Istituto Superiore di Sanità

VINTAGE
Good Health into Older Age

Alcohol and older people:
a public health perspective
Vintage Project Report

Peter Anderson and Emanuele Scafato

November 2010

This report should be quoted:

Anderson, P. and Scafato, E. (2010)
Alcohol and older people – a public health perspective. Report for the Vintage project

Professor Peter Anderson, MD, MPH, PhD, RCP
Faculty of Health, Medicine and Life Sciences
Maastricht University, Netherlands
 E-mail: peteranderson.mail@gmail.com

Professor Emanuele Scafato, MD, PhD
Istituto Superiore di Sanità
National Centre for Epidemiology, Surveillance and Health Promotion - CNESPS
Population health and health determinat Unit
National Observatory on Alcohol - CNESPS
WHO Collaborating Centre for Research & Health Promotion on Alcohol and Alcohol-Related Problems
 E-mail: emanuele.scafato@iss.it

TABLE OF CONTENTS

Acknowledgements

---

[1] SEE APPENDIX

About the authors

Peter Anderson MD, MPH, PhD, FRCP

Professor, Faculty of Health, Medicine and Life Sciences, Maastricht University, Netherlands
Visiting Professor, Institute of Health and Society, Newcastle University, England
peteranderson.mail@gmail.com

Prof. Anderson is trained as a general practitioner and a specialist in public health medicine at the University of Oxford and the London School of Hygiene and Tropical Medicine. His PhD thesis was on what family doctors can do to reduce the risk of alcohol. From 1992 to 2000, he worked as the regional advisor for both alcohol and tobacco with the European Office of the World Health Organization, where he prepared and implemented the European Charter on Alcohol, created the European Partnership project to reduce tobacco dependence, a public private partnership with the pharmaceutical sector, and became acting director of the department of public health. Since 2001, he has worked as a consultant in public health and has been an adviser in the field of addictions to the European Commission, the World Health Organization and several Ministries of Health around the world. He coordinates several major international research and policy projects for addictions and mental health for the European Commission and the World Health Organization. He has over 120 publications in international peer reviewed journals and is the author or editor of some 15 books. He has authored several recent monographs for the European Commission and the World Health Organization.

Emanuele Scafato MD, PhD

Professor, Istituto Superiore di Sanità, National Institute of Health, Rome, Italy
Epidemiologist, gastroenterologist
emanuele.scafato@iss.it

Prof. Scafato is trained as medical doctor and specialist in gastroenterology at the University of Rome "La Sapienza". He is an epidemiologist, director of Population's Health and Health Determinants Unit, of the World Health Collaborating Centre (WHO CC) for Research and Health Promotion on Alcohol and Alcohol-related health problems and of the National Observatory on Alcohol (NOA) at the CNESPS-ISS, formally charged with the realization and implementation of the National Alcohol Prevention Day and of the national campaigns and communication strategy on alcohol according to the law 125/2001. The professional experience of Prof. Scafato in the field is the result of more than 20 years of activity always performed into multi-disciplinary and international approach and environment. Prof. Scafato is appointed by the Italian government as WHO National Counterpart for the EAAP implementation and Alcohol Policy adviser and as national expert in several formal High Level Panel, Committees, Commissions such as the Committee on National Alcohol Policy and Action - CNAPA. He is partner of many EU Projects on alcohol, ageing and health monitoring such as PHEPA, PHEPA2, AMPHORA, ODHIN, ALICE-RAP, ECAT, Building Capacity, ELSA, BtG, MEGAPOLE, ECHI, ECHI2, ECHIM. ERA-AGE, FUTURAGE and coordinator of VINTAGE. He is appointed by the Prime Minister as Member of the National Committee on drug-dependencies and by the MoH as Member of the National Committee on Alcohol. Prof Scafato is the Scientific coordinator and the Research manager of more than 20 projects funded during the last five years by the Ministry of Health, the Prime Minister Office and of the Ministry of Social Affairs (budget managed during the last 5 years: 7 millions of euros). He is co-author of more than 250 scientific publications and he is the President of the Italian Society of Alcohology and Vice-President of the European Federation of Addiction Societies, EUFAS. Prof. Scafato is a leading researcher in "cognitive" field as National coordinator of the main population based projects on Alzheimer disease (IPREA project), dementia, cognitive impairment and ageing (ILSA project) .

Preface

Over the past years, there has been a growing attention at the EU level on the relevance of alcohol use disorders among older people as an increasing and common public health problem.

