

YOUNG PEOPLE & ALCOHOL

What does the
medical evidence
tell us about the
legal drinking age
in New Zealand?



FAMILY
FIRST NEW ZEALAND

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Executive Summary

Issues involving alcohol and young people are often discussed in terms of social, cultural, political and financial considerations. However, while these aspects provide an interesting context, ultimately alcohol policies and decisions about a legal drinking age should be firmly based on the health and well-being of New Zealand's young people.

In considering key factors to decide upon establishing the legal drinking age, New Zealand is in no way a unique or special case. The effects of alcohol on the brains and bodies of young people in New Zealand are the same as they are on young people on the opposite side of the world. And the social consequences are also highly similar.

Fortunately, a new generation of evidence from a wide variety of medical and biosciences including neurophysiology, genetics, neuropharmacology, molecular neurobiology, forensic pathology, toxicology, hepatology, teratology, epidemiology and developmental psychobiology have brought into sharp relief the full range of new found effects of alcohol on young people.

In particular:

- Alcohol is now considered more harmful than all popular illegal substances.
- It is an injurious myth that drinking small amounts of alcohol, in particular red wine, may confer modest health benefits on young adults. In point of fact, even the most modest and infrequent consumption of alcohol confers no health advantages whatsoever, but is linked to a variety of negative health effects.
- It is myth that the French are healthier because they drink alcohol. In truth, the French suffer from serious problems with alcohol. The world view that the French are able to control their drinking habits is also entirely untrue. France's death rate from cirrhosis of the liver is about four times higher than that in New Zealand.

Physical childhood continues for many years after the current legal drinking age. While children legally become adult at the age of 18, a child's brain doesn't actually reach physical and functional adulthood until they're almost 25 years old. 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. Recent well-controlled studies are finding a link between alcohol consumption and cerebral brain volume [size] in teenagers and adults of all ages.

- In teenagers who only binge drink *infrequently* (4-5 drinks once a month) brain cells in 18 parts of the brain are found to be thinner and weaker with less protective coating leading to poor, inefficient communication between brain cells
- The hippocampus is a crucial area for memory formation and learning. Several studies have found links between alcohol consumption and "*significantly smaller left hippocampal volumes*" in teenagers and young adults.
- Alcohol seems to interfere with the natural division and migration of the brain cells in the hippocampus. Furthermore this lasting alcohol-induced reduction in brain cell production and development is accompanied by an increase in brain cell degeneration.

Decisions about a legal drinking age should be firmly based on the health and well-being of New Zealand's young people.

A new generation of evidence from a wide variety of medical and biosciences have brought into sharp relief the full range of new found effects of alcohol on young people.

While children legally become adult at the age of 18, a child's brain doesn't actually reach physical and functional adulthood until they're almost 25 years old.

- Research is now identifying the precise chemical chain of events that damage adult brain cells in the hippocampus during binge drinking: '*neuropathological*' and immune system changes induced in the brain including '*neuro-inflammation induced in the hippocampus*'.

In the United States, the U.S. Surgeon General's Call to Action To Prevent and Reduce Underage Drinking (under the age of 21) makes the US Government's concern over the neurological effects of alcohol on young adults 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).

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

- Exposure to alcohol before a young person's impulse control is fully developed upsets the balance between brain areas driving a young person's impulses versus those areas involved in controlling those impulses, thereby heightening risk-taking and distorting the learning process necessary to acquire self-control.
- Consuming alcohol is now found to influence human DNA thereby changing the way our genes actually function. Binge drinking has recently been found to cause changes in gene expression within the brains of animals. For example, changes have been observed in genes in the amygdala, a part of the brain which plays a key role in the processing of emotions.
- More generally, drinking alcohol causes widespread alterations in gene expression that can result in long-term physiological changes. A number of studies have now identified a variety of genes that are 'upregulated' or 'downregulated' by short- or long-term exposure to alcohol in experimental animals and humans.
- There are implications for the fertility of young females who binge drink. Even one episode of 'binge drinking' may induce chromosome changes in female eggs. In animals, those eggs fertilised had a "*high chance of being spontaneously aborted*" or babies "*show moderate to severe degrees of mental retardation, craniofacial and other abnormalities, as well as having a significantly reduced life expectancy.*"

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 as well as contributing to their future health and well-being.

Recent evidence makes it abundantly clear that *ideally* 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.

New Zealand would benefit from adopting a single legal drinking age of 21, even if this 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.

- Fewer young people will incur illness or die between ages 18 and 21 and beyond.

The U.S. Surgeon General's Call to Action To Prevent and Reduce Underage Drinking makes the US Government's concern over the neurological effects of alcohol on young adults explicitly clear.

Alcohol, even in small amounts, may have long-lasting effects on young people's brains that we simply didn't know about before.

Ideally young people should not consume any alcohol at all until they have reached at least the age of 24.5 years.

- Fewer young people will develop alcohol use disorders between ages 18 to 21 and beyond.
- Alcohol consumption has secondary effects and consequences such as increased levels of sexually transmitted disease and HIV, unplanned pregnancy, and rape/date rape. A rise in the legal drinking age is likely to result in a reduction in all of these secondary outcomes.

Contrary to the received wisdom, raising the legal drinking age to 21 will *not*, as parents and legislators fear, cause teenagers to rebel and drink even more.

Evidence clearly shows that children and young people absorb parental and societal values and rules about alcohol - even though they may claim otherwise. And this subconscious awareness that the government and parents stand together on this matter is highly likely to exert a positive influence on young drinking habits.

New Zealand would benefit from adopting a single legal drinking age of 21.



