HEALTH-RELATED BEHAVIOURS

Paternal alcohol consumption, family transition and child development in a former Soviet country

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Background Although major societal changes have been observed in former Soviet countries, the child health consequences of these changes have rarely been studied.

Methods We examined the associations of paternal alcohol consumption and family transitions with cognitive ability and behaviour problems among healthy, early school-age Belarusian children. Our study is based on follow-up of children aged 6.5 years participating in a cluster-randomized trial of a breastfeeding promotion intervention. Paternal alcohol consumption was measured at follow-up and classified into three categories: at least weekly consumption of heavy (>6 standard units per occasion), moderate (4–5 units per occasion), or light (<3 units per occasion) or infrequent drinking. Family transition from birth to age 6.5 years was categorized into living stably with an intact family, having transitioned into a stepfamily, having transitioned into a single-parent family and living stably with a single-parent family. Mean differences in intelligence quotient (IQ) measured with the Wechsler Abbreviated Scales of Intelligence and in behaviour problems measured with the Strengths and Difficulties Questionnaire were compared according to paternal alcohol and family transition, after controlling for a wide range of confounding factors.

Results Children whose fathers were moderate or heavy drinkers with at least weekly alcohol consumption showed 1.5–2.5 points lower mean IQ scores and greater behaviour problems (range 0.1–0.3 SD) compared with those whose fathers were light or infrequent drinkers. Compared with children from stable intact families, children who transitioned into stepfamilies had 1 point lower IQ and greater behaviour problems by 0.1–0.4 SD, and children from stable single-parent families or with transition into single-parent families showed no cognitive deficit but greater behaviour problems (range 0.1–0.3 SD).

Conclusions The sharp rise in both alcohol consumption and divorce/re-marriage rates in former Soviet countries may have negative consequences for cognitive and behavioural development in children.

Keywords Child development, paternal alcohol, family transition, cognitive ability, mental health
Introduction

The sharp rise in alcohol consumption in former Soviet countries is but one consequence of social changes since the collapse of the Soviet Union and has been driven by low alcohol prices and higher incomes.\(^1,2\) The increased alcohol consumption is believed to be responsible for the ‘mortality crisis’ in former Soviet countries,\(^3,5\) in which heavy alcohol consumption by men is the norm. The level of alcohol consumption and life expectancy have fluctuated in parallel, and more than 30% of all deaths in Russia between 1990 and 2001 have been attributed to alcohol.\(^4\) In particular, the increase in heavy, episodic alcohol consumption has been associated with increased deaths from cardiovascular disease and accidents.\(^3,5\) However, the health toll of this increased alcohol consumption has been studied mostly for the drinkers themselves, and few studies have examined the impact on their families.

Although a large body of research links paternal alcohol consumption to the well-being of their children, that research has been based in Western European and North American countries, and on a relatively small number of children whose fathers were diagnosed with alcohol dependence. Such studies have shown that fathers’ alcohol dependence is associated with their children’s problems in cognition and academic performance,\(^6\) externalizing and internalizing behaviours,\(^7,8\) and alcohol and illicit drug use.\(^9,10\) However, the effect of paternal drinking on child outcomes in the general population has rarely been studied.

In addition to the sharp rise in alcohol consumption, former Soviet countries have experienced changes in family structure with increases in divorce and cohabitation rates,\(^11\) and their divorce rates are among the highest in the world.\(^12\) A large number of studies linking changes in family structure to child development have shown that children from single-parent families and stepfamilies have greater behavioural and emotional problems and lower academic performance,\(^3,14\) whereas other studies have shown advantages of the living in two-parent vs single-parent families, irrespective of step-parental or biological relationship of the second parent.\(^15\) Existing studies have been based mostly in Western countries, however, and the effect of family transition on child development in rapidly evolving societies has not received the same attention.