Although there is a paucity of epidemiological studies specifically aimed at identifying the impact of hazardous and harmful alcohol use in this vulnerable group of the population, some estimates suggests that the prevalence of alcohol-related problems, alcohol abuse or dependence among older adults is increasing.

Some fully attributable alcohol diseases, such as alcoholic cirrhosis, as well as problems related to hazardous drinking are estimated to be even more common among older people than among younger individuals. For alcohol use disorders, a huge gap between the number of older adults who should need treatment for addictive disorders and the number who are engaged in treatment is sometimes reported by health care professionals, even if not subject to formal or scientific investigation.

A systematic screening for alcohol problems in older people is not a specific target of the ongoing prevention or action plans all over Europe along with the early detection and brief intervention activities in primary health care, where professionals do not usually receive a clinical training focusing on the need to look at hazardous or harmful alcohol consumption among older people as an opportunity for prevention.

To what extent older people should be considered as a specific risk group in relation to alcohol is clearly an issue for debate and further research.

Some evidence has emphasized the relative higher impact of alcohol-related consequences and health outcomes among older people, such as changes in metabolism or in pharmacokinetic processes increasing the vulnerability of ageing people to the effects of alcohol, the higher consumption of pharmaceutical drugs and the prevalence of diseases or health conditions in which alcohol use is not recommended; all arguments for stressing the special relationship between alcohol and older people. Most of the current scientific literature, even acknowledging the biological and metabolic differences between younger and older individuals, fails to elaborate data assuming a lower limit of at-risk consumption for older people, probably affecting the estimates of harmful drinking among older people. More methodological problems in comparing studies aimed at evaluating the impact of harmful alcohol consumption are currently related to the age of reference, which varies widely from 55 to 65+ or 80+ years of age.

The overall VINTAGE project experience, integrated by the present systematic review report clearly identifies that more and better data and reporting, standardized across Europe, is needed on alcohol use, consumption patterns and alcohol-related consequences amongst older people, including also measuring lower levels of alcohol consumption and potential alcohol related consequences and health outcomes.

Some policy implications arising from the VINTAGE report analysis together with the forthcoming VINTAGE survey report on the collection of best practices in the EU (https://excmail.iss.it/exchweb/bin/redir.asp?URL=http://ec.europa.eu/health/alcohol/events/ev_20 100914_en.htm), whose preliminary results have been already submitted to debate at EU level, can be summarized as follows:

- alcohol and ageing is an issue for strategic framework of action and prevention;

- alcohol strategies should ensure an ageing perspective, as well as should include alcohol issues into healthy ageing strategies;
- messages about alcohol consumption of older people (adults more in general) are politically sensitive;
- older people should be made more aware about alcohol-related consequences on health and safety;
- alcohol consumption guidelines, currently in progress for adoption in some Member States, dealing with alcohol and older people should be an appropriate way of drawing attention to this apparently neglected target of health planning and prevention; and
- alcohol in older people should be a major health policy issue for tackling mental health in older people

According to a lifecycle approach, it should be recommended to overcome the distinction between current and future older people hopefully aiming at the prevention of future problems in older people according to a reduction in alcohol consumption among those who are middle-aged at present, but also increasing the capacity to deal with alcohol-related problems in older people by early detection of hazardous level of alcohol use.

A renewed approach, hopefully oriented at increasing the research base of evidence, is what VINTAGE aims for to better deal with the need to overcome the mistaken belief that older persons have little to gain from diagnosis and treatment of alcohol-related problems, as well as to give to older people the right to appropriate and valuable interventions supporting healthier lives and a more active ageing perspective.

Emanuele Scafato

VINTAGE project leader

Rome 12/11/2010

Summary

Compared with younger people, there is a paucity of data describing alcohol use, alcohol-related harm and effective policy and preventive approaches amongst older people. Nevertheless, compared with their younger counterparts, older people do not suffer from disproportionally higher levels of harm: in general, they drink less, drink less hazardously, and suffer less harm. In absolute terms, they experience a much lower number of deaths and hospital admissions for conditions wholly attributable to alcohol than their younger adult counterparts. When considering conditions partially attributable to alcohol, the estimated number of deaths and particularly the number of hospital admission become much higher, although these numbers are likely to be inflated due to the application of attributable fractions estimated for younger adults applied to older adults. Many surveys have suggested that light drinking older people (up to 20g alcohol per day) experience a better quality of life than non-drinking or heavy drinking counterparts. However, it is unknown the extent to which this is due to other factors, including drinking patterns, and it may simply mean that lighter drinkers are healthier, wealthier and better socially integrated people than non-drinkers or heavier drinkers.