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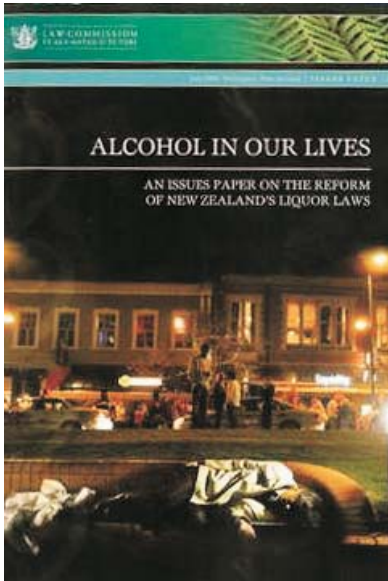
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Introduction

It is the duty of democratic Governments to reconcile the strong desires of young people with the bald realities of the medical and social consequences of drinking and the need to protect them. It goes without saying that young people are interested in drinking alcohol. The real question is: *"Is it really in the best interests of young people to drink alcohol?"*

As the New Zealand Parliament considers whether to raise the legal age of drinking, the Law Commission has published *Alcohol in Our Lives: an issues paper on the reform of New Zealand's liquor laws*. In large headline capital letters they highlight what they feel is the key point for New Zealand citizens to consider:



"NEW ZEALANDERS NEED TO DECIDE WHERE THE BALANCE SHOULD LIE BETWEEN THE BENEFITS WE DERIVE FROM ALCOHOL AND THE HARM BEING EXPERIENCED BY INDIVIDUALS AND SOCIETY AT LARGE"

(The Law Commission, 2009).

While older teenagers and young adults may enjoy drinking alcohol, it is a fact that there are actually no health or mental health benefits derived from alcohol for young adults. In fact, neither the World Health Organization nor medical schools nor government health departments in

New Zealand and around the world recommend that young adults drink any alcohol in order to derive any benefits.

Alcohol continues to be, by far, society's greatest drug problem. A study published at the end of 2010 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), buprenorphine (6) and magic mushrooms (5) (Nutt et al, 2010).

Is it really in the best interests of young people to drink alcohol?

There are actually no health or mental health benefits derived from alcohol for young adults.

Alcohol is now considered generally more harmful than all popular illegal substances.

Young People & The French Myth

Parents and legislators are routinely presented with reassuring news reports claiming that modest drinking improves health and extends our lifespan.

For example, a typical report has recently appeared in the *International Journal of Wine Research* written by Dr Giuseppe Lippi and colleagues claiming that: *"The healthful and nutritive properties of wine have been acknowledged for thousands of years, but the observation that moderate consumption of red wine on a regular basis may be preventative against coronary disease is recent. ... These effects are attributable to the synergic properties of several biochemical components of wine (alcohol, resveratrol, and especially polyphenolic compounds), particularly the red varieties"* (Lippi et al, 2010).

However, despite the comforting headlines there is actually little evidence for any health benefits to be derived from moderate drinking. Quite the contrary. A research team in Sweden recently looked at this claim by examining facts as to whether low levels of alcohol actually make people healthier by keeping them out of hospital or off sick from work. Their stated aim was: *"Based on the full epidemiological information, we study the effect of low alcohol consumption on health."* And the news for those interests claiming that modest drinking is advantageous to health is very disappointing: *"Low alcohol consumption carries a net cost for medical care ... Low alcohol consumption also causes more episodes in medical care. The only age group, for both genders, that show a protective effect of low alcohol consumption on medical care costs are 80+"* (Jarl et al, 2009). Young people aged 18 - 20 derived no health benefits whatsoever from low levels of drinking, but instead only incurred health disadvantages.

A decade ago epidemiologists began to question the enthusiastically embraced assumption that red wine or alcohol in general extends our life. For example, Dr. Ian Graham, a professor of epidemiology at Trinity College in Dublin, suggested that the lower rate of coronary deaths in France could actually be due *"to competing causes of death"* - many more French men might die early from alcohol-related causes *before* they have the opportunity to die of heart disease.

It is a myth that the French are healthier than most everyone else because they drink alcohol. In truth, the French suffer from serious problems with alcohol. The world view that the French are able to control their drinking habits is also entirely untrue. It is worth noting that France's death rate from cirrhosis of the liver is about four times higher than that in New Zealand (Kaner et al, 2007).

Pierre Kopp, professor of economics at the Sorbonne was part of a team conducting the first French study estimating the cost of legal (alcohol and tobacco) and illegal drugs. The study looked at the cause of disease or death attributable to alcohol, tobacco and/or illicit drugs and concluded: *"Alcohol is the drug that gives rise to the greatest cost in France ... Alcohol takes more than half of the social cost of drugs to society. The greatest share of the social cost of alcohol comes from the loss of productivity due to premature death, morbidity."* Drinking is responsible for nearly 53 percent of overall social costs of alcohol, tobacco and illegal drugs. But even these high alcohol economic cost figures are underestimated, cautioned the researchers, because they omitted alcohol-related crime and accidents, which comprise some of the largest costs to society. *"There is a collective misunderstanding of the dangers of alcohol in a country where a regular intake is claimed as a protection against heart problems,"* says Kopp. *"Consumption is exceptionally high and the final bill is extremely heavy."* To Kopp, all the self-perpetuating belief in the so-



Young people aged 18-20 derived no health benefits whatsoever from low levels of drinking.

France's death rate from cirrhosis of the liver is about four times higher than that in New Zealand.

called health benefits of wine to society's health is "so stupid" (Fenoglio et al, 2003).

With regard to alcohol and death, while the media focuses on alcohol preventing death from heart disease, they - and we - would prefer not to think that death and premature death comes from many different quarters, heart disease being only one. While it may be that some older men may gain a small benefit of reduced cardiovascular risk from a very small amount of wine, they could die prematurely from something else.

Alcohol takes more than half of the social cost of drugs to society.

Benefits For Young People?

In a report for the European Commission, the Institute for Alcohol Studies pronounced on the death prevention/health-giving beliefs about modest drinking for all citizens in 27 countries. The scientists concluded: *"There is a positive, largely linear relationship between alcohol consumption and risk of death in populations or groups with low coronary heart disease rates (which includes younger people everywhere). ... Thus the overall risk of death is a balance between the harms that alcohol causes, which can be present at all ages, and the benefits from coronary heart disease, which is largely an illness in older age. This means that for women under the age of 45 years and for men under the age of 35 years, the level of alcohol consumption with the lowest risk to death is zero. In very old age, it seems that the reduced risk for coronary heart disease is much less, and it is likely again that any level of alcohol consumption might increase the risk of death."*

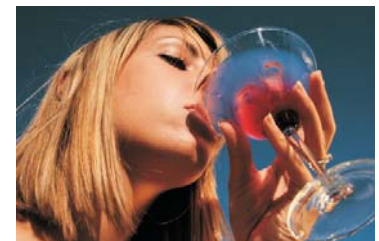
And there is a clear conclusion for all females of all ages in the 27 countries of the European Union: *"At any given level of alcohol consumption, women appear to be at increased risk from the chronic harms done by alcohol, with differing sizes of risk with different illnesses"* (IAS, 2006).

