



mother and daughter drinking red wine together

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Preventing Alcohol Use Disorders Among Children and Adolescents in the EU

by Dr Aric Sigman

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Summary

The European Union is the region with the highest alcohol consumption in the world accompanied by high levels of alcohol use disorders among adolescents and adults. Alcohol policies and legal drinking ages vary and have been based on the history, culture, social conditions, economic interests and taxation policies of each country. However this is increasingly at odds with a new generation of medical research. This paper will present empirical evidence clearly pointing to basic changes that need to be made in alcohol policy across the EU in order to prevent further alcohol use disorders and the resultant high levels of morbidity and mortality.

INTRODUCTION

It is easy to point to individuals who were given alcohol as children or allowed to drink as teenagers and who have grown up perfectly healthily, without any alcohol problems. It is also true, that most infants who breathe in daily bedroom passive cigarette smoke and most young people who smoke a pack of cigarettes every day will never develop lung cancer, most young people who sniff cocaine will never become cocaine addicts, most young people who have unprotected sex will never acquire HIV and develop AIDS, most young people who eat large daily servings of pig fat will not die prematurely in middle age from coronary heart disease. But health policies are based on behaviours that increase or reduce the *likelihood* that something unfortunate will happen to our young people.

This report outlines some selected key factors that may increase the *likelihood* that young people will develop a problem with alcohol or suffer health consequences now and decades later. In short, a delay in the age at which children begin drinking and a reduction in the amount or frequency of their drinking will lead to significantly fewer dead, mentally ill, cancer suffering, and alcoholic European children and adults.

If EU legislators and society are made aware of the risks and probabilities linked to even modest adolescent alcohol consumption they can make more *informed* decisions about what is in the best interests of young people. This report is intended to assist them in this process.

'The European Union (EU) is the region with the highest alcohol consumption in the world... more than double the world average.' (WHO 2012)

The World Health Organisation recently reported 'The European Union (EU) is the region with the highest alcohol consumption in the world... more than double the world average.' (WHO 2012). Europeans start drinking long before they reach adulthood. Minimum legal drinking ages vary and have been based on the history, culture, social conditions, economic interests and taxation policies of each country. Parenting beliefs about alcohol and children are based on tradition. Both policy and parental beliefs are also influenced by the information made available and the way it is presented.

Impartial and Objective Information?

One of the greatest hindrances to clear decision making on alcohol policy and young people has been the inability of adults to uncouple their beliefs, expectations, experience and sheer fondness for alcohol with an entirely new understanding of the specific effects – not upon adults – but on teenagers and young adults, which is an entirely different matter. And one of the ongoing obstacles contributing to this state of affairs has been the source of information about alcohol, which, if more widely known, would enlighten adults and even many doctors.

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Prominent research scientists are starting to complain about the 'increasing involvement of the alcoholic beverage industry in scientific research ... Using terms such as 'corporate citizenship', 'corporate social responsibility' and 'partnerships with the public health community', the industry funds a variety of scientific activities such as meetings of investigators, research programs and scientific publications. In addition to the potential for conflicts of interest, such activities may affect the objectivity of independent scientists and the integrity of science, as has been demonstrated in relation to the influence of the pharmaceutical, tobacco and other industries.' (Babor, 2009)

Parents, schools and doctors' offices have 'information' leaflets about alcohol and adolescents produced by organizations funded by the alcohol industry, as opposed to leaflets produced by health experts unconnected to the alcohol industry.

Politicians being under the influence of the alcohol industry is an international problem. For example the Commissioner of the Directorate for Health and Consumer Protection for the European Commission has said that while the EU was developing a strategy on alcohol he was 'surprised at the aggressiveness of the lobbying campaign by certain parts of the alcohol industry', while other sources have suggested that this was the strongest lobbying campaign ever faced by the Directorate (Baumberg and Anderson, 2007).

Although politicians and parents continue to be exposed to mixed messages about young people and alcohol, the medical picture is becoming perfectly clear. For example, in assessing the impact of alcohol on European adolescents, the World Health organization recently concluded:

'The adolescent brain is particularly susceptible to alcohol, and the longer the onset of consumption is delayed, the less likely it is that alcohol - related problems and alcohol dependence will emerge in adult life. ... It is neurotoxic to brain development, leading in adolescence to structural hippocampal changes' (WHO 2012)

Alcohol continues to be, by far, the world's and Europe's greatest drug problem (WHO 2012). The United Kingdom's Royal College of Psychiatrists states 'alcohol causes much more harm than illegal drugs like heroin and cannabis.' (RCP 2008). A study published in the medical journal *The Lancet*, ranking 20 of the most popular recreational drugs according to their degree of harm placed alcohol at number 1: 'Drugs were scored out of 100 points ... 'Overall, alcohol was the most harmful drug (overall harm score 72), with heroin (55) and crack cocaine (54) in second and third places.' Alcohol is now considered generally more harmful than all popular illegal substances. As points of comparison harm scores for other substances include: crystal meth (33), cocaine (27), tobacco (26),

amphetamine/speed (23), cannabis (20), GHB (18), ketamine (15), methadone (13), ecstasy (9), anabolic steroids (9), LSD (7), and magic mushrooms (5). (Nutt et al, 2010)

Therefore, while culture, social conditions, economic interests and the taxation policies of each country – along with parental beliefs about alcohol and children – may indeed be interesting, ultimately alcohol policies and parental approaches to young drinking should be firmly based on the health and well-being of European young people. In this respect, no EU country is a unique or special case: The effects of alcohol on the brains and bodies of young people in Sweden are the same as they are on young people in Greece. Nor is the EU as a whole a unique or special case: the brains and bodies of young people in the EU are the same as they are in young people studied on the opposite side of the world.

Misconceptions

Unhappy children?

Making informed decisions about young people and alcohol has been bedevilled by some basic misconceptions. For example, it is often assumed that if young people develop an alcohol problem it is because they are unhappy, in other words we 'drown our sorrows by turning to the bottle'.

Yet it now appears that the reason behind the alcohol problem might actually be shallower than we have been led to believe.

