Using multi-level data to estimate the effect of an 'alcogenic' environment on hazardous alcohol consumption in the former Soviet Union

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ABSTRACT

Purpose: The purpose of this study was to assess whether alcohol-related community characteristics act collectively to influence individual-level alcohol consumption in the former Soviet Union (fSU).
Methods and results: Using multi-level data from nine countries in the fSU we conducted a factor analysis of seven alcohol-related community characteristics. The association between any latent factors underlying these characteristics and two measures of hazardous alcohol consumption was then analysed using a population average regression modelling approach. Our factor analysis produced one factor with an eigenvalue > 1 (EV=1.28), which explained 94% of the variance. This factor was statistically significantly associated with increased odds of CAGE problem drinking (OR=1.40 (1.08–1.82)). The estimated association with EHD was not statistically significant (OR=1.10 (0.85–1.44)).
Conclusions: Our findings suggest that a high number of beer, wine and spirit advertisements and high alcohol outlet density may work together to create an 'alcogenic' environment that encourages hazardous alcohol consumption in the fSU.

1. Background

Drawing on the increasing number of studies using multi-level data (O'Campo, 2003)), it is now established that the physical environment can contribute to health-related behaviours and thus impact on health (Kawachi and Berkman, 2003). This focus on the individual's wider surroundings has given rise to the concept of the 'obesogenic' environment (Swinburn et al., 1999), whereby a combination of area-level factors (e.g. access to recreational space, safe walking routes, healthy food products, etc.) influence patterns of diet and physical activity and thus the probability of becoming overweight or obese (Swinburn et al., 1999; Swinburn and Egger, 2002). A key element of this concept is that different aspects of the environment act in concert (Hill et al., 2003), so that multiple predictors must be analysed together (Papas et al., 2007), thereby necessitating the development of a comprehensive approach to assessing the obesogenicity of an environment (Swinburn et al., 1999; Kirk et al., 2010).

Although this work has focused largely on diet and physical activity (and to a lesser extent, smoking), there are strong grounds for applying this perspective to other health phenomena, such as the consumption of alcohol. A number of studies using multi-level data have evaluated the association between aspects of what might be termed the 'alcogenic' environment and consumption. They include studies of alcohol outlet accessibility (Gruenewald et al., 1993; Van Oers and Garretsen, 1993; Pollack et al., 2005) and advertising (Kwate and Meyer, 2009). The results of these studies have been mixed; however, a recent systematic review concluded that, although the evidence was limited, higher outlet density and greater advertising did seem to be associated with increased drinking and heavy drinking (Bryden et al., 2012). Despite these findings, to the best of our knowledge, no studies have analysed these factors simultaneously with other potentially important area-level characteristics such as price (Chaloupka et al., 2002; Babor, 2003).

Moreover, to our knowledge, the multi-level studies undertaken on this topic to date have been from very few countries, with the majority from the United States. Thus, there is a need for research on area-level characteristics conducive to hazardous

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alcohol consumption in a greater range of countries, especially where alcohol is a major determinant of health. This is particularly the case in the countries of the former Soviet Union (fSU), where annual adult per capita alcohol consumption is the highest in the world (e.g. Russia: 15.76 L per year; Ukraine: 15.60 L; Republic of Moldova: 18.22 L compared to 9.44 L in the United States, 10.30 L in Sweden and 13.37 L in the United Kingdom), and is estimated to cause almost 500,000 deaths per year (World Health Organization, 2011), from causes such as accidents, cirrhosis of the liver, alcohol poisoning and cardiac arrest (Malyutina et al., 2004; Chenet et al., 2001; Shkolnikov et al., 2001; World Health Organization, 2002; Stickley et al., 2007). Yet, despite the scale of the problem in this region, recent systematic reviews revealed remarkably little research on the social determinants of drinking there (Murphy et al., 2012), and none on the alcohol environment specifically (Bryden et al., 2012). Moreover, alcohol policy in the fSU is, in general, very weak (although there have been some positive developments recently in Russia (Neufeld and Rehm, 2013)), with no restrictions on alcohol outlet density in any fSU country and, at most, only partial bans on print or billboard advertising (most often for wine and spirits but not beer) (World Health Organization, 2013).

We hypothesize that, as with obesogenic environments, alcohol-related environmental characteristics may act together, rather than in isolation, to create contexts conducive to hazardous alcohol consumption in the fSU. Using multi-level data from nine countries in this region, we employ factor analysis to assess whether a specific alcogenic environment can be identified and whether it is associated with problem drinking in this region.