Most importantly, when headlines claim that light drinkers live longer than non-drinkers, journalists don't ask the obvious question: could it be that non drinkers have something else about themselves or their lifestyle utterly independent of their abstinence that may explain the real reason why they may not live as long as light drinkers. And frequently the answer is 'yes' - non drinkers are unusual and do not represent a normal healthy control group to compare light drinkers with.

In the above report for the European Commission the IAS identified *"un-healthier lifestyle factors in abstainers"* such as being older and non-white, being widowed or never married, having less education and income, lacking access to health care or preventive health services, having multiple health conditions such as diabetes and hypertension, having lower levels of mental well-being, being more likely to require medical equipment, having worse general health, and having a higher risk for cardiovascular disease (Naimi et al, 2005).

An Australian study found that non-drinkers had a range of characteristics known to be associated with anxiety, depression and other facets of ill health, such as low status occupations, poor education, current financial hardship, poor social support and recent stressful life events, as well as increased risk of depression, all of which could explain an increased risk of heart disease amongst non-drinkers compared with light drinkers (Rodgers et al 2000; Greenfield et al 2002).

One American study found that, whereas alcohol consumption reduced the risk of coronary heart disease in white men, it increased the risk in black men, suggesting that the cardio-protective effect could be explained by consistent confounding



At any given level of alcohol consumption, women appear to be at increased risk from the chronic harms done by alcohol.

of lifestyle characteristics of drinkers (Fuchs et al, 2004) (IAS, 2006).

In a recent study finding that older moderate drinkers (55 -65 yrs) had a lower premature death rate than abstainers, the researchers admitted that the group of abstainers they chose to study *"excluded lifetime abstainers, number of years of abstinence, or reasons for abstinence, all of which remain important issues for future research."* Most interestingly, the lead researcher made clear: *"Moreover, nondrinkers should not start drinking to try to enhance their health"* (Holahan et al, 2010).

To clarify matters, the New Zealand Ministry of Health strongly advises adequate and often increased consumption of many foods and drinks:

*"Eat plenty of vegetables and fruit.
Have milk ... preferably reduced - or low fat options.
Drink plenty of liquids each day, especially water"*

Curiously, alcohol does not feature in the Ministry's list of suggested food and drinks for improved health (Ministry of Health, 2010).

It is also most telling that the New Zealand Ministry of Health - along with other national governments and medical schools around the world - are certainly *not* advising non-drinkers of any age to alter their habits and take up very modest drinking of red wine or any alcohol in order to improve their health and live longer.

The (French) Chairman of the European Alcohol Policy Alliance continues to encapsulate the French paradox: *"The problem is that every French person is a lobbyist for wine. It's in the head, in the culture. We don't need the alcohol lobby here because we view wine passionately. We have a conflict between the figures about drinking that prove our mortality and morbidity and the positive symbolic value it has"* (Craplet, 2000).

Society wants to hear and believe that it is actually better to eat chocolate or drink wine because we enjoy it and yet some of us suspect that it actually isn't benefitting our health. Instead of trying to justify our pleasures possibly by misinterpreting the studies and believing the headlines, perhaps we'd be better off simply enjoying alcohol without the need to turn it into a health food elixir so we feel better. We manage to do this with many other hedonistic aspects of our lives.

If we as adults consider alcohol for ourselves in an honest light, society's attitude toward young drinking will change for the better.



Alcohol does not feature in the Health Ministry's list of suggested food and drinks for improved health.

Impartial & 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 love of 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. In addition, one of the ongoing obstacles contributing to this state of affairs has been the source of information, which would enlighten adults and even many doctors. 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).

Prominent research scientists are starting to complain about the *"increasing involvement of the alcoholic beverage industry in scientific research, in ways that go beyond investigating the product safety and consumer marketing. Using terms such as 'corporate citizenship', 'corporate social responsibility' and 'partnerships with the public health community', the industry (mainly large producers, trade associations and 'social aspects' organisations) 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).

Politicians being under the influence of the alcohol industry is an international problem.

Effects On The Brain

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."* Although men were more likely to drink alcohol, the researchers noted that the association between drinking and brain volume was even stronger in women. This could be due to biological factors, including women's smaller size and greater susceptibility to alcohol's effects. 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.



Protecting our young people from the harm of drinking means that now, in light of new circumstances and new information about the effects of alcohol, it is necessary to revise the entire way we view the concepts of adulthood and legal age. While children legally become adult at the age of 18, a child's brain doesn't actually reach adulthood until they're almost 25 years old. We may see adolescence as a process finishing 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. Furthermore, young people differ individually, with some maturing biologically later than others. In terms of growth in stature, for example, some boys will still be growing at 20 years of age (Bittles and Collins, 2009).

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.

In the United States, the U.S. Surgeon General's Call to Action To Prevent and Reduce Underage Drinking 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).

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.

The Chief Medical Officer in the UK has now stated: *"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"* (DOH, 2009).

While 80 per cent of brain growth takes place between birth and three 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).

Understanding this point isn't merely an exercise in neurophysiology for the sake of it. These alcohol-related changes are linked directly to a young person's intellect, personality, mental and physical health. Alcohol, even in small amounts, may have long-lasting effects on young people's brains that we simply didn't know about before.

Despite the health claims appearing in the media, alcohol - often referred to as ethanol - is actually *neurotoxic*, meaning it's poisonous to brain cells. This is certainly not a new discovery, even at the turn of the millennium. The U.S. Department of Health and Human Services in a report to the US Congress stated: *"Studies clearly indicate that alcohol is neurotoxic, with direct effects on nerve cells"* (US Department of Health, 2000).

And alcohol begins this process within only 6 minutes, according to a study in the *Journal of Cerebral Flow and Metabolism*, which describes in explicit terms exactly how *"Ethanol consumption may directly increase oxidative stress and the neuronal vulnerability to it."* The researchers casually refer to *"...ethanol-induced cell membrane modifications and alternative energy substrate usage upon alcohol exposure"*, while having a few drinks in quick succession (binge drinking) is described in terms of *"induces immediate and toxic effects"* involving *"distinct biochemical and neurotransmitter changes"* in the brain (Biller et al, 2009).