New long-term studies from birth have concluded that heavy drinking in young people may cause major clinical depression

The assumption that the relationship between depression and alcohol only runs in one direction – that is, that depression leads to drinking – is being turned on its head. New long-term studies from birth have concluded that heavy drinking in young people may *cause* major clinical depression i.e. a one-way route from drink to depression: 'a unidirectional association from alcohol abuse or dependence to major depression, but no reverse effect from major depression to alcohol abuse or dependence'. (Fergusson, et al 2009), There is strong evidence to suggest that binge drinking alcohol alters the function of the brain cells which use the neurotransmitter serotonin thought to influence mood (Rodd, et al 2007; Szumlinski, et al 2007).

And so a child may indeed drink to change the way they feel, to blot out the unhappiness about a home situation. But they may also drink purely for pleasure, to get high because it simply feels good, and end up depressed or addicted, or both, simply because they had too much of a good time.

Binge drinking?

In considering alcohol misuse, society has been preoccupied with teenage 'binge drinking' because it is the most immediate and visible form of alcohol misuse strongly linked to antisocial behaviour, crime and accidents. However, this focus on binge drinking has distracted attention away from understanding other harmful drinking patterns that may not seem excessive. Furthermore the actual dose of alcohol that constitutes binge drinking is far less than many people believe. In fact the Royal College of Psychiatrists clearly defines binge drinking as drinking over 2.5 standard 175ml glasses of wine (6 units) for a fully-grown adult woman or 3.5 glasses for a man (8 units), in a short space of time. (RCP, 2008) Binge drinking is considered '*hazardous*' or '*harmful*' drinking because the amount consumed at the time can, even at a seemingly moderate level, causes physiological damage such as brain or female egg damage and/or leads to harm (e.g. accidents) because of drunkenness.

However, as will be explained later, a modest but frequent drinking pattern in young people can lead to alcoholism or alcohol *dependence* – a physical addiction to alcohol, either at the time or decades later. And while liver disease is thought by many to be a major risk of binge drinking, it now appears that it is regular heavy or early social drinking, not binge drinking, that is the greater risk (Hatton et al 2009). Some people who binge drink may abuse alcohol but are not addicted to it, while those that are addicted may not binge drink. One pattern is abuse, the other is dependence, and both in their own ways are harmful to children and adults.

'Teaching' responsible drinking?

A fundamental misconception held by many Europeans concerns the best age at which to introduce children to alcohol – specifically the supposed benefit of the early gradual introduction of alcohol to cultivate 'responsible drinking' in teenagers, which is thought to prevent heavy drinking and alcoholism later on in life. While many believe that children benefit from the role modeling and restraint displayed at the family dinner table, they have not considered the biochemical, genetic and neurological processes at work.

The early introduction to an addictive substance leads to greater likelihood of addiction: earlier use of cocaine or nicotine or heroin is more, not less likely to lead to addiction in adulthood

Children may be more likely than adults to develop substance dependence or may develop dependence at lower doses or frequencies of use. The early introduction to an addictive substance leads to greater likelihood of addiction: earlier use of cocaine or nicotine or heroin is more, not less likely to lead to addiction in adulthood. Yet, in the case of alcohol this established medical principle has been reversed, whereby early introduction is thought to *prevent* addiction. In trying to prevent alcohol problems in young people the emphasis has been on social learning, with the role of adults 'teaching' and children 'learning' how

to drink alcohol, while the power of the substance, the vulnerability of the developing neurocircuitry involved in addiction and the role of genes predisposing the child to alcohol misuse, remain under-recognised (Sigman 2012). European children conform to the same basic alcohol factors:



Protecting our young people from the harm of drinking means that now, in the light of new information about the effects of alcohol, it is necessary to revise the entire way the EU views the concepts of adulthood and drinking age.

Tissue vulnerability

While children legally become adult at the age of 18, a child's brain does not actually reach adulthood until they are almost 25 years old. Adolescence is a process which finishes around age 19 but the regions of the brain important for judgment, critical thinking and memory do not fully mature until a person is in his or her mid-20s. And there are other differences between the age of legal maturity and the age of biological and tissue maturity. In the case of adolescent skin cells and tissue, having three or more blistering sunburns before age 20 multiplies a child's lifetime risk of developing melanoma skin cancer by 500 per cent. The cells lining the adolescent cervix are more vulnerable to the effects of the human papillomavirus and the development of cervical cancer through unprotected sex before the age of 20. In the same way, it is now becoming clear that exposing adolescent tissue and cells to alcohol before they are fully developed can damage such tissue and cells. Fortunately, a new generation of evidence from a wide variety of medical and biosciences has brought into sharp relief the full range of newfound effects of alcohol on young people.

Young brains

Alcohol-related brain changes are linked directly to a young person's intellect, personality, and mental and physical health. Even in small amounts, alcohol may have long-lasting effects on young people's brains that we simply did not know about before.

In the United States, the U.S. Surgeon General's Call to Action To Prevent and Reduce Drinking under the age of 21 makes this explicitly clear: *'Underage [under the age of 21] drinking can cause alterations in the structure and function of the developing brain, which continues to mature into the mid-to late twenties, and may have consequences reaching far beyond adolescence'* (US Department of Health, 2007).

'Adolescents are likely to be more vulnerable than adults to both subtle brain damage and long-lasting cognitive deficits following alcohol exposure ... not drinking is the healthiest option for young people.' (UK Department of Health (DOH), 2009)

The Chief Medical Officer in the UK states, *'Adolescents are likely to be more vulnerable than adults to both subtle brain damage and long-lasting cognitive deficits following alcohol exposure... not drinking is the healthiest option for young people.'* (UK Department of Health (DOH), 2009)

one of the influences affecting the size, shape, complexity and function of a young adult's brain is alcohol. (Guerra and Pascual, 2010)

While 80 per cent of brain growth takes place between birth and 3 years, the size, shape, complexity and function of the brain continue to develop in highly important ways for many years to come. A young person's brain is 'plastic' in that it is constantly being physically shaped in response to what environmental experiences the young person has. And, like a clay sculpture, it ultimately 'sets'. The technical term for this process is structural neuroplasticity. As a society we want to prevent any distortion in this process. And one of the influences affecting the size, shape, complexity and function of a young adult's brain is alcohol. (Guerra and Pascual, 2010)

Alcohol and brain size

Alcohol may have effects on fully developed adult brains. A study of 1839 adults published in the *Archives of Neurology* found the more alcohol a fully grown adult drinks, the smaller his or her total brain volume [size]. Although "most participants reported low alcohol consumption... There was a significant negative linear relationship between alcohol consumption and total cerebral brain volume." The neurologists and epidemiologists wrote, "The public health effect of this study gives a clear message about the possible dangers of drinking alcohol" (Paul et al, 2008). We should ask ourselves why, while newspapers regularly present claims that alcohol will extend life, few of us are likely to have heard of this large study.

