and decreased as drinking frequency increased (Table 5). Male binge drinkers were significantly less likely to convert from cohabitation to marriage compared to those who drank more moderately. The results changed little when we added in our socio-economic and health variables. There were no significant interactions between the variables related to drinking and any of the other covariates. Alcohol consumption was not associated

**Table 6** Odds ratios for entry into a union among unmarried people of each sex, aged 16–49 years, according to changes in their drinking frequency and pattern. Russia 1998–2010

Adjusted odds ratios for being in a union at time $t$ (figures in parentheses show 95 per cent confidence interval)		
	Men	Women
<i>Change in drinking frequency</i>		
Change in drinking frequency between $t - 2$ and $t - 1$ <sup>1</sup>		
Increase	0.97 (0.71–1.34)	1.74 (1.24–2.43)
Decrease	1.07 (0.72–1.60)	1.34 (0.86–2.09)
Stable	1.0 [ref]	1.0 [ref]
<i>N</i> of follow-up periods	5,789	7,678
<i>Change in drinking pattern</i>		
Change in drinking pattern between $t - 2$ and $t - 1$ <sup>1</sup>		
Increase	1.27 (0.81–1.98)	0.77 (0.40–1.47)
Decrease	1.18 (0.73–1.91)	0.67 (0.34–1.29)
Stable	1.0 [ref]	1.0 [ref]
Follow-up periods ( <i>N</i> )	5,833	7,717

<sup>1</sup>Adjusted for drinking at  $t - 2$ , and age, calendar time, education, income and employment, self-assessed health, children, area of Russia, original union status, and (for women only) pregnancy at time  $t - 1$ .

Source: As for Table 1.

with the probability of remaining in a cohabiting union vs. a return to single status during the period between wave  $t - 1$  and wave  $t$ .

#### *Further analysis of changes in drinking frequency and pattern*

We used a subset of men and women for whom we had data from three consecutive waves of the RLMS to assess whether changes in drinking frequency and drinking pattern affected entry into a union. The individuals forming this subsample, for which there were a total of 18,992 observations, were similar to

the main sample in age, education, and reported alcohol consumption. Table 6 shows the associations found between changes in ‘drinking frequency’ and ‘drinking pattern’ and the risk of entering into a union for each sex, and Table 7 shows the associations found between the two types of change in drinking and the conversion from cohabitation to marriage, again for each sex. Table 6 shows that if men changed their drinking frequency or pattern this did not significantly affect their chances of forming a union within the follow-up period, but if women increased their drinking frequency in this period their chance of forming a union increased.

**Table 7** Odds ratios for entry into marriage among cohabiting Russians of each sex, according to changes in drinking frequency and pattern. Russia 1998–2010

Adjusted odds ratios for having entered a marriage at time $t$ (figures in parentheses show 95 per cent confidence interval)		
	Men	Women
<i>Change in drinking frequency</i>		
Change in drinking frequency between $t - 2$ and $t - 1$ <sup>1</sup>		
Increase	0.56 (0.33–0.97)	0.87 (0.43–1.74)
Decrease	1.31 (0.76–2.26)	1.71 (0.79–3.67)
Stable	1.0 [ref]	1.0 [ref]
Follow-up periods ( <i>N</i> )	1,506	1,806
<i>Change in drinking pattern (men and women combined)</i>		
Change in drinking pattern between $t - 2$ and $t - 1$ <sup>1</sup>		
Increase	0.45 (0.24–0.86)	
Decrease	1.43 (0.84–2.42)	
Stable	1.0 [ref]	
Follow-up periods ( <i>N</i> )	3,924	

<sup>1</sup>Adjusted for drinking at  $t - 2$ , and age, calendar time, education, income and employment, self-assessed health, children, area of Russia, original union status, and (for women only) pregnancy at time  $t - 1$ .

Source: As for Table 1.

Table 7 shows that if men who cohabited increased their drinking frequency they were significantly less likely to convert from cohabitation to marriage, but this was not true of women. When cohabiting non-drinkers began to drink, or moderate drinkers living with a partner started to binge drink, they reduced their odds of converting from cohabitation to marriage by 55 per cent.