Most people assume binge drinking involves becoming drunk very quickly by consuming many drinks, while in fact many medical studies define binge drinking as consuming four drinks in an evening. Britain's Royal College of Psychiatrists clearly defines 'binge-drinking' as the consumption of three small (125ml) glasses of wine for a fully-grown adult woman and four for a man *"in a day"* (RCP, 2008).

So there has been a distinct lack of awareness that binge drinking is not necessarily heavy drinking or inebriation and that physical childhood continues for many years after the current legal drinking age.

Neuropharmacologists are increasingly concerned about the misunderstanding our society has regarding the actual effects of binge drinking. One study for example concluded: *"Urgent action is therefore needed to comprehend the aetiology and pathogenesis of the binge drinking culture, as well as to educate individuals on the dangers of such drinking. There is little doubt that 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).

In teenagers who drink regularly, the parts of the brain important in emotional

Adolescents are likely to be more vulnerable than adults to both subtle brain damage and long-lasting cognitive deficits following alcohol exposure.

There has been a distinct lack of awareness that binge drinking is not necessarily heavy drinking.

and impulse control - the prefrontal cortex - have actually been found to be smaller and remain so even when the people are in their 20s. And even in teenagers who only binge drink *infrequently*, brain cells in many different parts of the brain are now found to be subnormal (McQueeney et al, 2009).

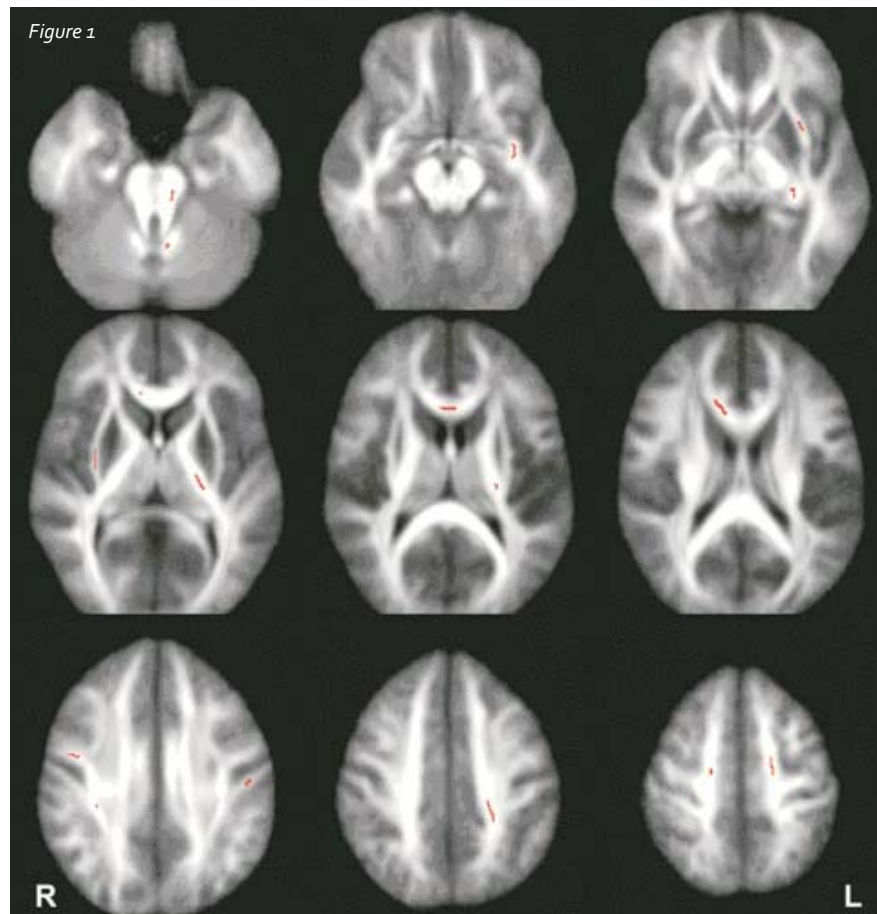


Figure 1: Examples of brain regions in binge drinking adolescents showing compromised white matter, including superior and inferior longitudinal fasciculi, corona radiata, internal and external capsules, corpus callosum, cerebellum, and limbic projection fibers.

There is little doubt that the problem of binge drinking, particularly by adolescents, needs to be addressed urgently.

Brain Damage In White Matter

'White matter' refers to brain areas that appear light in colour due to the brain cells being heavily coated in white protective fats. These cells are fibres that connect different parts of our brains. The health and condition of this white matter is essential to the efficient relay of information within the brain and is linked to performance on a range of cognitive tests, including measures of reading. Any abnormalities in the health of a young person's white matter could lead to reduced ability to consider multiple sources of information when making decisions, and to their emotional functioning.

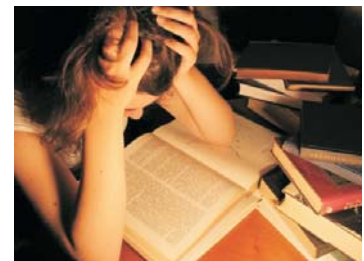
A study entitled *Altered White Matter Integrity in Adolescent Binge Drinkers* has found that even in teenagers who have no history of any alcohol use or mental disorder and only binge drink *infrequently* (e.g. 4 or 5 drinks once a month), brain cells in 18 parts of the brain are found to be thinner and 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.

And there seem to be direct intellectual consequences to these changes in the integrity of teenagers' white matter. In 2009, 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, two or three times a month - classic binge drinking behaviour observed in New Zealand teenagers. Comparing the young people who drank heavily with those who remained non-drinkers at 3 yr follow-up, researchers found that the binge drinkers performed worse on thinking and memory tests. There was also a distinct gender difference: "*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.*"

And the boys? "*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 neuromaturational 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).

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For boys who engaged in binge drinking during adolescence, we see poor performance on tests of attention.

Brain Damage In Grey Matter

The parts of the brain dominated by nerve cell bodies not covered in the white protective fat and which looks greyish in colour are referred to as grey matter. And alcohol seems to damage grey matter. 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).

A previous 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, 2007).

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. Or to put it more accurately, their brains showed: *"no hippocampal activation to novel word pairs; and slightly poorer word pair recall, which could indicate disadvantaged processing of novel verbal information and a slower learning slope"* (Schweinsburg et al, 2010).