At the same time, a new generation of research is now finding that drinking alcohol can damage the normal growth and development of a teenager's brain cells in a variety of regions.

Neuropharmacologists are increasingly concerned about the misunderstanding our society has regarding the actual effects of binge drinking. One study for example concluded, 'the problem of binge drinking, particularly by adolescents, needs to be addressed urgently, to prevent cognitive impairment, which could lead to irreversible brain damage.' (Ward et al, 2009a)

Alcohol and brain cells

The health and condition of white matter is essential to the efficient relay of information within the brain and is linked to performance in a range of cognitive tests, including measures of reading. Any abnormalities in the health of a young person's white matter could lead to the reduced ability to consider multiple sources of information when making decisions, and to impaired emotional functioning. A study entitled 'Altered White Matter Integrity in Adolescent Binge Drinkers' has found that even in 16–19 year old teenagers who have no history of any alcohol use or mental disorder and only binge drink *infrequently* (e.g. at least 4 or 5 drinks once in the last 3 months), brain cells in 18 parts of the brain are found to be thinner, weaker with less protective coating leading to poor, inefficient communication between brain cells: "...infrequent exposure to large doses of alcohol during youth may compromise white matter fiber coherence." (McQueeney et al, 2009). One of the researchers commented, "These results were actually surprising to me because the binge drinking kids hadn't, in fact, engaged in a great deal of binge drinking. They were drinking on average once or twice a month," (Tapert, 2010a). The researchers explained, "Because the brain is still developing during adolescence, there has been concern that it may be more vulnerable to the effects of neurotoxins, such as high doses of alcohol ... alcohol may disrupt brain development." (McQueeney et al, 2009). In fact, animal studies have suggested this is accurate.

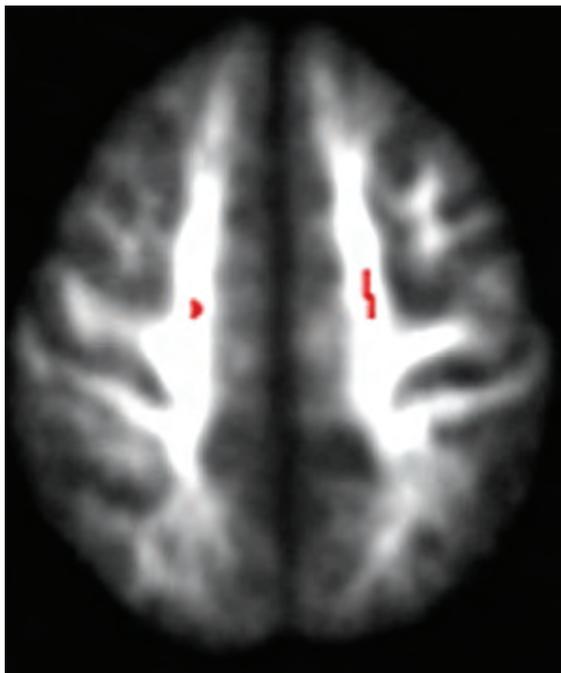


Figure 1: *Infrequent Binge Drinking and The Brain: the red areas highlight where the integrity of the brain's white matter is significantly less in teenagers who binge drink, compared to those who do not (Tapert/McQueeney, UCSD).*

Effects of alcohol on intellect?

There may be direct intellectual consequences to these changes in the integrity of teenagers' white matter. Researchers looked at 12 to 14 year olds *before* they used any alcohol or drugs. Over time, some of the teenagers started to drink, in some cases four or five drinks per occasion (binge), two or three times a month. Comparing the young people who drank with those who remained non-drinkers, [at 3 year follow-up] researchers found that the binge drinkers performed worse on thinking and memory tests. There was also a distinct gender difference:

while teenagers vary in the way alcohol may affect their brain, for some teenagers, there may be no 'safe' level of alcohol use.

"For girls who had been engaging in heavy drinking during adolescence, it looks like they're performing more poorly on tests of spatial functioning, which links to mathematics, engineering kinds of functions... For boys who engaged in binge drinking during adolescence, we see poor performance on tests of attention - so being able to focus on something that might be somewhat boring, for a sustained period of time.... The magnitude of the difference is 10 percent. I like to think of it as the difference between an A and a B." (Tapert, 2010a). Their study concluded that this type of moderate binge drinking during teenage years 'may adversely influence neurocognitive functioning. Neurocognitive deficits linked to heavy drinking during this critical developmental period may lead to direct and indirect changes in neuromaturation course, with effects that would extend into adulthood.' (Squeglia et al 2009) And so, while teenagers vary in the way alcohol may affect their brain, for some teenagers, there may be no 'safe' level of alcohol use. The investigators found negative effects in thinking and memory in teenagers after as little as 12 drinks a month, or two or three binge drinking episodes a month. (Tapert, 2010b)

Scientists have recently monitored the real-time brain function of 16 – 19 year old occasional binge drinkers versus non drinkers while they carried out cognitive tests of spatial memory and found that females may be particularly vulnerable: 'In all [8] brain regions, female binge drinkers showed less spatial working memory [brain] activation.... poorer sustained attention and working memory performances ... Females may be more vulnerable to the neurotoxic effects of heavy alcohol use during adolescence' (Squeglia et al 2011).

Alcohol and grey matter

And alcohol seems to damage the brain's grey matter too. The study 'Binge Drinking is Associated with Abnormal Cortical Architecture' examined the brains of 18–25 year olds who had had four or more drinks on one occasion in the past year for females and five or more drinks for males. Researchers found that 'higher than average drinks per binge was associated with cortical-thinning... representing large to medium effects'. The pre-frontal cortex is related to executive functioning such as paying attention, planning and making decisions, processing emotions and controlling impulses leading to irrational behaviour (Medina and McQueeney 2011).