Methods

Study participants

Our study is based on Belarusian children (and their parents) who participated in a cluster-randomized trial of a breastfeeding promotion intervention—the Promotion of Breastfeeding Intervention Trial (PROBIT)—and attended a follow-up visit at age 6.5 years. The study design and participants of PROBIT have been described elsewhere.\(^16\) In brief, a total of 17 046 mothers and their healthy, full-term singleton infants born between June 1996 and December 1997 with birthweight \(\geq 2500\) g and gestational age \(\geq 37\) weeks were recruited during their post-partum stay in 31 maternity hospitals and followed at affiliated polyclinics (paediatric outpatient clinics where children are seen for health maintenance and illness care). After frequent scheduled visits during the first year, 13 889 (81.5%) children and their parents participated in a follow-up visit at age 6.5 years. Trained study paediatricians (1 paediatrician in 24 of the 31 polyclinics and 2 in the 7 busiest polyclinics) examined the children and interviewed the accompanying parent (the mother in 92%) at follow-up. At the 6.5-year follow-up, the accompanying parent reported the relationship with the child (mother or father), the child’s behavioural development, asthma and allergy symptoms, family structure (including current marital status and number of children) and height and weight and smoking and drinking of each parent.

Of the 13 889 children who attended the 6.5-year follow-up, 65 (0.5%) did not have assessments of cognitive ability, and 82 (0.6%) and 1879 (13.5%) did not have parent and teacher behaviour assessments, respectively. Most of the children without a teacher assessment had not yet started formal schooling by the time of follow-up. Parental report of marital status at the follow-up was missing for 204 (1.5%) children. After further exclusion of children (~4%) without information on at least one confounding factor, 13 059 children remained for associations of family transition with cognitive ability, 13 073 for parent-assessed behaviour and 11 358 for teacher-assessed behaviour.

For associations with paternal drinking, we restricted our analysis to children who had lived with both biological parents from birth \((n = 11 305)\), because more than a half of the mothers whose marital status had changed did not report alcohol consumption of the child’s father, and it is not clear whether mothers who did report alcohol consumption and were living with new partners were reporting on the biological father or the stepfather. This restriction also prevented us from assessing effects of paternal drinking on family transition. After excluding children with missing information on paternal drinking \((n = 100)\), our analysis for paternal alcohol consumption was based on 10 932 children who were living with both biological parents for cognitive ability, 11 034 children for parent-assessed behaviour and 9492 children for teacher-assessed behaviour.

The study received approval from the Institutional Review Board of the Montreal Children’s Hospital, and participating mothers signed the consent in Russian.
Outcome measures

At the 6.5-year follow-up, child cognitive ability was assessed using the Wechsler Abbreviated Scales of Intelligence (WASI), administered by the paediatricians after extensive training and monitoring by child psychologists and psychiatrists based in Minsk, the capital of Belarus. The WASI consists of four subtests of vocabulary and similarities for verbal intelligence quotient (IQ), and of block designs and matrices for performance IQ; all subtests are combined to generate the full-scale IQ. The WASI was translated from English to Russian and back-translated to ensure comparability of the Russian version. In a convenience sample of 45 children tested after a 1-week training workshop, interpaediatrician agreement was high, with Pearson correlation coefficients [95% confidence interval (CI)] of 0.80 (0.67, 0.89) for vocabulary, 0.72 (0.54, 0.83) for similarities, 0.80 (0.67, 0.89) for block designs and 0.79 (0.66, 0.88) for matrices.

Child behaviour was measured using the Strengths and Difficulties Questionnaire (SDQ) by the parent and the teacher. At the 6.5-year follow-up visit, the accompanying parent completed the SDQ in the polyclinic waiting room and provided the name and contact information for the child’s teacher. The polyclinic paediatricians then distributed the teacher version of the SDQ to the teacher. The SDQ is a brief behaviour screening questionnaire for children aged 4–16 years and consists of five subscales (hyperactivity, conduct problems, emotional symptoms, peer problems and prosocial behaviour), each with five items. Each item is rated as not true (0), somewhat true (1), or certainly true (2). Scores for hyperactivity and conduct problems are summed to generate an externalizing behaviour problems score (0–20), and emotional symptoms and peer problems are summed for an internalizing behaviour problems score (0–20). The sum of externalizing and internalizing behaviour scores represents total difficulties (0–40). The SDQ items are identical in the parent and the teacher versions. The SDQ has been validated against other widely used measures of child behaviour problems, including the Child Behaviour Checklist. It had already been translated, validated and standardized in Russian. Several studies have demonstrated the cross-cultural validity of the SDQ in European and developing countries. Internal consistency and test–retest reliability of the parent and teacher SDQ were high in our study. Pearson correlations between the parent and teacher SDQ scores were modest: 0.28 for total difficulties, 0.29 for conduct problems, 0.36 for hyperactivity, 0.19 for emotional symptoms, 0.19 for peer problems and 0.19 for prosocial behaviour.