It is questionable that older people are at particular risk of alcohol-related conditions that might be more common for their age. The evidence is simply inconclusive to suggest that there are at greater risk of falls and fractures. If anything, small doses of alcohol seem to reduce the risk of dementia and Alzheimer's disease. Light older drinkers also have less risk of dying over short follow-up periods than non-drinkers or heavier drinkers, although, again, it is difficult to be certain how much of this effect is due to other confounding variables. The one area where older people might be at special risk is interactions with medications, older people being more likely to take medications than younger adults. Although, the extent to which this is a significant health problem is not known.

There are a wide range of evidence based alcohol policies that reduce the harm done by alcohol, but none of these have been evaluated for their specific impact on older people. However, there is no reason to assume that older people would not react to alcohol policy interventions different from younger adults. Certainly, the policy option that is likely to have the greatest impact is increasing the price of alcohol, which, amongst other things, leads to immediate reductions in alcohol dependence, liver cirrhosis and alcohol-related mortality. For those older people, whose consumption of alcohol is hazardous or harmful, the, albeit limited, evidence suggests that screening and brief intervention programmes are just as effective as for the younger adult populations.

The number of older Europeans will increase enormously over the coming years - in the next twenty years alone, people aged 65 years and older will increase in number from the current 87 million to 123 million, and people over 80 years of age will increase in number from the current 23 million to 36 million. These people are the present middle age, who have high levels of both frequency and volume of drinking. They are also the group of people with the highest levels of wholly attributable alcohol related hospitalization and death. To prevent burgeoning alcohol-related problems amongst older people over the coming twenty years, it is important to target policy on the present middle age, which will also have an immediate impact in reducing alcohol-related hospitalizations and deaths. Further, many alcohol-related conditions, and in particular cancers, have a long latency period in terms of both cause and reduction in risk. Thus, if one wishes to prevent an increase in alcohol-related cancers and other conditions in older people, action should also be taken on the middle-aged. From a policy perspective, actions that reduce the consumption of the middle aged, will not only prevent problems for a future cohort of older people but, at the same time, reduce patterns of hazardous and harmful alcohol consumption amongst the existing cohort of older people.

1. INTRODUCTION

This report considers alcohol and older people. There are no standardized age definitions for older people. Eurostat, the statistical branch of the European Commission, groups older people into those aged 65 years or older, and those aged 80 years or older[2].

Most Europeans drink alcohol, which is associated with more than sixty medical disorders and conditions (Rehm et al 2010a), and which is estimated to be responsible for some ten per cent of the total disease and injury burden in Europe (Anderson & Baumberg 2006). Alcohol use is linked to serious social problems, including violence, crime and work absenteeism.

As the 2009 Council of the European Union Conclusions on Alcohol and Health noted[3], there are a number of reasons to consider reviewing the impact of alcohol on older people in the European Union (EU) and what can be done about it (Hallgren et al 2010; Scafato 2010).

First, much less is known about the health, social and economic impacts of alcohol use in older people compared to younger adults.

Second, there are relevant biological changes associated with ageing. Research suggests that older people might be more sensitive to alcohol's negative health effects compared to younger adults, which could mean that more harm results from equivalent amounts of consumption by older people. One reason for this heightened sensitivity is the higher blood alcohol concentration (BAC) achieved by older compared to younger people after consuming an equal amount of alcohol. Ageing also interferes with the body's ability to adapt to the presence of alcohol (i.e. tolerance) and, through this decreased ability to develop tolerance, older people may continue to exhibit certain effects of alcohol (e.g. coordination problems) at lower doses than younger people whose tolerance increases with increasing consumption (NIAA, 1998). Brain research also suggests that ageing may render a person more susceptible to alcohol's effects. For example, it has been reported that older people with a history of chronic, heavy alcohol use exhibit more brain tissue loss than younger people, often despite similar lifetime alcohol consumption (Oscar-Bergman et al., 1997).

Third, there are the demographic changes in the European Union. The older population is the fastest growing segment of the EU. Due largely to the ageing baby boomer generation of the post second world war years, the number of people aged 65 years and older is estimated to increase from 86.8 million in 2010 to 122.5 million in 2030. The number of people over 80 years of age is estimated to increase from 23.3 million in 2010 to 36 million in 2030 (Eurostat 2008). Average life expectancy has risen by five years for women (to 81 years) and four years for men (to 76 years) since 1960, and will continue to rise in the coming decades (European Commission, 2009). These changes will have an enormous impact on European society. The ageing baby boomers are high alcohol consumers and will bring with them a significant cultural shift favourable to alcohol and drug use. Further, an older population typically increases the overall health burden and poses many challenges for public health policymakers. Demographic shifts have been paralleled by improvements in average disposable incomes and the buying power of many older Europeans, which generally lead to increases in alcohol consumption; although it is likely that future cohorts of older people will experience less prosperity. The ageing of the European population means that the absolute number of older EU citizens with alcohol-use disorders is likely to rise and the impact of these changes must be considered.