The hippocampus is a crucial area for memory formation and learning and it actively develops during adolescence and early adulthood. A team at the University of California, San Diego, School of Medicine examined the hippocampus in 15 -17 year olds - 'all teens came from middle to upper class families'. One group misused alcohol in that they 'were primarily weekend binge drinkers' with about 17 days in between each drinking episode. And it was this group that 'had significantly smaller left hippocampal volumes' - in other words this key part of their brain was noticeably smaller than in the non binge-drinking teenagers (Nagel, et al 2005). Another study had a related finding in 15 - 18 year olds: 'smaller left hippocampal volumes' in the binge-drinkers (Medina, 2007). While another earlier study looked at a wider age range of 13-21 years and reported: "... these findings suggest that, during adolescence, the hippocampus may be particularly susceptible to the adverse effects of alcohol... toxic mechanism is age dependent and becomes fully sensitive between puberty and adulthood" (De Bellis et al 2008).

These differences in brain size are now associated with abnormal brain functioning in teenage binge drinkers who haven't had a drink in over a month. Reflecting their abnormal brain scans, the teenage drinkers did more poorly on learning verbal material than their non-drinking counterparts.

Alcohol seems to interfere with the natural division and migration of the hippocampal brain cells. Furthermore this lasting alcohol-induced reduction in brain cell production and development when studied in monkeys was accompanied by an increase in brain cell degeneration. Researchers found a lasting effect, two months after the monkeys' last drink, which they believe may underlie the deficits in cognitive tasks including verbal learning and memory (Taffe et al, 2010).

What remains unknown is whether or not the cognitive decline in teenage binge drinkers is reversible.

Risk taking and impulse control

The ability to delay gratification allows humans to make decisions and accomplish goals. This vital function is rooted in a part of the frontal lobe of the brain: the prefrontal cortex (Figner et al 2010). In particular the lateral prefrontal cortex is critical for making decisions in which forgoing a small immediate reward can lead to a better future outcome. On the other hand, an inability to delay gratification is implicated in psychiatric disorders related to impulse control such as substance abuse.

In teenagers who drink regularly, the parts of the brain which are important in emotional and impulse control - the prefrontal cortex - have been found more likely to be smaller and to remain so even when the teenagers studied were in their 20s.

Whether in moderation or excess, adults drink alcohol because it disinhibits those parts of the brain that have evolved over many years to control our thoughts, feelings and behaviours. Adults describe this in terms of 'relaxing' and 'enjoying ourselves'. And, in most cases, this is what it does.

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But the effects on the young are, in fact, far more fundamental: when teenagers and young people drink, the disinhibition that takes place does so precisely at a point when their brains and behaviours are still undergoing crucial development of the ability to control impulses, so disrupting this essential process. The temporary disinhibition offered during a few hours of drinking may lead to a longer term general disinhibition while they are sober which may become a permanent feature of their character. And so by allowing our young people to learn to let go and 'chill out' with alcohol, we may paradoxically be creating future problems for the young people and society.

Alcohol disinhibits impulses and potentiates risk-taking while at the same time reduces judgment, coordination and reaction time - a lethal combination.

A European study found that 43.6 per cent of injured cyclists who were hospitalized were 'intoxicated' (Vargaa et al 1999). A study published in the Journal of the American Medical Association states that 'Elevated blood alcohol concentrations (BACs) are found in about one third of fatally injured bicyclists aged 15 years or older'. In particular, cyclists whose blood alcohol levels were at the legal driving limit or over (80mg per 100ml) had a '20-fold heightened risk of fatal or serious injury'. But even those whose blood alcohol level was low - only a quarter of the legal limit (20mg per 100 ml) - were 5.6 times more likely to be killed or seriously injured on their bike. It is important to realize that these statistics excluded any victim who survived for 6 hours or more after the accident before dying (because their blood alcohol levels would have dropped). Furthermore, the statistics came from daytime cycling (until 9pm only) and the researchers emphasise therefore that 'it is conceivable that the risk of bicycling injury attributable to alcohol use is actually greater than reported in this study.'(Li et al, 2001)

Quite aside from the focus on drivers who drink alcohol and kill pedestrians, it has now emerged that a huge proportion of pedestrians killed have been drinking. One of many world examples comes from the Coroners and Procurators Fiscal in Britain who report 'Seventy-four per cent of pedestrians killed between 10 pm and 4 am were over the legal limit for drivers.' (Coroners and Procurators, 2007)

Positive evidence that reducing young people's access to alcohol reduces death by accident is provided by research in The Journal of the International Society for Child and Adolescent Injury Prevention. Pedestrians who drink less, die less. The nine-year study reported that decreased alcohol use among pedestrians was 'associated with substantial reductions in crash mortality.' (Cummings et al, 2006)

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Future risk taking

New findings suggest when teenagers drink, it may increase the level of risk taking and impulsive behaviour not just at the time they are drinking but also far into the future. The researchers believe that because adolescence is a time when many begin to drink, this can have serious effects on brain development. In studying male teenagers and young adults they identified a significant trend regarding the amount of alcohol a teenager drinks, and changes in levels of impulsive behaviour that follow the *next* year.

The study, by The Center of Alcohol Studies at Rutgers University, involved annually following more than 500 boys from age 8–18, with another follow up at ages 24 and 25. What is particularly striking is that it is the vast majority of teenagers and young people who are only *moderately* impulsive that are most affected in the long term. The results showed that for adolescent boys exhibiting moderate levels of impulsive behaviour (61% of all of the young adults), as opposed to those in the low or high groups, there was a significant increase in impulsive behaviour when they engaged in heavy drinking the previous year: 'those who are moderately impulsive appearing to be at greatest risk for increased impulsive behavior following heavy drinking ... heavy drinking may increase impulsive behavior by affecting the development of brain areas that support behavioral control or through other associated mechanisms. ...Heavy alcohol use in adolescence may lead to alterations in brain structure and function that reduce behavioral (impulse) control, which could, in turn, promote further heavy drinking. ...These studies highlight the importance of prevention. Decreasing heavy drinking during adolescence may decrease impulsivity by preventing damage to crucial brain areas.' (White et al, 2011)

Given the vulnerability of developing brains, the overriding importance of proper brain development, the powerful implications of distortions or hindrances to that development, and the growing link between alcohol and significant changes in the brains of teenagers and young people, it is imperative to reduce and prevent exposure to alcohol whilst their brains are in transition.

Fertility

Although there is a growing understanding of the way that even small amounts of alcohol can affect the growing foetus there is good reason to be concerned about the eggs before

the foetus is even created. Girls are born with oocytes – their egg supply for life. Only about 400 eggs are released during a woman's reproductive life. The egg is one of the longest-lived cells in the body and it appears that it can be affected by drinking.