Exposure and confounder measures

The accompanying parents at the 6.5-year follow-up reported their own and their partners’ alcohol drinking frequency and the amount of alcohol consumed per occasion. Frequency of alcohol drinking was measured as ‘average frequency of alcohol currently consumed’; the response options were less than once per month, 1–3 times per month, once per week, twice per week, and ≥3 times per week. The amount of alcohol consumed per occasion was measured as 0–50 ml vodka (0–100 ml wine, 0–200 ml beer), >50–150 ml vodka (>100–250 ml wine, >200–500 ml beer), >150–250 ml vodka (>250–500 ml wine, >500–1000 ml beer), >250–400 ml vodka (>500–750 ml wine, >1000–1500 ml beer) or >400 ml vodka (>750 ml wine, >1500 ml beer). One standard unit (glass) of vodka was 50 ml (100 ml and 200 ml for wine and beer, respectively). Spearman (rank) correlations between maternal and paternal alcohol consumption were 0.36 for frequency and 0.40 for amount consumed per occasion. After cross-classification of frequency and amount of paternal alcohol consumption, we grouped paternal drinking into three categories: weekly or more frequent heavy (6 or more standard units per occasion once or more times per week), weekly or more frequent moderate (4–5 units per occasion once or more times per week) drinking and any lighter drinking, either in amount per occasion or frequency (less than weekly moderate or heavy drinking), the reference category.

Marital status at birth was reported by the mother during the postpartum hospital stay and by the parent accompanying the child at the 6.5-year follow-up. Based on the two reports, we classified family transitions into four categories: living in an intact two-parent family, transition into a stepfamily (from a two-parent or a single-mother family), transition into a single-parent family (owing to parental divorce, separation or death of one parent) or living in a stable single-parent family.

Potential confounding factors included gestational age at birth in completed weeks, sex- and gestational age-standardized birthweight z-score, sex, maternal age (<20 years, 20–29 years, ≥35 years), paternal age (<20 years, 20–29 years, 30–39 years, ≥40 years) at the birth of the child, maternal smoking and alcohol consumption during pregnancy (both categorical as yes/no), breastfeeding (only for cognitive ability as outcome, because it was associated with cognitive ability but not with behaviour), number of older children in the household as a proxy for birth order and both parents’ education and occupation as reported by the mother at enrolment. We also included paternal smoking and maternal drinking reported by the accompanying parent at the 6.5-year follow-up.

Data analysis

Because PROBIT is a cluster-randomized trial, we used random-effects linear regression analysis to account for clustering. We previously reported an intra-class (within cluster) correlation coefficient (ICC) for
full-scale IQ of 0.31. ICCs for the SDQ ranged from 0.01 to 0.03 for both the parent and teacher SDQ.

Mean differences in IQ and SDQ scores by paternal alcohol consumption and family transitions were first estimated in crude (i.e. cluster-adjusted) analysis and then in confounder-adjusted (i.e. cluster and confounder-adjusted) models. We also examined whether paternal drinking or family transition was associated with cognitive ability and behaviour differently for boys and girls. No interaction was observed, however (P-values >0.1 for all interactions), and thus we present only sex-adjusted results. In this study, we report teacher SDQ results only for behaviour, because (i) the results of the parent SDQ were similar to those of the teacher SDQ, and (ii) the teacher-assessed behaviour may be a more objective measure for this study, since the mother also reported the spouse’s drinking and the marital status change.

Results

Table 1 shows characteristics of the study of children and their parents, according to paternal alcohol consumption among children from intact families and family transition at 6.5 years. Notable differences were found for family size and parental education and occupation across paternal alcohol consumption categories. Birthweight of the child, maternal smoking and drinking during pregnancy, parental education and maternal drinking at the 6.5-year follow-up also differed somewhat across family transition categories.