---

[2] http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-SF-08-072/EN/KS-SF-08-072-EN.PDF
[3] http://www.se2009.eu/polopoly_fs/1.26039!menu/standard/file/CC%20alcohol%20and%20health.pdf

This report attempts to answer a number of questions to do with alcohol and older people, including the pharmacokinetics of alcohol, and what we know about the use of alcohol and trends in consumption and alcohol-related harm amongst older people. The report considers the relationships between alcohol and well-being and health in older people. It then considers how alcohol policy might impact on older people's use of alcohol, and the evidence for the effect of screening and brief intervention programmes amongst older people. The approach and focus is public health, rather than the treatment of those with alcohol use disorders. When considering alcohol policy and older people, the report will note the importance of the ageing middle aged population, a cohort with high levels of alcohol consumption and alcohol-related harm, and which will be the future older population.

2. Methods

Formal literature searches of the scientific literature were undertaken in Pub med, MEDLINE, the Cochrane Library and Google scholar using the search terms adapted from Table 1. Searches were restricted to the English language and since the year 2000. Key reviews of the impact of alcohol policies in reducing the harm done by alcohol were screened for information on older people (Anderson et al 2009; Anderson2009; Anderson & Baumberg 2006). Three hundred and sixty nine titles and abstracts were indentified in the search, from which 78 papers were retrieved. Selected papers were those that were systematic reviews or original papers not included in systematic reviews. Papers already included in systematic reviews and clinically or practice oriented papers were excluded.

Table 1 Search terms used for formal literature searches.

#	Search History
1.	"AGED 80 AND OVER"/ OR AGED/
2.	"middle aged"
3.	(retired or retirement)
4.	(elderly or gertiatr$ or senile$ or older or older adult or older person or old age or later life). ti, ab.
5.	(injury OR death OR mortality OR fatality OR trauma OR fall$ OR violent OR fracture OR crash OR accident OR suicide OR disorder OR assault OR murder OR homicide OR motor OR driv$).ti,ab.
6.	(cancer or liver or cirrhosis or cardiovascular or cerebrovascular or stroke or coronary or heart or ischemic or ischaemic or atherosclerosis or depress$ or cognit$ or brain or dementia or alzheimers or bone or diabetes or hospital$ or drug or medication or comorbid or dependence or disorder).ti,ab.
7.	(educat$ or train$ or promot$ or interven$ or program$ or administer$ or campaign$ or evaluat$ or assess$ or control$ or compar$ or prevent$ or safe$ or strateg$ or scheme$ or incentive$ or trial$ or policy or policies or reduc$ or approach$ or enforce$ or guideline). Ti,ab.
8.	(drink$ or consum$ or heavy or binge or episodic or risk$ or safe or pattern).ti,ab
9.	alcohol$.ti,ab.
10.	or/1-4
11.	or/5-8
12.	and/9-11

3. ALCOHOL PHARMACOKINETICS

Chapter summary There are two pharmacokinetic processes that might lead to older people being more susceptible to the impact of consumed alcohol than younger people: first, due to reduced degradatory activity in the liver (and, to lesser extent, the stomach) of older people, more alcohol may reach the blood stream for each given intake; and, second, due to on average reduced body water, higher blood alcohol concentrations may be achieved in older people. Other potential consequences of increased alcohol consumption include oxidative and micronutrient stress. Although the extent of these processes and their health importance are not fully known, they have led to some countries recommending lower levels for lower risk alcohol consumption amongst older people, compared with younger adults.

Ethanol (C_2H_5OH) is a physiologically nonessential, energy- yielding (29 kJ/g or 7 kcal/g) molecule produced by alcoholic fermentation from plants with high carbohydrate content (eg, barley, wheat, corn, and grapes) (see Ferreira & Weems 2008). Ethanol does not need to be digested and is absorbed from the gut directly. Already in the stomach, some of the ethanol is metabolized by gastric alcohol dehydrogenase (ADH). In older adults, gastric ADH activity is significantly reduced, potentially increasing the amount of ethanol available to be absorbed with age. Alcohol that is not metabolized in the stomach diffuses across the stomach and the first part of the intestine to enter the body, where it first passes through the liver.