For example, researchers have found that in the unfertilized eggs of mice who are exposed to the equivalent of only one episode of 'binge' drinking, 'exposure to alcohol can induce chromosome segregation errors in the ovulated oocyte. Those eggs fertilised had "a very high chance of being spontaneously aborted" those relatively few foetuses that survive "show moderate to severe degrees of mental retardation, craniofacial and other abnormalities, as well as having a significantly reduced life expectancy. ... The potential hazard of exposure of pre-ovulatory human eggs to alcohol is at least as harmful as exposure to this agent during pregnancy, and consequently this should be an equal cause for concern (Kaufman,1997).

alcohol should be limited in adolescence and early adult years ... these years [are] key to preventing breast cancer later in life." (Berkey et al, 2010)

Girls and breast cancer prevention

Western Europe has the highest incidence of breast cancer in the world – almost 5 times higher than other areas such as Eastern Africa. Other parts of Europe also have an extremely high incidence. The role of alcohol in causing breast cancer remains under-recognised among adult women in the EU.

But the risks may begin in childhood. A prospective study by Harvard Medical School of 7000 girls 9–15 years found that girls and young women who drank alcohol increased their risk of benign (non-cancerous) breast disease. However, benign breast disease increases the risk for developing breast cancer. The researchers advised: "alcohol should be limited in adolescence and early adult years ... these years [are] key to preventing breast cancer later in life." (Berkey et al, 2010)

Research in developmental psychobiology is finding that young people are more sensitive to the positive rewarding effects of alcohol while unfortunately they are less sensitive to the unpleasant negative effects (Spear and Varlinskaya, 2010)

Preventing alcohol problems

Research in developmental psychobiology is finding that young people are more sensitive to the positive rewarding effects of alcohol while unfortunately they are less sensitive to the unpleasant negative effects (Spear and Varlinskaya, 2010). Therefore it is not surprising that a growing number of studies from different parts of the world are coming to similar conclusions to that of WHO (2012), cited at the beginning of this report, regarding a safe age at which to introduce European adolescents to alcohol: '*the longer the onset of consumption is delayed, the less likely it is that alcohol-related problems and alcohol dependence will emerge in adult life.*'

A longitudinal study from the US government's National Institute on Alcohol Abuse and Alcoholism looked at the important question of whether small amounts of alcohol during the teenage years affected the likelihood of teenagers having an alcohol problem later on when they were adults, or whether this approach in some way immunizes teenagers from developing an alcohol problem as has been assumed by many up until now.

Adolescents and young people were screened for the age at which they had had their first drink, indications of alcohol dependence or alcohol abuse. The investigators then looked specifically at 'low-risk drinkers'; - those with no history of parental alcoholism, impulsivity, conduct disorders and childhood risk factors such as sexual abuse - and found that in those who had their first drink before age 18 the risk of developing alcohol dependence 'was far greater' later when they were adults. One particular significant risk that increased in these 'low-risk' teenagers who had their first drink before 18 was that they 'continued drinking despite physical/psychological problems caused by drinking, compared to those who had their first drink at 18 or older.' (Dawson et al, 2008)

The Finnish Jyväskylä Longitudinal Study of Personality and Social Development following children from age 8 to age 50 has come to very clear conclusions: 'Early onset of drinking was related to the four indicators of the use of alcohol in adulthood [frequency of drinking, binge drinking, two alcoholism screening tests] both in men and women... The risk for heavy drinking was highest in men and women if drinking was started at less than age 16 years. Socio-emotional behaviour and school success at age 8 did not predict the age of onset of drinking... By delaying the onset age, at least the hazardous effects of heavy drinking in adolescence could possibly be avoided. ...a change in general attitudes is needed to prevent an increase in problems caused by alcohol in the future. Achieving this result will require a joint effort by everyone, including parents, media, professionals, and politicians, and will necessitate a change in adult drinking culture.' (Pitkänen et al 2005). A further Finnish study found 'early age of onset of drinking and heavy drinking in adolescence' was associated with 'problem drinking in early middle age' (Pitkänen et al 2008).

A study by Yale University School of Medicine, recently published, found that an adolescent who consumed his first drink at age 15 was at greater risk for heavy drinking and alcohol problems years later at the age of 22 than an adolescent who took his first drink at age 17. Furthermore, an adolescent who took his first drink at age 15 and also drank to intoxication at age 15 was at even greater risk for later heavy drinking and problems than an adolescent who had his first drink at age 15 and did not drink to the point of intoxication until he was 17. The authors concluded, "The best way to prevent heavy drinking and the experience of alcohol-related problems is to prevent alcohol use. Therefore, our first recommendation would be to delay the onset of any alcohol use as long as possible." (Morean et al 2012)

Because the younger brain is very malleable and changes quickly in response to new influences, exposure to alcohol may 'prime' the developing brain to enjoy alcohol more by creating a link between it and pleasurable reward. The same is true with cocaine or nicotine (Daza-Losada et al, 2009)

Switching on genes

Because the younger brain is very malleable and changes quickly in response to new influences, exposure to alcohol may 'prime' the developing brain to enjoy alcohol more by creating a link between it and pleasurable reward. The same is true with cocaine or nicotine (Daza-Losada et al, 2009). It seems that by trying to help our teenagers resist over-indulgence with alcohol by introducing them to modest controlled amounts, we may inadvertently be switching on genes that affect susceptibility to alcohol addiction.

A study of 6257 adult twins from Australia reported that 'Early age at first drink [16 years] may facilitate the expression of genes associated with vulnerability to alcohol dependence symptoms... Something about starting to drink at an early age puts young people at risk for later problems associated with drinking... exposure to early-onset drinking somehow modifies the developing brain.' (Agrawal et al, 2009)

Other scientists are beginning to identify the mechanisms and the chain of events in the genes and brains of teenagers that lead from first drink to later alcohol problems. Molecular pharmacologists have reported that drinking alcohol (ethanol) during adolescence 'induces long-term changes in responsivity to ethanol in adulthood. Exposure to moderate doses of ethanol during adolescence produced alterations in dopamine in the nucleus accumbens septi [brain area involved in addictions] during adolescence and later in adulthood. Taken together, all of these data indicate that the adolescent brain is sensitive to the impact of early ethanol exposure during this critical developmental period.' (Maldonado-Devincci et al 2010)

Cellular pathologists have reported '*Experimental evidence suggests that early exposure to alcohol sensitises the neurocircuitry of addiction.*' (Guerra and Pascual, 2010)

A person who begins drinking as a young teen is four times more likely to develop alcohol dependence than someone who waits until adulthood [21] to use alcohol." (USDH, 2009)

The U.S. Department of Health and Human Services, National Institutes of Health, clearly concludes: "A person who begins drinking as a young teen is four times more likely to develop alcohol dependence than someone who waits until adulthood [21] to use alcohol." (USDH, 2009)

Parenting style and alcohol misuse

There is a misconception that to deny teenagers and young people some alcohol elevates alcohol to the status of a 'forbidden fruit', and that therefore the best way to de-mystify alcohol is to let them drink it. This, along with the early gradual introduction of alcohol, is

intended to cultivate 'responsible drinking' and prevent alcohol problems.