2. Methods

2.1. Data

2.1.1. Household survey

We used data from the Health in Times of Transition 2010 (HITT) study. This included nationally representative household surveys among men and women aged 18 years and older in nine fSU countries: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Moldova, Russia and Ukraine (Fig. 1). Households were selected using multi-stage random sampling with stratification by region and rural/urban settlement type. One respondent was randomly selected from each household. Surveys were undertaken between March and May 2010 (the survey was conducted one year later in Kyrgyzstan due to political unrest) and included 1800 respondents in each country, except in Russia and Ukraine, where 3000 and 2000 respectively were sampled to reflect their larger and more regionally diverse populations and in Georgia ($n=2200$) where a booster survey of 400 additional interviews was undertaken in November 2010 to ensure a more representative sample. Individual exclusion criteria included being institutionalised, hospitalized or homeless, being intoxicated at the time of the survey, and being in the military or in prison. Response rates in countries varied from 43.7% to 83% and the final sample size was 18,000. More details of the HITT surveys have been published previously (Balabanova et al., 2012).

2.1.2. Measuring hazardous alcohol consumption

We used two measures of hazardous alcohol consumption from the HITT household survey data. The first measure was the CAGE questionnaire, a tool commonly used to screen for problem drinking. (Ewing and Rouse, 1970; Dhalla and Kopec, 2007; Mayfield et al., 1974). The CAGE tool identifies alcohol dependence as 2 or more affirmative answers on its 4-item questionnaire, which asks about individuals' feelings of wanting to cut down their alcohol consumption, annoyance at criticism of their drinking behaviour, guilt about drinking and need to drink in the morning to get rid of a hangover. This criterion has been validated and has been shown to have 93% sensitivity and 76% specificity for the identification of problem drinkers (Ewing, 1984). Cronbach's alpha for the CAGE questionnaire in the HITT data was 0.75. The second measure – episodic heavy drinking (EHD) – is more specific to the post-Soviet context where this pattern of drinking is particularly widespread among working-age men (Pomerleau et al., 2008) and is a major driver of mortality, being linked to increased risk of sudden cardiac death (Mckee et al., 2005; Leon et al., 2007) as well as injury and violence (Gmel et al., 2003). As noted by Pomerleau et al. (2008), studies in countries of the fSU have used different definitions of EHD; for consistency we use Pomerleau et al's. (2008) definition (i.e. > 2000 g of beer, 750 g of wine or 200 g of strong spirits on one occasion).

2.1.3. Community profiles

The HITT study also conducted 'community profiles' to record characteristics of the communities in which survey participants live, including prevalence of alcohol advertisements, retail shops selling alcohol, prices and aspects of the built environment. Community sampling was designed to capture a representative cross-section of communities in each country. A few small regions of Georgia, Russia, and Moldova were omitted from the sampling frame due to geographic inaccessibility, dangerous political situations and ongoing military actions. The selected communities were randomly drawn from the larger number of sampling units used in the main HITT household survey (between 160 and 330 per country)using multi-stage random sampling with stratification by region and rural/urban settlement type.

Community profile data were collected for 333 communities across the nine countries – 30 community profiles were conducted in each country except Russia ($N=73$) and Ukraine ($N=50$), to reflect their larger and more diverse populations – during the same period as the household survey data collection. The total number of respondents living in those communities in which profile data were collected was 3082.

The instrument used for these profiles was based on the Environmental Profile of a Community's Health (EPOCH), an instrument developed by Chow et al. for the Prospective Urban Rural Epidemiology study (PURE) (Chow et al., 2010) and adapted to the context of the HITT countries, following its piloting in each country. A final standardized instrument, the Community Observation Form (COF) was used in all of the study countries to ensure consistency and comparability. The COF is reproduced in Supplementary Appendix Fig. 1.

Within each of the communities selected for the community profile method, the data collectors (two per community) chose a starting point by selecting a prominent land mark, such as a major road intersection, a bus station, train station, market or post office, or crossroads in the village centre. They would then select a walking route (approximately 1 km) and follow the walking route and systematically complete the COF. In villages, this route would be the entire village. In towns or cities, it involved a walk along the main shopping streets and residential areas.

2.2. Measuring the alcohol environment

The HITT community profile data included measures of the following characteristics: 24-h availability of alcohol, density of alcohol outlets (over a distance of approximately 1 km), frequency of exterior advertisements for beer, wine and spirits (also over approximately 1 km), and the cost of a 0.5 L bottle of vodka and beer. Specifically, 24-h availability was defined by whether or not