### *The analysis of missing data and the use of multiple imputation*

In the data from the full sample, shown in Table 1, 22.1 per cent of men and 16.9 per cent of women could not be followed from wave  $t - 1$  to wave  $t$ . The numbers lost to follow-up were also significantly higher for more frequent drinkers and younger individuals, and was also associated with level of education, employment status, and area of residence in Russia (defined in the Methods section). Union status at wave  $t - 1$  was also associated with attrition: never married, cohabiting, and divorced people were more likely to be lost to follow-up between wave  $t - 1$  and wave  $t$ . The possible bias caused by this differential rate of attrition was investigated using MI under the MAR assumption, details of which were given in the Methods section above. When the same models used to calculate the figures in Tables 2 and 3 were refitted using data obtained from the MI procedure, the association for men between non-drinking and remaining out of union was weakened but did not disappear completely. When the models in Table 4 were refitted, the MI models showed the same pattern of associations for both sexes, but with levels of significance lower than those in Table 4. The MI versions of the models in Table 5 showed the same patterns as those featured in the table, with the levels of association virtually unchanged.

### **Discussion**

Statistically the strongest result from our study was the intriguing finding that in Russia, after adjustment for a range of factors such as age, education, and health, those who consumed alcohol were significantly more likely to enter a union than those who did not drink. In addition, we also found some evidence that people not in unions and who were frequent drinkers were more likely to enter a cohabitation than to get married. Amongst those who were cohabiting, those who did not drink were more likely to convert their union into a marriage

than were more frequent or binge drinkers. Thus, frequent or binge drinking seems to have had apparently opposite effects on union status—increasing the likelihood of forming a union in the first place, but lowering the chance of converting a cohabiting union into a marriage. On the whole, the same relationship between patterns of alcohol consumption and union formation was seen for both sexes. There were no significant differences in the effect of alcohol consumption between those in the various union states when first observed at wave  $t - 1$ , and little attenuation of the effects of alcohol after adjustment for factors such as education, employment, income, or health. Further analysis of recent changes in drinking behaviour showed that if a woman substantially increased the frequency with which she drank, she became more likely to enter a union. We also demonstrated that for both sexes a substantial increase in drinking pattern by cohabiters (moving from non-drinking to moderate drinking or moving from moderate drinking to binge drinking) decreased the likelihood that their union would be converted into a marriage. In combination, these associations between drinking behaviour and union formation are likely to have produced the association between greater alcohol consumption and delayed entry into marriage. Together with recent studies which used the RLMS data to show that heavier drinkers were more likely to experience divorce (Keenan et al. 2013), these findings suggest that the levels of alcohol consumption in Russia result in fewer people embarking on, and remaining in, the married state. The odds ratios we report may seem small when considered over the course of a year-long interval, but over a longer period they could have an appreciable cumulative effect on the likelihood of entering a union. Continued heavy drinking over a longer period could have detrimental effects on health, occupation, and social-economic status, which may all in turn affect the chance of union formation. Alcohol consumption seems to be an important, and often overlooked, factor affecting an individual's pattern of union formation over the life course, and one which may play a particularly important role in a country like Russia where heavy drinking is common.

The contradictory nature of some of the associations between alcohol consumption and union formation are in line with findings from studies in Western countries, which indicate that heavy drinking is associated with the early assumption of adult roles, including union formation (Newcomb and Bentler 1987; Forthofer et al. 1996), and that heavy drinkers tend to delay marriage (Fu and Goldman



1996; Waldron et al. 2011). It should be noted, however, that the association between non-drinking and non-entry into a union was not found in any of the previous studies of the relationship between alcohol consumption and union formation, which all used data from the USA (Newcomb and Bentler 1988; Forthofer et al. 1996; Fu and Goldman 1996). The association between non-drinking and reduced entry to union could be explained by a number of factors. First, some individuals who do not drink alcohol may suffer from the type of health problems previously found to be associated with an increased likelihood of non-drinking, such as anxiety and depression (Rodgers et al. 2000) or cardiovascular disease (Marmot et al. 1981; Malyutina et al. 2002). These health problems may reduce sufferers' chances of forming a union. Alternatively, it is possible that by reducing their intake of alcohol individuals also reduce their opportunities for social interaction, and thus their likelihood of meeting potential partners. The reports of several qualitative studies have stressed the social function of drinking in Russia (Simpura and Paakkanen 1997; Pietilä and Rytönen 2008b; Saburova et al. 2011), although they tend to concentrate on men's drinking behaviour. The fact that our results are relatively consistent for both sexes, and our finding that women who recently increased the frequency of their drinking were more likely to form a union than those who had not done so, both suggest that a factor such as sociability, which has a positive association with alcohol consumption, rather than poor health, which has a negative association, is responsible for the association between increased drinking and union formation. The importance of changes in drinking behaviour over the life course to an individual's chances of union formation, and the fact that this has an impact over and above that of recent alcohol consumption, highlights the need to understand drinking behaviour as a dynamic and cumulative process over an individual's lifetime. This is an issue which could be further explored if more comprehensive longitudinal data were available.