A growing number of studies are confirming that conveying parental values, alcohol rules and boundaries to young people is more likely to prevent young people from binge drinking or developing an alcohol problem

These beliefs are unjustified. A growing number of studies are confirming that conveying parental values, alcohol rules and boundaries to young people is more likely to prevent young people from binge drinking or developing an alcohol problem. In particular, parental disapproval is good for sobriety in the young. At *all ages*.

This principle is found on opposite sides of the world. In Australia, a team of researchers concluded that "Reduced levels of later drinking by adolescents were predicted by: parental modeling, limiting availability of alcohol to the child, disapproval of adolescent drinking, general discipline, parental monitoring." (Ryan et al 2010). And the same findings exist in New Zealand. The National Addiction Centre, University of Otago addressing the question 'How to reduce alcohol-related problems in adolescents: what can parents do and what can the government do?' found that supplying alcohol to young people under supervision backfired as a tactic aimed at reducing harm. "Many parents consider this is the best way to prevent negative alcohol outcomes in their children, that is by allowing drinking at home and directly supplying them with small amounts of alcohol when they go out to parties. The normalisation of drinking alcohol is aimed at lessening the 'big deal' of adolescent initiation rites involving alcohol. However, the evidence points in the opposite direction, that normalisation of alcohol increases the risk of harm." Lower levels of alcohol use later in life were noted in those whose parents monitored their activities and knew their friends. The same applied to parental disapproval of adolescent drinking (Sellman et al, 2010).

In the US, research from the Prevention Research and Methodology Center at Pennsylvania State University entitled 'Myth of the forbidden fruit' recommends that parents practice a 'zero-tolerance' policy in the home and concludes that 'there is no scientific basis to the common belief that prohibiting alcohol turns it into a "forbidden fruit" and encourages abuse. Researchers studied 300 first year university students and compared their drinking habits to their parents' attitudes towards alcohol. Those students whose parents never allowed them to drink -- about half of the group -- were significantly less likely to drink heavily at university, regardless of gender. Moreover, "the greater number of drinks that a parent had set as a limit for the teenagers, the more often they drank and got drunk in college". Whether the parents themselves drank, on the other hand, had little effect on predicting the student's behaviours (Abar et al, 2009a, b, c).

'I would advise parents to prohibit their child from drinking, in any setting or on any occasion.' (van der Vorst et al, 2010)

In the Netherlands, parents who try to teach responsible drinking by allowing their teenagers to drink alcohol at home may be well intentioned, but they may also be wrong. In a study of 428 Dutch families, researchers found that the more teenagers were allowed to drink at home, the more they drank outside the home as well. And teenagers who drank under their parents' supervision or on their own had an elevated risk of developing alcohol-related problems including trouble with school work, missed school days and getting into fights with others, among other issues. In addition, teenagers who drank more often, whether in or out of the home, tended to score higher on a measure of problem drinking two years later. 'Parental supervision of adolescents' alcohol use' did not have a positive effect at all. The authors suggest that teenage drinking begets more drinking -- and, in some cases, alcohol problems -- regardless of where and with whom they drink. The findings, say the researchers, put into question the advice of some experts who recommend that parents drink with their teenage children to teach them how to drink responsibly - with the aim of limiting their drinking outside of the home. That advice is common in the Netherlands, where the study was conducted. "The idea is generally based on common sense," according to the lead investigator. "For example, the thinking is that if parents show good behavior - here, modest drinking - then the child will copy it. Another assumption is that parents can control their child's drinking by drinking with the child." Based on this and earlier studies, 'I would advise parents to prohibit their child from drinking, in any setting or on any occasion.' (van der Vorst et al, 2010)

reducing alcohol use in a new generation will 'require a joint effort by everyone, including parents, media, professionals, and politicians.'

Societal disapproval and alcohol misuse

In addition to parental disapproval of underage drinking, there is evidence that societal disapproval and intolerance of underage drinking is associated with significantly less drinking, heavy drinking and drunkenness in teenagers. (Hibell B ET AL 2004) A report for the U.S. Office of Juvenile Justice and Delinquency Prevention entitled Youth Drinking Rates and Problems: A Comparison of European Countries and the United States concluded that 'There is no evidence that the stricter laws and policies regarding drinking by young people in the United States are associated with higher rates of intoxication. Equally, there is no evidence that the more liberal policies and drinking socialization practices in Europe are associated with lower levels of intoxication.' (Department of Justice, 2005) Pitkänen et al (2005) concluded that reducing alcohol use in a new generation will 'require a joint effort by everyone, including parents, media, professionals, and politicians.'

The European school survey project on alcohol and other drugs (ESPAD) reported on 'Alcohol use among students 15 -16 years old in 35 European countries' (Hibell et al 2004). Interestingly, Turkey an Islamic culture, had incomparably lower levels of drinking, heavy drinking and drunkenness in teenagers than all other European countries. The analysis, which included data from the US, found it to be the country with the second lowest levels of alcohol use (Department of Justice, 2005). (see Graphs 2,3,4)