The liver is the primary site of ethanol metabolism. Hepatic ADH is the rate-limiting enzyme that oxidizes alcohol to acetaldehyde, Figure 1. In older adults, liver ADH activity is also significantly reduced, increasing the amount of ethanol that reaches the blood stream with age.

Maximal blood alcohol concentrations (BAC) are reached approximately 45 to 75 minutes after an oral dose of alcohol in 20- to 60-year olds (see Ferreira & Weems 2008). Body composition is altered by aging and this influences BAC. Whereas young adult body mass is approximately 70% water, by age 65 years, body fat doubles in men and increases by 50% in women resulting in reduced total body water and with age. This means that, compared with younger people, blood alcohol concentrations are likely to reach a higher level at any given alcohol intake.

A potential consequence of increased alcohol consumption is oxidative stress, which is implicated as a risk factor for many lifestyle-related diseases, including cancer, cardiovascular disease, and diabetes mellitus (see Ferreira & Weems 2008). Oxidative stress occurs when there is an imbalance between anti-oxidant systems and the production of reactive oxygen species. These reactive molecules are generated in response to the metabolism of ethanol by the microsomal ethanol oxidizing system, and may have a role in the development of alcoholic liver disease. Unhealthy nutrient status may occur when food is displaced by increased alcohol intake. Potential displaced nutrients are B vitamins, notably thiamine and pyridoxine.

A reduction in n-3 polyunsaturated fatty acid intake, which is protective against coronary heart disease, has been associated with three or more daily drinks of alcohol (Kim et al 2007). As well, the requirements for some micronutrients (for example, niacin and riboflavin) may be increased due to alcohol metabolism.

One consequence of the pharmacokinetic processes that might lead to older people being more susceptible to the impact of consumed alcohol than younger people has been to suggest lower guidelines for lower risk drinking amongst older people compared with younger people, as is the case in Italy.

Further epidemiological studies to compare whether or not older people show an increased risk of harm per gram of alcohol, when compared with younger people would confirm the importance of this approach.

4. ALCOHOL CONSUMPTION IN OLDER PEOPLE

Chapter summary Surveys conducted across many European countries in the early 2000s reported that potentially risky drinking patterns of younger adults also continued amongst those aged 50-65 years. Whether or not these cohorts will continue their potentially riskier drinking as they age is not known. In general, analyses of the drinking patterns of older Europeans find that their alcohol consumption mirrors those of younger Europeans, although at lower levels, and there is no evidence to suggest disproportionate increases in the alcohol consumption of older people. An illustrative and detailed survey of the drinking habits of people aged 75 years or more in the United Kingdom found that heavy drinking, and the problems associated with such behaviour, was rare.

The GENACIS project reported in 35 countries worldwide, including eleven EU countries, that the prevalence of current drinking did not decline with increasing age amongst the majority of studies undertaken during the early 2000s, with still very high proportions of drinkers amongst those aged 50-65 years (Wilsnack et al 2009); high frequency drinking (≥ 5 days/week) tended to increase with age and high volume drinking (> 23g/day) did not regularly decrease with age, and often increased with age certainly for men and most likely for women. Although episodic heavy drinking (≥ 60g in a day in preceding 12 months) tended to decrease with age, still a very high proportion of those aged 50-65 years engaged in this activity. Whether or not the cohorts of heavier drinking middle age people continue to drink more heavily as they age remains to be seen.

A comprehensive review of alcohol consumption amongst elderly European Union citizens published in 2009 and reviewing data from the Czech Republic, Germany, Finland, Italy, Latvia, Poland, Spain, Sweden and the United Kingdom suggested that there were some increases in alcohol consumption in older people in some European countries, but it was difficult to say that this was a large, consistent or worrying trend in terms of drinking rates, volume of consumption or risky patterns of drinking, all of which were substantially lower than in the middle aged population (Hallgren et al 2009). There was no evidence of disproportionate changes in the drinking of older people compared with that of younger people. That is, any trends in the volumes and patterns of drinking amongst older people mirrored those of the population as a whole.