Compared with members of the original PROBIT cohort, who were excluded from our current analysis, children in the current analysis were slightly heavier at birth (3.45 vs 3.41 kg), born to a mother who was older (24.5 vs 24.0 years) and less likely to be the first child (56 vs 65%). Our study also included more children whose fathers did not have a university education (87 vs 82%) and had a manual occupation or was unemployed (71 vs 68%). For outcome measures, children who were interviewed at the 6.5-year follow-up but excluded from the current study sample (mostly with respect to associations with paternal drinking, owing to our sample restriction to families with both biological parents) had lower IQ scores (102.1 vs 106.1) and higher total difficulty scores (11.2 vs 9.5) compared with our study children.

Table 2 shows the mean outcome scores according to paternal alcohol consumption and family transition. As expected, children whose fathers were light or infrequent drinkers had the most favourable scores, both for IQ and behaviour measures. For family transition, children living in stable two-parent families showed the most favourable outcomes, although the results varied according to type of family transition and across outcome measures.

Associations with paternal alcohol consumption

Figure 1 shows crude and potential confounder-adjusted associations for full-scale IQ and teacher SDQ scores. After adjusting for confounding factors, children whose fathers were at least weekly moderate or heavy drinkers had lower full-scale IQ scores by 1.6 (95% CI −2.5, −0.9) and 2.5 (95% CI −3.4, −1.6) points, respectively, compared with those whose fathers were infrequent or light drinkers. Adjustment for confounders approximately halved the crude associations; parental socio-economic characteristics were responsible for ~30% of the attenuation. Similar patterns were observed for verbal and performance IQ (data not shown).

For child behaviour scores, frequent paternal drinking was associated with increased scores in total difficulties (0.9, 95% CI 0.5, 1.4 for heavy drinking; 0.5, 95% CI 0.1, 0.8 for moderate drinking) and externalizing behaviours (0.8, 95% CI 0.5, 1.1 for heavy drinking; 0.4, 95% CI 0.1, 0.6 for moderate drinking) but not with internalizing behaviours after adjusting for confounders. For prosocial behaviour, only children of at least weekly heavy-drinking fathers had lower scores (−0.2, 95% CI −0.4, −0.1).

Associations with family transition

Figure 2 shows crude and adjusted associations of family transition with full-scale IQ and teacher SDQ scores. Different patterns of association emerged for IQ and behaviour scores. Only children who transitioned to stepfamilies had lower full-scale IQ scores (−1.3, 95% CI −2.4, −0.2 compared with those from stable, two-parent families) after adjusting for confounders. Children from stepfamilies had lower performance IQ (−1.6, 95% CI −2.7, −0.5) but their verbal IQ scores were not significantly different from those of stable two-parent families (−0.7, 95% CI −1.8, 0.4) after adjusting for confounders. No differences in full-scale IQ were observed for children who experienced a transition into a single-parent family from an intact family (0.1, 95% CI −0.6, 0.8), nor in children from stable single-parent families (0.1, 95% CI −3.3, 3.5) compared with those from intact families.

On the other hand, children with any family transition or living in a stable, single-parent family all exhibited higher behaviour problems. Children from stepfamilies exhibited 1.6 (95% CI 1.1, 2.1) points higher mean total difficulties scores, 1.2 (95% CI 0.8, 1.5) points higher externalizing behaviours, and 0.4 (95% CI 0.2, 0.7) points higher internalizing behaviours. Children who transitioned into a single-parent family also had higher total difficulties (1.1, 95% CI 0.8, 1.4), externalizing behaviours (0.7, 95% CI 0.5, 0.9) and internalizing behaviours (0.4, 95% CI 0.2, 0.5). Children who lived in a stable single-parent family exhibited higher mean scores for total difficulties (2.1, 95% CI 0.5, 3.7) and internalizing behaviours.
Table 1  Child and family characteristics [mean (SD) or %] by paternal alcohol consumption among children from intact families at age 6.5 years and family transition between birth and age 6.5 years

<table>
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<tr>
<th>Paternal alcohol consumption</th>
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<th>Family transition</th>
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<td>Weekly or more frequent moderate drinking (n = 1215)</td>
<td>Weekly or more frequent heavy drinking (n = 868)</td>
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<td>Transition into stepfamily (n = 577)</td>
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<td>24.9 (4.9)</td>
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Discussion

In this large sample of young school-age children from post-Soviet Belarus, we found that frequent moderate or higher paternal alcohol consumption and family instability are both associated with cognitive deficits and behavior problems (externalizing behaviors in particular). Children whose fathers were moderate or heavy drinkers but drank less than once a week did not show cognitive deficits or behavior problems compared with those whose fathers were light drinkers at any frequency. These results are consistent with studies based on children of fathers with alcohol dependence reported from clinical settings. Paternal alcohol dependence is associated with poor parenting, which can lead to negative outcomes for children, including reduced intellectual stimulation and emotional support during childhood.