Figure 1. Prevalence of Drinking in the Past 30 Days: United States and Europe

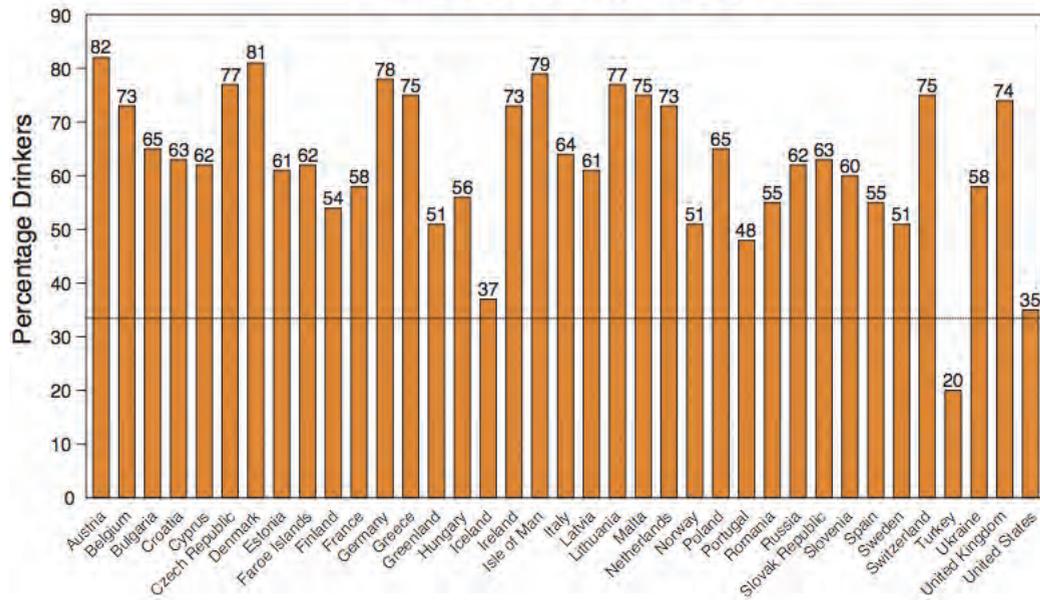


Figure 2. Prevalence of Heavy Drinking in the Past 30 Days: United States and Europe

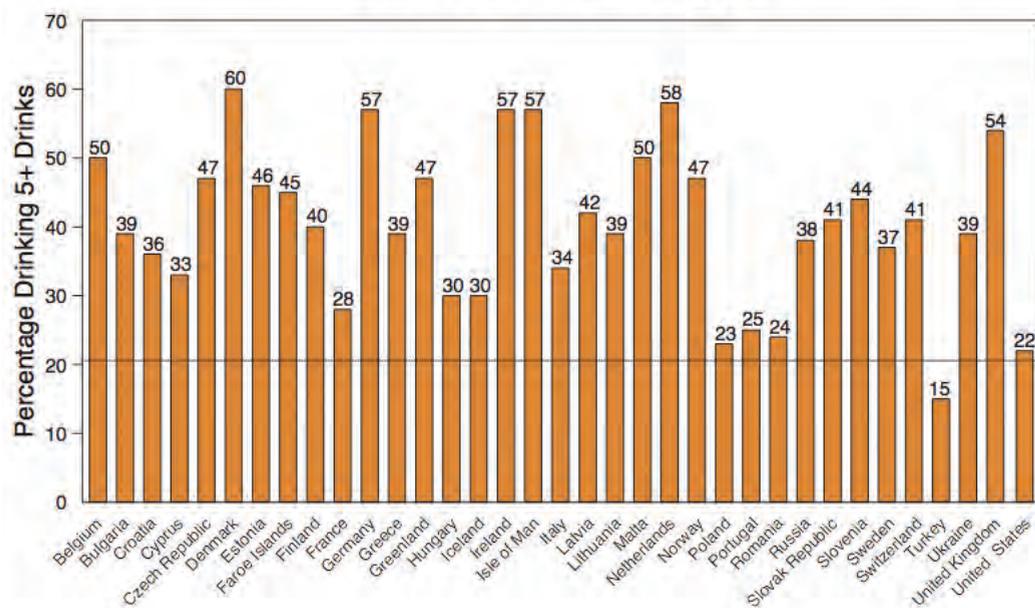
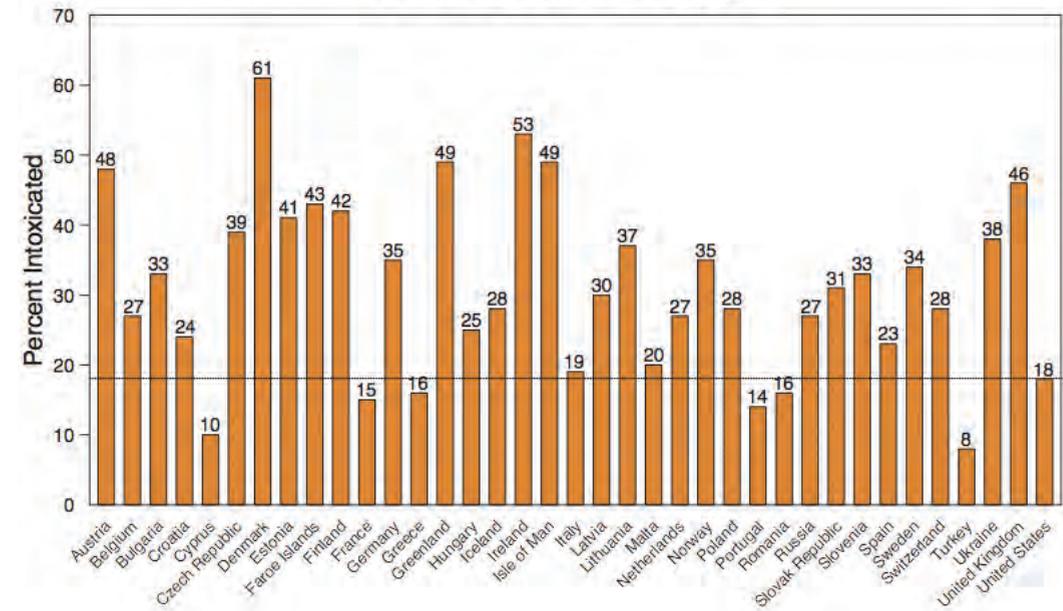


Figure 3. Prevalence of Intoxication in the Past 30 Days: United States and Europe



(Department of Justice and Pacific Institute, 2005)

Alcohol consumption in general in Turkey has traditionally been significantly lower than in the rest of Europe: the average EU citizen drinks 8.5 times more alcohol per year than the average person in Turkey.