On the other hand, there is some evidence of cohort effects. In Italy, for example, whilst the prevalence of alcohol use during the previous twelve months declined with age in 2007, this was not the case for wine, Figure 1. This could be a cohort effect, with the older generations continuing the pattern of wine consumption during meals.
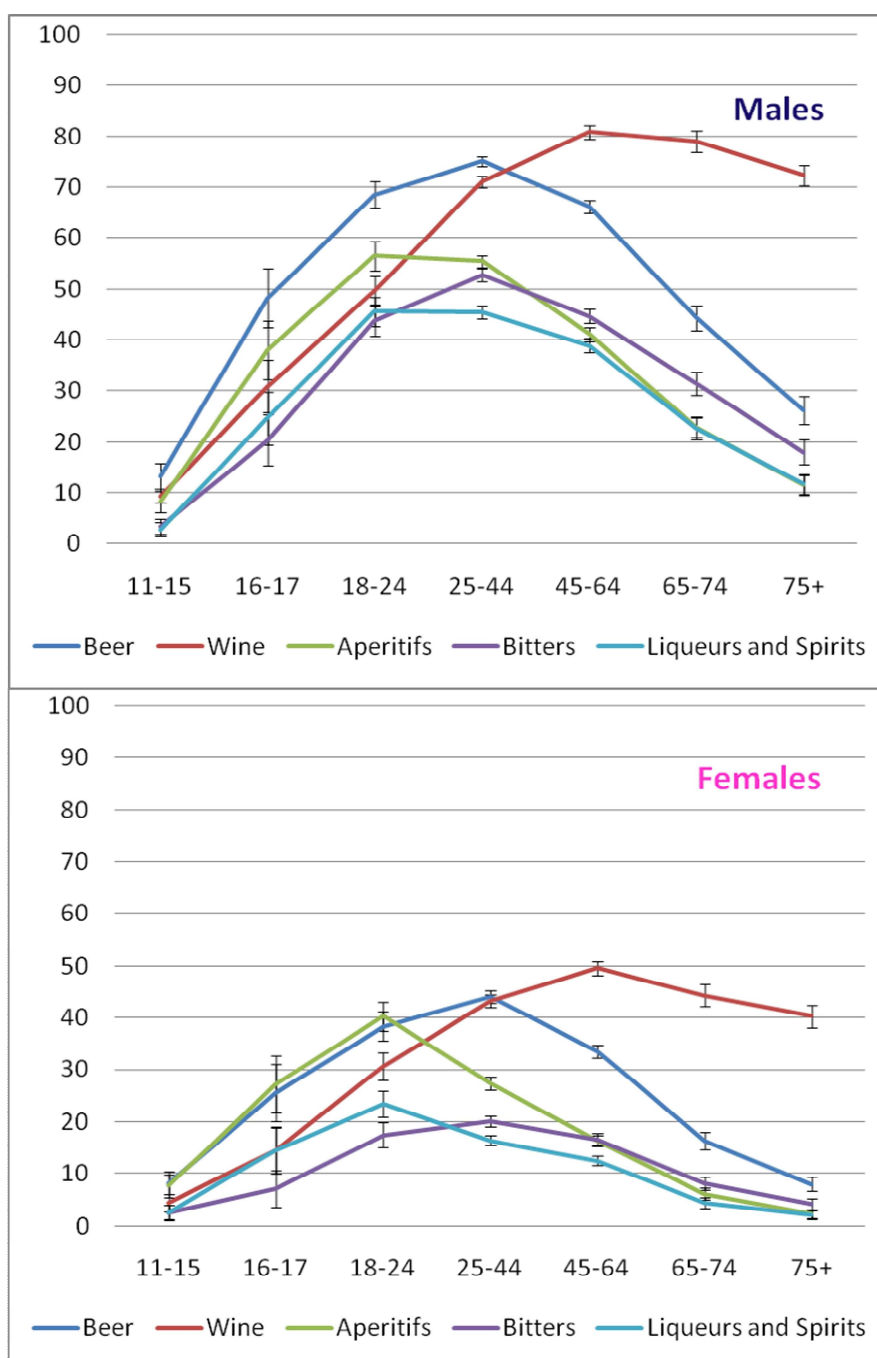
Figure 1. Prevalence of alcohol use during previous 12 months by gender and age (2007 data). (Source: Multiscopo ISTAT survey data 2008 elaborated by National Observatory on Alcohol of the National Centre for Epidemiology, Surveillance and Health Promotion (CNESPS) and WHO CC Research on Alcohol)

There is some evidence in Spain that between 1987 and 2006, self-reported alcohol use increase more quickly amongst those aged 65 years and older than the general population, Figure 2. But, this could also be a cohort affect, with the previous higher prevalence of alcohol use (drinking with meals) amongst the middle aged persisting into older age, with such patterns diminishing amongst younger drinkers.

Figure 2. Self reported alcohol use during the last two weeks among Spanish men and women (1987–2006). Source: Hallgren et al 2009.