In trying to understand precisely what happens in the hippocampus when teenagers drink alcohol, another team of scientists reported in the *Proceedings of the National Academy of Sciences* that *"adolescence is a period of high vulnerability to brain insults."* They found that the hippocampus in Macaque Monkeys who binge drink becomes damaged in two ways. 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 was accompanied by an increase in brain cell degeneration. And they 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).

Other scientists are even more specific in discovering the precise chemical chain of events that damage adult brain cells in the hippocampus during binge drinking. While investigating the 'neuropathological' and immune system changes induced in the brain they've found *"neuro-inflammation induced in the hippocampus of 'binge drinking'"* (Ward et al, 2009b).

What remains unknown is if the cognitive decline in teenage binge drinkers is reversible.

For some teenagers, there may be no 'safe' level of alcohol use.



What remains unknown is if the cognitive decline in teenage binge drinkers is reversible.

Reduction In Brain Size

In teenagers 15 - 17 years old who regularly drink alcohol, parts of the brain important in emotional and impulse control have actually been found to be smaller. *"Consistent with adult literature, alcohol use during adolescence is associated with prefrontal volume abnormalities, including white matter differences."* In particular they found that females with alcohol use disorders had a smaller prefrontal cortex (PFC) (Medina et al, 2008). A previous study looked at a wider age range of 13 - 21 year olds and found those *"with alcohol use disorders had smaller prefrontal cortex and prefrontal cortex white matter volume"* (De Bellis et al, 2005).

Until we fully understand the relationship between alcohol consumption and smaller prefrontal cortex in young people there are exceedingly good reasons why government policy must err on the side of caution. 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. The pattern of impairments in people with antisocial personality disorder with highly psychopathic tendencies show a remarkable resemblance to those people with frontal lobe damage, suggesting that an underlying cause of the behavioural disturbances seen in psychopathy may be dysfunction in the frontal lobes (Shamay-Tsoory et al, 2010).

In children and teenagers, the lateral prefrontal cortex is not yet fully developed. This helps explain why these younger age groups have a harder time delaying gratification.

Higher intelligence is related to better self-control, and the anterior prefrontal cortex, which is one of the last brain structures to fully mature, is heavily involved. Better self-control is relevant to a host of important behaviours including the prevention of risk taking and impulsive actions (Shamosh et al, 2008).

These findings provide a glimpse of the neurological landscape of alcohol's role in preventing teenagers from developing self-control when they're sober, because their brain hardware is underdeveloped until they reach 24.5 years of age. 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. Of course, most fully grown adults prefer to view this less technically in terms of 'relaxing' and 'enjoying ourselves'. And, in most cases, this is what it does. Yet alcohol's extraordinary ability to disinhibit our other adult impulses is well documented every day of the week. And we need only look at the role of alcohol in the antisocial behaviour of adults over the age of 24.5 years to realise that there's no reason why it should not help younger people to become badly behaved too.

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. Yet, society tends to treat underage drinking as a *consequence*

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or a symptom of an underlying problem, rather than something that can in its own right actually change - neurologically - the way a young person behaves in future and the way in which they develop neurologically. 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.

Even the largest white matter in the brain, the connecting cable for communication between the left and right halves of the brain - the corpus callosum - seems to be affected by alcohol. In 17 year olds with alcohol use disorders the integrity of the corpus callosum was affected *"suggesting neurotoxic effects of alcohol on adolescent corpus callosum microstructure."* Girls were worse off: *"As seen in adults, female adolescents with AUD may be especially vulnerable to corpus callosum microstructural injury"* (De Bellis et al, 2008).

Alcohol continues to have new found consequences that parents and politicians are completely unaware of.

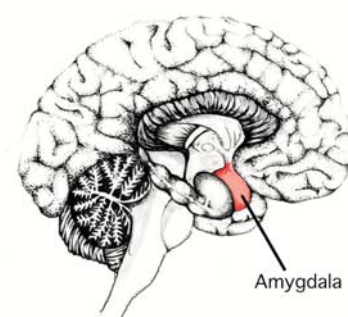
Genetic Changes

Binge drinking has recently been found to cause changes in gene expression within the brains of animals. The Institute of Psychiatric Research, Indiana University looked at genes in the amygdala, a part of the brain which plays a key role in the processing of emotions and is linked to both fear responses and pleasure. Conditions such as anxiety, autism, depression, post-traumatic stress disorder, and phobias are suspected of being linked to abnormal functioning of the amygdala, owing to damage, developmental problems, or an imbalance in neurotransmitters. It may sound complicated, and there's no need to understand the fine detail, but the conclusion of this study should make it clear that alcohol continues to have new found consequences that parents and politicians are completely unaware of: *"overall, the results indicate that binge-like alcohol drinking... produces region-dependent changes in the expression of genes that could alter transcription, synaptic function, and neuronal plasticity"* (McBride et al, 2010).

Brain Function

While the effects above focus on the size, structure, gene function and chemistry of the brain in relation to alcohol, scientists have also been looking at electrophysiological changes which are better known under the name of 'brain waves'. The Molecular and Integrative Neurosciences Department of The Scripps Research Institute has recently reviewed what is currently known about the electrophysiological effects of binge drinking in adolescent rats. They concluded that even relatively brief exposure to binge drinking during adolescence in the rat *"is sufficient to cause long-lasting changes in functional brain activity."* The changes in brain waves included *"disturbances in waking electroencephalogram and a reduction in the P3 component of the event-related potential (ERP)."* But most disturbing was the way brief exposure during adolescence was also found to produce *"long-lasting reductions in the mean duration of slow-wave sleep (SWS) episodes and the total amount of time spent in SWS, a finding consistent with a premature aging of sleep"* (Ehlers and Criado, 2010).

Slow-wave sleep is the deepest stage of a young person's nightly sleep and the most 'restorative'. For example when scientists selectively suppressed some SWS in young healthy lean people, even though they slept for the same length of time as normal, the scientists reported in the *Proceedings of the National Academy of Sciences* that they found *"marked decreases in insulin sensitivity...leading to reduced*



The main causes of death among 18-20 year olds are related to greatly heightened risk-taking and greater impulsive behaviour.

glucose tolerance and increased diabetes risk." They wrote that the magnitude of the change in insulin sensitivity was comparable with that associated with a body weight gain of 13kg (Tasali et al, 2008).