Our study had several limitations, one of which was the likelihood of bias in the samples we used. It is likely that the individuals selected for study were untypical in their levels of alcohol consumption, because a greater proportion of frequent drinkers and heavy drinkers left observation, and because individuals in these groups were also less likely to have participated in a population survey such as the RLMS in the first place (Jousilahti et al. 2005). When compared with the proportion of single men in previous studies who reported that they had not

drunk alcohol in the last month (Bobak et al. 1999; Pomerleau et al. 2008), the proportion of men in our sample who reported not drinking over the previous 30 days was, at 46 per cent of the total, rather high. Another possible indication of bias is that the sample seemed to have had a higher proportion of men than women with lower education. The under-representation of heavy or frequent drinkers is a common limitation of population panel data, and one for which it is difficult to correct. However, assuming that the associations reported here hold for the whole population, it is reasonable to suppose that had our sample included more heavy drinkers, the associations we found would have been strengthened.

Another possible source of bias is the likelihood of attrition rates being related to outcomes, because entering a cohabitation or marriage might make sample members more likely to drop out of the survey; for example, the couple might go somewhere else to live. As a result fewer transitions between union states may have been captured than occurred. However, although we have not shown the analysis here, we calculated that marriage rates of individuals interviewed in the RLMS were broadly comparable with Russia's national crude marriage rate over the relevant period. To attempt to correct for biases in attrition, we used MI models, assuming MAR. These models imply that any missing values are entirely explained by the observed data, which included data on marital status and alcohol consumption. The results from the MI models did not show substantially different patterns of effect, but reliance on the inherently untestable MAR assumption means that it is impossible to know if the individuals who dropped out of the sample did so as a result of unobserved factors. Procedures for dealing with data that are missing but not at random (MNAR), require much more complex solutions than those we could apply in our study, generally involving the use of appropriate sensitivity analysis (see, e.g., Carpenter and Kenward 2013, Chapter 10).

The RLMS survey itself had some limitations. Alcohol consumption was self-reported in the RLMS, and as a result was probably under-reported. The questions relating to alcohol within the survey did not permit an individual's total alcohol consumption to be calculated, nor was it possible to investigate the particular aspects of hazardous drinking behaviour characteristic of the Russian drinking pattern considered in previous studies (Tomkins et al. 2007). We were also unable to establish the relationship and union history of individuals before they were interviewed as part of the RLMS survey, and this may have led to some misclassification of

individuals' union status. For example, the 'never married' category will have included not only those who had never been in any union, but also those who had previously cohabited but were not doing so when interviewed at wave  $t - 1$ . Similarly, those categorized as cohabiting at  $t - 1$  will have included some individuals who had previously divorced or been widowed. Further, an individual's previous relationships or marital history might affect both their propensity to engage in adverse drinking behaviour, or behaviours, and their likelihood of entering a future union, over and above any effect their current marital status may have on that possibility (Grundy and Tomassini 2010).