Despite the strong body of research on alcohol consumption patterns in young and middle-aged people, very little work on older people (especially those aged 80 years or more) has been undertaken. As a result, knowledge about the characteristics of drinkers and heavy drinkers in this age group remains limited.

One example of an exception to this is the UK based MRC Trial of the Assessment and Management of Older People in the community, a cluster randomised trial investigating different approaches to multidimensional screening for people 75 years of age and over with randomisation by practice (Hajat et al 2004). Figure 3 shows the frequency distribution of drinking among the 14,962 responders by gender.

As would be expected, a higher proportion of women than men were never drinkers, whereas the heavier drinkers tended to be male. Overall, about 10% of the cohort drank between 7 and 13 drinks in the week, and very few people drank more than this. Only 5% of men and 2.5% of women exceeded the Royal Colleges of Physicians, Psychiatrists and General Practitioners recommended weekly drinking limits (168g for men and 112g for women).

Over half of the drinkers drank mostly wine, with 30% drinking mostly beer and just over 12% drinking mostly spirits. In relative terms, women tended to drink more wine and spirits, and men favoured beer. In both men and women, the never drinkers were older, whereas the heavier drinkers tended to be younger. The odds ratio of being a moderate drinker (less than 210g alcohol per week for men and less than 140g alcohol per week for women) as opposed to being a non-drinker decreased linearly with increasing age.
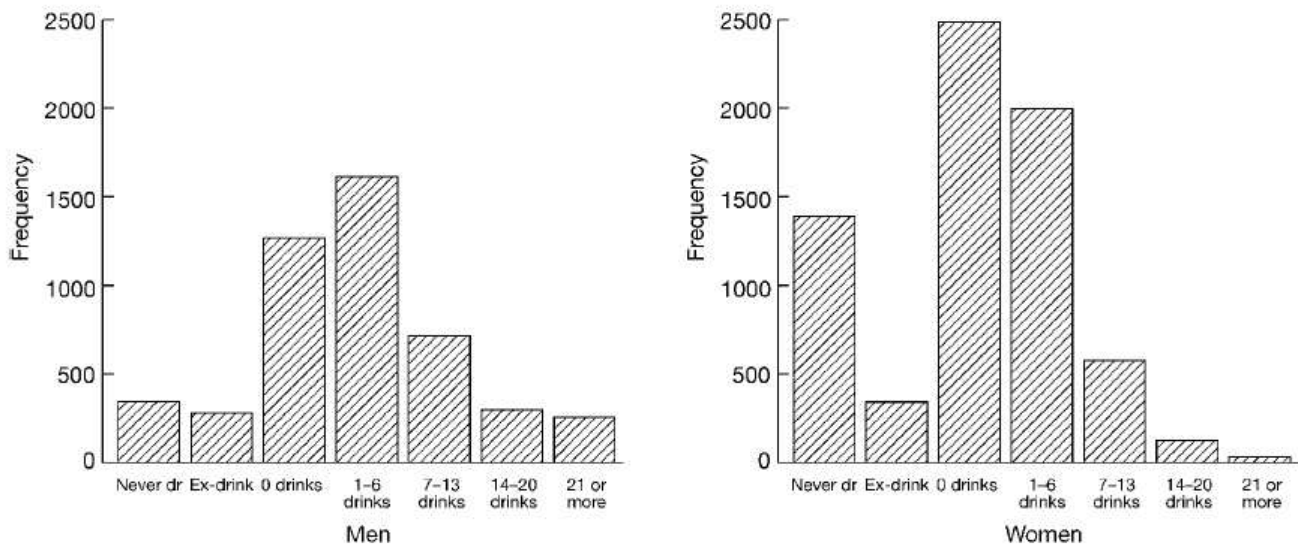
Figure 3 Distribution of alcohol intake in past week by gender (one drink = 8g alcohol).

5. ALCOHOL-RELATED HARM IN OLDER PEOPLE

Chapter summary There is some evidence for increases in alcohol-related hospital admissions and alcohol-related deaths in older people in some European countries, usually paralleling changes in alcohol consumption. But, as with changes in alcohol consumption, it seems that any trends amongst older people mirror those of the population as a whole. Estimates from the United Kingdom suggest that deaths and hospital admissions from conditions that are wholly attributable to alcohol are quite small in the older population compared with the middle aged population. In contrast, deaths and hospital admissions from conditions that are partially attributable to alcohol are quite large in the older population, but this may be an inflated artefact resulting from applying attributable fraction estimates derived from younger adults to older people.