Risk & Impulse Control

Aristotle observed that youth *"are hot-tempered, and quick-tempered, and apt to give way to their anger,"* and there is a long history of anecdotal evidence, empirical investigation, and actuarial analysis indicating that adolescence is a time of heightened risk-taking and recklessness (Steinberg, 2008).

Across most of the industrialised world, the main causes of death among 18-20 year olds (e.g. road traffic accidents, suicide, violent assault, general accidents, drowning) are related to greatly heightened risk-taking and greater impulsive behaviour in this age group who are often allowed access to more adult activities and substances - especially alcohol. This is a main reason why car insurance premiums are higher for drivers 18 to 24 years of age and then decline from age 25.

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) and over - were 5.6 times more likely to be killed or seriously injured on their bike. It's important to realize that these statistics excluded any victim who survived for 6 hours or more after the accident before dying (because 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's 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).

As in other countries, in the United States the percentage of corpses of young people who were victims of violent crime testing positive for alcohol is between one third to two thirds. For example, in a study of 5,000 homicides in Los Angeles toxicology reports noted alcohol in half of the corpses, and in thirty percent of the corpses the blood alcohol level was high enough to classify the victim as legally intoxicated at the time of their demise.

Forensic scientists describe a typical alcohol-related murder as a young male stabbed to death in a bar on a Friday or Saturday night as the result of an argument with an acquaintance or friend (Karmen, 2009).

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 of *"changes in traffic crash mortality rates attributed to alcohol use by drivers and pedestrians"* reported that decreased alcohol use among pedestrians was *"associated with substantial reductions in crash mortality"* (Cummings et al, 2006).

Reducing young people's access to alcohol reduces death by accident.



Exposure to alcohol before impulse control is fully developed upsets the balance between brain areas underlying a young person's impulses versus those areas involved in controlling those impulses.

In addition to changing brain size, structure and function, exposure to alcohol before impulse control is fully developed upsets the balance between brain areas underlying a young person's impulses versus those areas involved in controlling those impulses, thereby heightening risk-taking and distorting the learning process necessary to acquire necessary control.

A new study has found that teenagers who binge drink are more likely to engage in risk-taking behaviour later on. It is already known that impulsive behaviour can be caused or exacerbated by drinking alcohol within a few hours time period, but new findings suggest that it may increase the level of risk taking and impulsive behaviour over a long-term time period. 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 an individual 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 behaviour following heavy drinking ... heavy drinking may increase impulsive behaviour by affecting the development of brain areas that support behavioural control or through other associated mechanisms"* (White et al, in press). *"Heavy alcohol use in adolescence may lead to alterations in brain structure and function that reduce behavioural (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."*

Consistent with findings on brain development, heightened reward-seeking is most clearly and consistently seen during mid-adolescence. However, gains in impulse control continue throughout adolescence and well into young adulthood. Neuroscientists are now reporting *"strong evidence of structural and functional maturation over the course of adolescence and well into the 20s of brain regions that subserve impulse control and other aspects of self-regulation (see Paus, 2005)...impulse control not only improves between childhood and adolescence, but between adolescence and adulthood [19 - 30yrs] as well. In reconciling this slowly maturing brain tissue with the desire among young people to drink alcohol, the investigators conclude...Nevertheless... a more effective strategy than one designed to make adolescents more informed or more thoughtful, might be to reduce adolescents' opportunities to engage in harmful risk- behaviour. ... more vigilantly enforcing laws governing the sale of alcohol, increasing adult supervision of adolescents... would likely be more effective in limiting adolescent smoking, substance abuse, risky sexual behaviour, and automobile fatalities than attempts to make adolescents wiser, less impulsive, or less shortsighted. Some things just take time to develop, and mature judgment is probably one of them."* (Steinberg, 2010).

Alcohol disinhibits impulses and potentiates risk-taking while at the same time reducing judgement, coordination and reaction time - a lethal combination. If the legal drinking age is raised, levels of victimhood will fall.

In almost all other areas of the health of the young, our society errs on the side

Drinking alcohol may increase the level of risk taking and impulsive behaviour over a long-term time period.

Decreasing heavy drinking during adolescence may decrease impulsivity by preventing damage to crucial brain areas.

More vigilantly enforcing laws governing the sale of alcohol would likely be more effective in limiting adolescent smoking, substance abuse, risky sexual behaviour, and automobile fatalities.

of caution, subscribing to the ancient medical imperative *'first do no harm'*. 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 while brains are in transition.

If the legal drinking age is raised, levels of victimhood will fall.

Epigenetics

The field of epigenetics is identifying way substances can influence our DNA thereby changing the way our genes actually function. And there is now increasing interest in the way that alcohol causes epigenetic changes in humans, even before they're born and how this may change their behaviour and health too. For example, one study in the *Journal of Neuroscience* stated that: *"Drinking alcohol causes widespread alterations in gene expression that can result in long-term physiological changes."* A number of excellent studies have identified a variety of genes that are 'upregulated' or 'downregulated' by short- or long-term exposure to alcohol in experimental animals and humans. The researchers have actually identified one of the molecular mechanisms which they say *"may mediate some of the changes in gene expression triggered by alcohol intake, which could be important in a variety of pathophysiological responses to alcohol"* (Pignataro et al, 2007).



Liver

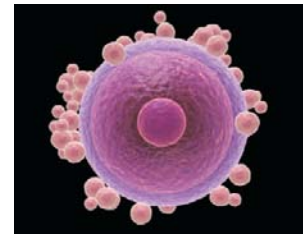
Although parents may delude themselves into believing that they are giving their children a more responsible, cosmopolitan and sophisticated approach to alcohol, it is worth being reminded of the fact that France's death rate from cirrhosis of the liver is about four times higher than that in New Zealand (Kaner et al, 2007). British liver specialists have recently started to complain aggressively about this misperception that it is binge-drinking that causes more liver damage.

A team at the University of Southampton Medical School have published: *"The link between daily or near-daily drinking and the development of liver disease is important. ... Conclusions: Increases in UK liver deaths are a result of daily or near-daily heavy drinking, not episodic or binge drinking, and this regular drinking pattern is often discernable at an early age. ... only a minority of patients with cirrhosis or progressive cirrhosis have evidence of severe alcohol dependency and many have no evidence of dependency at all - they are controlled heavy social drinkers"* (Hatton et al, 2009).

France's death rate from cirrhosis of the liver is about four times higher than that in New Zealand.