When working with the multinomial models of cohabitation vs. marriage shown in Table 4, a problem of misclassification could have biased the associations we found. Given the average length of time between observation points  $t - 1$  and  $t$  of approximately 1 year, it is likely that some individuals both began to cohabit and then make the transition to legal marriage within the year-long interval. In these cases the individual would have been classified as married at time  $t$ , when in fact they could actually have been classified as having been in a cohabitation, or more accurately in both a cohabitation and a marriage. To assess the likely scale of this misclassification in Russia we used another Russian data set, the GGS conducted in 2004. The GGS showed that within a timeframe similar to that of our study, 1998–2004, approximately 32 per cent of new marriages that had begun as cohabitations had been converted to marriages within 12 months or less. If these figures, which imply that 32 per cent of observed marriages were actually misclassified cohabitations, are applied to the RLMS data, the effect would be to increase the number of individuals entering a cohabitation between time  $t - 1$  and time  $t$ . The number of cohabitations would increase from 1,109 to 1,368, that is, from 5.6 to 6.9 per cent of those not in union at time  $t - 1$ ; the corresponding figures for the number entering marriage would decrease from 809 to 550, 4.1 to 2.8 per cent of those not in union at time  $t - 1$ . How might the under-enumeration of cohabitation or the over-enumeration of marriage bias the associations seen? Unfortunately, the details of interviewees' alcohol consumption were not collected as part of the GGS, so we can only speculate about the direction of bias. If union status had been randomly misclassified (i.e., independently of alcohol consumption), the effect would have been to dilute the associations found. However, if, as seems more plausible, light drinkers converted to marriage

more quickly than heavy drinkers, and were therefore more likely to have been misclassified, our analysis will have overestimated the association between heavy drinking and cohabitation, and as a result made the relationship between alcohol consumption and cohabitation appear more distinct from the relationship between alcohol and marriage than was actually the case.

The main strength of our study was the use of longitudinal data, which allowed us largely to eliminate the possibility of reverse causality in the relationships we were observing. By using data on alcohol consumption which preceded the transition to a new union state, we could be confident that the change of state was the result of the alcohol-related behaviour and not vice versa. Nevertheless, the analysis does not necessarily imply a causal relationship. There is always the possibility of some residual confounding by unmeasured factors. For example, one such factor might be family background, and others might be personality or lifestyle characteristics not measured in our data set.

Models of patterns of union formation, such as those embodied in the theory of the second demographic transition, rarely take into account factors such as alcohol consumption, despite it being an integral part of the culture of most European countries, and one that produces short-term and long-term changes in behaviour that affect the success of individuals' personal relationships. Moreover, such behaviour changes are not likely to have a uniform effect on personal relationships cross-culturally because in some societies drunken behaviour is more socially acceptable and 'expected' than in others. The findings reported in this paper suggest that the role of alcohol should be more frequently considered in demographic models of union formation (Fu and Goldman 1996).

Our findings also suggest that recent Russian demographic patterns, including increased rates of cohabitation and lower rates of marriage, may be related to the country's high rates of heavy and hazardous drinking and its causes, rather than to changes in societal values about marital behaviour itself. The causes of change in alcohol-related behaviour may be related to underlying socio-economic problems, the consequences of which could include changes in cohabitation and marriage rates, which could, in turn, affect the country's fertility levels. The results from our study also contribute to the more general debate about the reasons why cohabitation, rather than marriage, is associated with a greater risk of adverse outcomes, such as higher rates of domestic violence (Brownridge and Halli

2000; Kenney and McLanahan 2006), lower reported rates of both general well-being (Soons and Kalmijn 2009), psychological well-being (Kim and McKenry 2002; Dush and Amato 2005), and higher rates of depression (Lamb et al. 2003). Because heavy drinkers are more likely to cohabit and alcohol consumption is often associated with these adverse outcomes, it could be acting as a confounding variable or common cause both of adverse health and social outcomes and cohabitation. These potential causal relationships need to be further investigated using appropriate longitudinal analysis. Research of this kind is particularly important given the growth of cohabitation both in Russia and elsewhere over the past few decades. Of course, it is possible that as cohabitation increasingly becomes the norm in Russia, its association with the adverse outcomes discussed above will weaken.

Our study is, to our knowledge, the first to investigate the effect of alcohol on union formation within Russia using longitudinal data, and complements previous work, which studied divorce alone (Keenan et al. 2013). The new study contributes to knowledge on the factors affecting Russian patterns of cohabitation and marriage (Gerber and Berman 2010; Philipov and Jasilioniene 2010) and also to the debates on the interplay between marital status and health in Russia (Pridemore et al. 2010). The results suggest that as well as being associated with negative health effects and increased marital instability, alcohol consumption in Russia also contributes to the country's particular patterns of union formation.

## Notes

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