In this study, we also examined the interactions between parental alcohol consumption and family instability in relation to children's development. We found that children who had both parents with a history of heavy drinking showed the least favorable IQ scores. However, the interactions were not statistically significant (all P-values > 0.1). The observed associations did not differ between the intervention and control groups (P-values for interaction all > 0.1).

To assess the observed associations with paternal alcohol consumption, we excluded unemployed fathers, and the results were unchanged. Similarly, when we excluded children accompanied by the father or legal guardian to reduce potential reporting bias, the results remained consistent. The observed associations were also observed after excluding children who were transitioned into a single-parent family, as well as those who transitioned from a stepfamily (all P-values < 0.05).

Finally, we examined the sensitivity of our results by controlling for residence (east vs west and urban vs rural Belarus). The results were also essentially identical with those of IQ when we used academic performance of the children rated by their teachers as another measure of cognitive ability. Overall, our findings suggest that paternal alcohol consumption and family instability may have significant impacts on children's development, and that interventions targeting these factors may be beneficial for promoting child health and well-being.
and behavioural outcomes associated with increased paternal drinking are unlikely to be driven by ‘problem drinkers’.

We also found that children who transitioned into stepfamilies had lower cognitive ability and more behaviour problems than those from intact families, whereas children who transitioned into a single-parent family showed more behaviour problems but no cognitive deficits. Although having two adults at home may increase economic resources and time spent with the child, our results support the instability hypothesis, by which children who experience family transitions fare worse developmentally. Children from stepfamilies may have experienced at least two transitions—the breakup of the biological parents’ marriage and their mother’s remarriage—and thus two periods of adjustment to a new family environment. The fact that no differences in IQ or externalizing behaviours were observed between children from stable two-parent families and those from stable single-parent families also supports the instability hypothesis.

Our study has several strengths. First, our study is from Belarus, a country that has undergone rapid economic and societal changes since the collapse of the Soviet Union. Second, it is based on a non-clinical general sample of children and their parents. Third, our large sample size provides good statistical power and permits precise estimates of associations. Fourth, we measured and controlled for a wide range of potential confounding factors, including both parents’ education and occupation, which have not been included in many previous studies. Finally, standardized outcome measures and multiple sources of outcome, along with consistent results across the measures, increase the confidence in our findings.

Several study limitations, however, are also worthy of mention. First, paternal drinking and child outcomes were simultaneously ascertained at the 6.5-year follow-up, thus preventing us from knowing the temporal sequence between them and limiting causal inferences from the associations we observed. Although longitudinal studies have shown that drinking habits among men are relatively stable during their 20s and 30s, i.e. ages similar to those of the fathers in our study, we have no information about whether paternal drinking measured at 6.5 years had been stable since (or before) the child’s birth. For family transition, it is less likely that child cognitive deficits and problem behaviours would have caused the family disruption. PROBIT children had higher mean IQ scores than the standard norm of 100 and were born at term with good health; this also argues against reverse causality. Nevertheless, the cross-sectional ascertainment of exposures and outcomes in the current study suggests the need for cautious interpretation. Problematic paternal drinking can destabilize marriage and, through that mechanism, adversely affect child development. However,
families with transitions are exactly those in whom we are uncertain whether the father’s drinking (reported almost exclusively by the mother) refers to the mother’s current partner or the child’s biological father. Thus, the potential mediation of the family transition effect by paternal drinking cannot be examined in our study with acceptable validity. It remains an important area for future research.

Figure 1 Crude (cluster-adjusted) and fully adjusted associations between paternal drinking and child IQ and behaviour problems. (a) Full-scale IQ. (b) Total difficulties. (c) Externalizing behaviours. (d) Internalizing behaviours. (e) Prosocial behaviour.
A second limitation is the potential for residual confounding by unmeasured (or poorly measured) factors, despite the relatively large number of factors adjusted for in our analysis. For example, chronic paternal alcohol consumption has been associated with impaired cognitive ability and hyperactivity in their biological children, even among those raised by non-alcoholic adoptive fathers, suggesting genetic effects that we are unable to control for.