Fertility

Although there is a growing understanding of the way that even small amounts of alcohol can affect the growing fetus, there is good reason to be concerned about the eggs before the fetus is even created. Unlike boys, girls are born with their egg supply for life. By birth the number of egg cells (oocytes) numbers one to two million, and then drops to 300,000 by puberty. Only a small percentage of oocytes mature into eggs of which 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 unfertilised eggs of mice that are exposed to the equivalent of one episode of 'binge' drinking, *"exposure to alcohol can induce chromosome segregation errors in the ovulated oocyte."* Those eggs fertilised had a *"high chance of being spontaneously aborted"* or babies *"show moderate to severe degrees of mental retardation, craniofacial and other abnormalities, as well as having a significantly reduced life expectancy. The findings from our experimental studies that have been carried out in mice draw attention to important principles which are of general applicability to the situation in the human. ...the potential hazard of exposure of preovulatory 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. This specific topic was discussed in the House of Lords almost 10 years ago, but little information in this regard has apparently percolated down into the public consciousness in the interim years. The availability of such information should by now be within the public domain and certainly should be readily available to medical practitioners and ancillary workers whose role it is to advise individuals who wish to maximize their chance of having a successful outcome to their pregnancy"* (Kaufman, 1997).

Young people are more sensitive to the positive rewarding effects of alcohol while unfortunately they're less sensitive to the unpleasant negative effects.

The Later, The Better

Nature made the brains of young people excitable. Their neurochemistry is ready to respond to everything in their environment. On the positive side, this is partly why young people can learn more easily than fully grown biologically mature adults. The younger brain is primed and ready for intense, all-consuming learning. This is a unique feature of the younger brain that drives much of the behaviour during adolescence and young adulthood. Young people become very passionate about a particular activity, a particular sport, passionate about music or changing the world. This is however a two-edged sword because those same inclinations to explore and try new things may also increase the likelihood of doing risky or negative things: driving fast, sex, nicotine, cannabis, cocaine, ecstasy and 'binge drinking'. Alcohol dependence is a form of neurochemical 'learning'. A young person's brain is designed to form new connections in response to the environment. If potent substances suddenly enter that environment, those substances are engaging a much more robust habit-forming ability.

Research in developmental psychobiology is finding that young people are more sensitive to the *positive* rewarding effects of alcohol while unfortunately they're *"less sensitive to the unpleasant negative effects."* And this may be exacerbated further by a history of prior stress or alcohol exposure as well as by a genetic disposition which may then enable a relatively high level of alcohol use and an increased probability for the development of alcohol abuse disorders (Spear and Varlinskaya, 2010).



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 they had their first drink, and indications of any alcohol dependence or alcohol abuse. The investigators then looked specifically at 'low-risk drinkers' and found that in those who had their first drink before age 18 the risk of developing alcohol dependence *"was far greater"*. 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).

One point worth considering here is that 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 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, we may inadvertently be switching on genes that affect susceptibility to alcohol addiction (Agrawal et al, 2009).

The U.S. Department of Health and Human Services National Institutes of Health has now clearly concluded: *"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).

For those who had their first drink before age 18, the risk of developing alcohol dependence "was far greater".

A person who begins drinking as a young teen is four times more likely to develop alcohol dependence than someone who waits until adulthood.

Forbidden Fruit?

There is also a misconception that to deny teenagers and young people some alcohol elevates alcohol to the status of a forbidden fruit. And 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 'sensible drinking'.

These concerns are absolutely unwarranted. 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 modelling, 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 answering the rhetorical 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*



Parental disapproval is good for sobriety in the young.

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).

The Society for Prevention Research is a prominent international body dedicated to "advancing scientific investigation on the etiology and prevention of social, physical and mental health problems". One of those preventions is an alcohol problem. At their annual meeting in 2010, researchers from the Prevention Research and Methodology Center at Pennsylvania State University conducted a symposium "Myth of the forbidden fruit". It was strongly suggested that parents practice a zero-tolerance policy in the home and delegates were told 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 in 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).

Parents who try to teach responsible drinking by letting their teenagers have 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 of home as well. And teenagers who drank under their parents' watch 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 other people, 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 behaviour - 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).

Related research has examined parenting and alcohol during the transition period between the end of high school and the first year at university. The researchers looked at three aspects of drinking: weekly alcohol use, 'heavy episodic' (binge) drinking, and alcohol-related problems. They found that the degree of 'parental permissiveness' toward drinking and the student's intention to be involved with fraternities or sororities "predicted the transition to use and consequence status

The normalisation of alcohol increases the risk of harm.

There is no scientific basis to the common belief that prohibiting alcohol turns it into a 'forbidden fruit' and encourages abuse.

Parents who try to teach responsible drinking by letting their teenagers have alcohol at home may be well intentioned, but they may also be wrong.

for all three outcomes and for increases in alcohol use and consequences...Our findings indicate the importance of the parental context (e.g., parental permissiveness of drinking)" (Walls et al, 2009). A study published in *Developmental Psychobiology* looked at the importance of 'sustained parenting' at the late stages of finishing high school and leaving home in reducing university drinking in first-year students. The study found "excessive drinking in university is a continuation of high school drinking tendencies." The researchers concluded that to prevent alcohol misuse in our children's transition to university, parents should remain vigilant and intolerant toward their teenagers drinking. "The empirical evidence from this study suggests that sustained parental efforts have a beneficial effect on reducing high-risk drinking and preventing harm even at this late stage of late adolescent/early adult development" (Turrissi and Ray, 2010).

A study published in the *Australian and New Zealand Journal of Public Health* found that teenagers who drank only small amounts of alcohol had a significantly higher risk of abusing alcohol or engaging in risky sexual behaviour as young adults. Melbourne's Murdoch Children's Research Institute tracked 1520 young people's drinking habits over more than 10 years from mid-teens to mid-20s, and concluded that there is no safe or sensible level of drinking for adolescents, in light of later likely events. The research found that teenagers, drinking at even a low-risk level of drinking for adults (defined as fewer than three standard drinks a day), increased their chances of alcohol abuse, social or legal problems or alcohol-related high-risk sexual behaviour 10 years down the track. Those who abstained from any alcohol in adolescence experienced fewer (bad) alcohol-related outcomes than those who drank at the recommended level (Moore et al, 2009).