Annual Pure Alcohol Consumption (per person age 15+ per year)

AVERAGE PERSON IN EU: 12.5 LITRES

AVERAGE PERSON IN TURKEY: 1.5 LITRES

(WHO, 2012; OECD 2011)

An analysis of the World Health Organization's annual reports places Muslim countries at the bottom of the list in per capita alcohol consumption. And of 43 countries with Muslim majorities those which are more intolerant of drinking alcohol such as Bangladesh, Iran and Saudi Arabia, have the lowest levels of alcohol consumption, while Kyrgyzstan and Azerbaijan, both former republics of the USSR with large non-Muslim Russian populations, ranked first and second place with the highest levels of alcohol consumption amongst Muslim countries. (Michalak and Trocki, 2006) Turkey, a secular EU candidate state ranked

12th highest in terms of consumption. Although the EU is politically secular with only 3.2 per cent of the population being Muslim, the findings on alcohol in Islamic countries are illuminating. It would appear that culture and law can influence alcohol consumption.

Minimum legal drinking age (MLDA)

In assessing strategies and interventions to reduce drinking by young people and alcohol-related harm, WHO (2012) awarded the strategy of instituting a minimum legal purchase age, a maximum score of 3 stars, rating it as having 'a high degree of effectiveness.' They concluded that 'changes in laws for minimum drinking ages can have substantial effects on drinking by young people and alcohol-related harm. These effects often lasted well after the young people reached the legal drinking age.' This is in keeping with other well-controlled studies Gruenewald (2011).

A minimum legal drinking age (MLDA) of 21 is accompanied by 'very substantial reductions related to underage alcohol use [followed by] long-term beneficial effects of these laws on adult drinking behaviors' (Gruenewald 2011)

A minimum legal drinking age (MLDA) of 21 is accompanied by 'very substantial reductions related to underage alcohol use [followed by] long-term beneficial effects of these laws on adult drinking behaviors' (Gruenewald 2011). Even decades later when they become adults, children can be affected by the lower MLDA that existed at the time they were teenagers. 'Exposure to a lower minimum legal purchase age was associated with a significantly higher risk of a past-year alcohol or other substance use disorder, even among respondents in their 40s or 50s.' (Norberg et al 2009).

In examining the best prevention policies on alcohol misuse an analysis published in the Journal of the National Institute on Alcohol Abuse and Alcoholism concludes, 'On the basis of these observations, one would question why any government would lower the MLDA below age 21. The many answers to this question include the willingness of governments to neglect public health for commercial interests' (Gruenewald 2011).

CONCLUSIONS

Evidence clearly shows that children and young people absorb parental and societal values and rules about alcohol – even though they may claim otherwise. And a subconscious awareness that the government and parents stand together on this matter is highly likely to exert a positive influence on young drinking habits. What we believe and expect as parents and as a society has a significant influence on how early, how often and how much our children drink.

New medical evidence on accident probability, disease and brain development makes it absolutely clear that delaying the age at which teenagers and young people have easy access to alcohol will reduce the level of damage they and society suffer at the moment

and will contribute to their future health and well-being. Contrary to the received wisdom and alcohol lobbyists' messages, delaying the age at which children are introduced to alcohol accompanied by rules to enforce this, does not, as parents fear, cause teenagers to rebel and drink even more.

At the moment there is a glaring discrepancy between what is medically true versus what is politically true about alcohol, and what is in our young people's best interests. And in order to protect our young people in today's drinking culture we have to narrow this disparity between competing truths. The age at which teenagers can be given alcohol at home, or buy, or be served alcohol outside the home, should be a decision based on the well-being of young people and not on the basis of political and economic considerations.

Protecting young people from today's drinking culture means that in the light of new circumstances and new information about the effects of alcohol it is necessary to change attitudes, advice and laws and the enforcement thereof

Protecting young people from today's drinking culture means that in the light of new circumstances and new information about the effects of alcohol it is necessary to change attitudes, advice and laws and the enforcement thereof. This is, of course, not only a big cultural and legal undertaking, but for many Europeans, a profound emotional wrench. Adults need to be fully aware that their favourite substance may have newfound consequences when young people consume it and consider, that on a purely health and development basis, recent evidence makes it abundantly clear that, in an ideal world, young people should not consume any alcohol at all – including having a drink with parents at home – until they have reached at least the age of 24.5 years.

Therefore any legal drinking age and advice given to parents about the age at which children can be introduced to alcohol is actually a political meeting-in-the-middle compromise. EU policy makers must now reflect on this inconvenient reality and ask themselves what must be done to reconcile the current disparity between the age at which children become interested in drinking versus the drinking age that is in their best interests.

RECOMMENDATIONS

- **Legal Drinking Age.** EU member states would benefit from adopting a single legal drinking and purchase age of, at the very least, 18 years old and encourage all members to attempt to enforce it. Even if it is difficult to enforce this will send an unambiguous message to young people and society about what is good for young people and will make it easier to exert authority over those of them who increasingly feel entitled to drink.
- **Parental Advice, Public Health.** European parents should be informed clearly and consistently about the basic principle of cell and tissue vulnerability in teenagers as

outlined in this chapter, in particular, about the growing link between alcohol and significant changes in the brain. It should be emphasized that it is now imperative to delay the age at which they introduce their children to alcohol or allow their children to drink. Children should not be introduced to any alcohol until at the very earliest, age 16. And while it may be difficult to achieve, parents should be generally advised to delay a child's first drink as long as possible. School and public health messages should contain similar elements and be directed at younger children as well as adolescents.

- **Political Lobbying.** In future discussions about policies on alcohol and young people, EU member states should, to the best of their ability, excise the influence of the alcohol industry. When considering any evidence on alcohol presented to them, policy makers should be highly vigilant in ensuring a high degree of 'information hygiene' and establish whether the alcohol industry has played any part in such research.

Despite the uncomfortable information presented in this report, there is good reason to be optimistic about young people and drinking in the future. Only a few decades ago it was acceptable in some EU countries to drink heavily and to drive children around with a cigarette in a parent's mouth, without seatbelts – this has changed radically. In fact, many drink-drive campaigns have generally been excellent examples of a successful health education campaign – changing attitudes and behaviours profoundly. Sustained efforts to change attitudes towards public and passive smoking, and drinking while pregnant have also been more far successful than expected.

While the problems created by adolescent drinking may seem daunting at the moment, there are good signs that things can change for the better in a relatively short space of time if Europe shows political, parental and legal resolve to present a united position on young people and alcohol based upon a new generation of evidence and child well-being.

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