Third, the mother was the usual (92%) source who reported the father's alcohol consumption. Although population-based studies of the validity of spousal report on alcohol intake have shown that wives' reports are valid proxy measures of the alcohol intake of their spouses, it is possible that wives' reports are inaccurate in particular for the amount of alcohol consumed by their husbands or when the wives are not drinkers. In our study, the proportion of fathers with heavy drinking at least weekly (the highest category of alcohol consumption in our study) was 8.2% in the maternal reports vs 5.3% in the paternal reports and the proportion in the reference category was 80.4 vs 87.5%. Mothers may have tended to overestimate their husband's drinking, or (more likely) fathers may have under-reported their own drinking. Our sensitivity analysis, however, in which we restricted the sample to children for whom paternal drinking was reported by the mother, yielded results that were very similar to those of the main analysis. In addition, this potential measurement error should be non-differential with regard to those study outcomes based on assessments of the paediatricians and the children's teachers.

Fourth, we were unable to examine the effects of timing of the family transition, owing to lack of information on timing. For example, adverse effects might be larger when the family transition occurs at age 4 years than at age 3 months. A recent study reported greater maternal parenting stress among mothers who experienced a transition to single motherhood when her child was 3–5 years old than

Figure 2  Crude (cluster-adjusted) and fully adjusted associations between family transitions and child IQ and behaviour problems. (a) Full-scale IQ. (b) Total difficulties. (c) Externalizing behaviours. (d) Internalizing behaviours.
when the child was 1–3 years old. Detrimental effects on child outcomes might also differ according to the child’s age.

Finally, our study did not have a direct measure of living arrangements among children experiencing family transition. In most cases, it is reasonable to assume that the child was living with the biological mother, because the accompanying parent was the mother for 93% of the children with family transition, and maternal custody is the norm for couples after divorce or separation in Belarus. Children living with the biological father (and a stepmother) may have different cognitive and behavioural outcomes from those living with the biological mother. However, we are unable to examine that hypothesis. Nevertheless, any potential bias is likely to be non-differential for outcomes assessed by the teacher or paediatrician, and our results were nearly identical when we restricted our analysis to children accompanied by their mother.

The effect sizes we observed are modest. As discussed above, residual confounding could explain these modest effects. Alternatively, the modest effects might be explained by the small socio-economic disparities in Belarus (relative to Western countries), because both adult drinking and marital stability and child development are socially patterned. Belarus is one of the countries with the least income inequality, as indicated by their Gini index of 27 in 2008 (much lower than 42 in Russia and 45 in the USA and only slightly higher than 24 in Sweden, one of the most egalitarian countries). As a former socialist country, Belarus is also characterized by a very high literacy rate and quality of universal education. These societal characteristics might mitigate the adverse effects of paternal alcoholism and family instability.

Modest associations with paternal drinking may also reflect underestimation of true effects in our study, perhaps owing to restriction of our study sample to young fathers who remained with the same partner for at least 6.5 years after the birth of a child. Such men have been reported to drink less than those who divorce or separate because of relationship problems. The prevalence of heavy drinking is lower (53%) in our sample than in a recent epidemiological study (71%) of alcohol consumption pattern in Belarus by Pomerleau et al. according to those authors’ definition of heavy drinking (≥4 units at least once every 2–3 weeks).

To the best of our knowledge, our study is the first to examine the effects on children of heavy paternal drinking in general populations of healthy children representative of a former Soviet country. Given the high prevalence of heavy drinking in such countries, our results, albeit modest in magnitude, suggest that heavy drinking in men in the post-Soviet era threatens not only their own health, but also jeopardizes that of future generation.

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### KEY MESSAGES

- Exposure to at least weekly moderate or heavy paternal alcohol consumption is associated with adverse cognitive and behavioural outcomes in school-age children in post-Soviet Belarus.
- Family stability in early childhood is important for optimal cognitive and behavioural development in these children, and type of family transition also matters.
- The sharp increase in both alcohol consumption and family transition in former Soviet countries may jeopardize healthy development of future generations.

### References