Even if the alcohol prohibition applies to young people who have moved away from home, scientists are finding a positive effect. A study, "Alcohol use after forced abstinence in basic training among United States Navy and Air Force trainees", examined drinking rates of U.S. Navy and Air Force trainees during the month before attending basic training and after the ban on drinking alcohol was lifted during advanced training. They found that heavy episodic drinking fell by two-thirds following basic training being described as "substantially lower". They believe that drinking rates are likely to increase over time "but not to pre-basic levels" (Bray, 2010).

Predisposition And Probability

A child's genetic predisposition in combination with environmental factors seems to affect the likelihood that they will develop an alcohol use problem. As with many other things, it is likely that a complex mix of gene-environment interactions are likely to underlie addiction vulnerability and development in teenagers and young adults. While this is not a fine science, much effort is now going into understanding the mechanisms involved in order to help us identify which young people may be at greater risk of alcoholism thereby enabling us as parents and society to reduce that risk. At the moment some geneticists are focussing on the *CYP2E1* gene, known for its involvement with alcohol metabolism (Webb et al, 2010). Others have identified a *network* glutamate receptor signalling genes which influence our level of response to alcohol when we drink (Joslyn et al, 2010).

This report outlines key factors that may increase the *likelihood* that young people will develop a problem with alcohol or suffer health consequences. Of course it's easy to point to individuals who were given alcohol as children or allowed to drink as teenagers and who have grown up perfectly well, without any alcohol problem. It's also true that most infants who breathe in daily bedroom passive cigarette

The researchers concluded that to prevent alcohol misuse in our children's transition to university, parents should remain vigilant and intolerant toward their teenagers drinking.



If legislators and society are made aware of general risks and probabilities, they can make informed decisions about what is in the best interests of young people.

smoke and most young people who smoke a pack of cigarettes every day will never develop lung cancer, most young people who inhale 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 daily servings of pig lard will never 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. If legislators and society are made aware of general risks and probabilities they can make *informed* decisions about what is in the best interests of young people.

The US Government has insisted that all 50 states raise their minimum legal drinking age to 21.

Raising The Legal Drinking Age

US states have a great deal of legal autonomy over a wide variety of profound issues including the age of sexual consent, whether to invoke the death penalty and even the actual form of execution (firing quad, gas chamber, lethal injection, electrocution). Yet the US Government has insisted that all 50 states raise their minimum legal drinking age to 21. In addition, many states do not allow those under twenty-one to enter an off-license or a bar. And many states do not allow anyone under twenty-one to drink anywhere, including home - in other words, alcohol consumption is banned completely before the age of twenty-one.

And there has been no backlash as claimed by the alcohol lobby. In the 1970s, the legal purchasing age went from 21 back to 18 and there was a notable increase in a range of alcohol-related problems, particularly road deaths. So, individual states were later told by the federal government to raise the age back to 21 and all eventually did so as researchers observed the effects.

Raising the drinking age causes young people to drink less.

When it was changed back the reverse occurred and state by state there was an obvious trend of reducing late night traffic fatalities, in addition to other problems. This has led to thousands of lives being saved each year from alcohol overdose and road traffic accidents alone. And raising the drinking age causes young people to drink less. The US National Institute of Health has concluded: "*Minimum legal drinking age laws have had positive effects on health and safety. The preponderance of research shows minimum legal drinking age laws have had positive effects primarily in decreasing traffic crashes and fatalities, suicide, and decreased consumption by those under age 21*" (NIH, 2008).

Contrary to popular assumptions and alcohol lobbyists' messages, raising the legal drinking age to 21 does not cause teenagers and young adults to rebel and drink even more. Parents who exert stricter authority over their teenagers about drinking are more likely to find that their children actually drink *less*, not more, alcohol.

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In August 2010, the New Zealand Parliament's Justice and Electoral Select Committee were provided with evidence compiled by a group of scientists from a range of international research on alcohol issues. Legislators who fear that there may be a political backlash as the result of raising the legal drinking age were clearly informed that in reality there are no examples of societal backlashes against raising the legal drinking age (NZ Parliament, 2010).

Conclusions

In addressing alcohol in the lives of New Zealand's young people, there is no magic bullet, and raising drinking ages does not cure an age-old problem. However, the evidence clearly indicates that it makes it less severe. Whether New Zealand wants to raise the legal 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 financial considerations. At the moment there is a glaring discrepancy between what is medically true versus what is politically true about what is in our young people's best interests. In order to protect our young people in today's drinking culture we have to narrow this disparity in competing truths.

Protecting young people from today's drinking culture means that in light of new circumstances and new information about the effects of alcohol it is necessary to change attitudes, advice and laws. This is, of course, not only a big cultural and legal undertaking, but for many in New Zealand, a profound emotional wrench. Adults need to be aware that their favourite substance and social lubricant may have newfound consequences when young people consume it. Those who feel that a rise in the legal drinking age is unjustified or an overreaction should consider that on a purely health and development basis recent evidence makes it abundantly clear that *ideally* 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 a legal drinking age of 21 is actually a political meeting-in-the-middle compromise.



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Recommendations

New Zealand would benefit from adopting a single legal drinking age of 21, even if this is difficult to enforce. This will send an unambiguous message to young people and society about what is good for our young people and will make it easier to exert authority over those of them who increasingly feel entitled to 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, banning alcohol until age 21 will *not*, as parents fear, cause teenagers to rebel and drink even more.

Evidence clearly shows that children and young people absorb parental and societal values and rules about alcohol - even though they may claim otherwise. This subconscious awareness that the government and parents stand together on this matter is highly likely to exert a positive influence on young drinking habits.

Despite the worrying information 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 to drink heavily and to drive children around with a cigarette in a parent's mouth, without seatbelts - that has changed radically. In fact, 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 people ever expected.

While the problems created by drinking, particularly in the young, 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 New Zealand shows political, parental and legal resolve to present a united position on young people and alcohol based upon a new generation of evidence.

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Family First NZ is a charitable organisation registered as a Charity with the Charities Commission and was formed in 2006. Its purposes and aims are:

- to promote and advance research and policy regarding family and marriage
- to participate in social analysis and debate surrounding issues relating to and affecting the family
- to produce and publish relevant and stimulating material in newspapers, magazines, and other media relating to issues affecting families
- to be a voice for the family in the media speaking up about issues relating to families that are in the public domain

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