The European region of the World Health Organization has the highest impact of alcohol, with about 6.5% of the deaths (men: 11.0%; women: 0.8%) and 11.6% of the disability adjusted life years (DALYs, the years of life lost due to premature death and disability) (men: 17.3%; women: 4.4%) attributable to alcohol (Rehm et al 2010). Most of these DALYs fall into the categories of neuropsychiatric disorders (with the overwhelming majority in alcohol use disorders), unintentional and intentional injuries, cirrhosis of the liver, cardiovascular diseases, and cancers. Alcohol, if consumed in a pattern of light regular drinking without heavy episodic drinking patterns, can also have a positive impact, mainly on ischaemic cardiovascular diseases. The above figures are net figures, taking into account the protective effects. Different dimensions of alcohol are responsible for causing harm (Rehm et al 2010). The overall volume of consumption over time impacts on most disease categories, whereas irregular heavy drinking occasions in addition impact on injury and ischaemic conditions. The dose-response relationships vary. For diseases where alcohol has a protective relationship, there are J-shaped curves, whereas for most other disease categories linear to exponential relationships prevail. For injuries, the acute level of blood alcohol concentration is the most important factor. To a lesser degree, the chemical composition of alcohol beverages may impact on health as well. This can be the case in methanol poisoning outbreaks, when methanol is added to spike alcoholic beverages, but also when production leaves too much acetaldehyde which is carcinogenic.

The review of alcohol consumption amongst elderly European Union citizens published in 2009 and referred to above also suggested that there were some increases in alcohol-related hospital admissions and alcohol-related deaths in older people, usually paralleling changes in alcohol consumption (Hallgren et al 2009). But, as with changes in alcohol consumption, it seemed that any trends amongst older people mirrored those of the population as a whole.

An illustration of this is changes in alcohol-related deaths (which include causes regarded as most directly due to alcohol consumption) in the United Kingdom.

Two-thirds of the deaths occurred amongst men, and over four-fifths were due to alcoholic liver diseases and fibrosis and cirrhosis of the liver, conditions with usually a long time course.

Figure 4 shows that for men, the most marked increases occurred in the age group 55-74 years, with a stable or only slightly increasing trend in those 75 years and older.
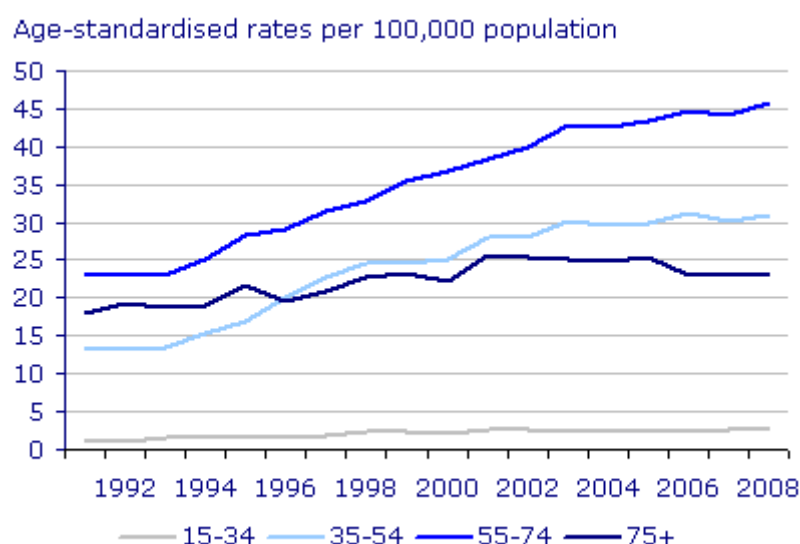
Figure 4 Male alcohol-related death rates by age-group, United Kingdom, 1991-2008

In a comprehensive analysis, Jones et al (2008) estimated deaths in the United Kingdom, also including conditions that are partially due to alcohol. For both men and women, the estimated highest number of deaths from wholly alcohol-attributable conditions occurred in the age ranges 45-64 years, and was quite small amongst those dying at age 75 years or more, Figures 5-6. In the older age ranges, the estimated number of deaths from the partially attributable conditions became more important. However, this may be due to methodological artefact.

Such conditions (cancers and cardiovascular diseases, see Table 2) are more common amongst older people, and even small relative risks and attributable fractions for such conditions will increase the number of deaths. Further, we do not have good estimates of relative risks and attributable fractions amongst older people, but they are likely to be considerably lower than such estimated for younger adults.

Thus, applying estimates derived from younger populations is likely to inflate the number of partially attributable deaths. Figures 5-6 also show that, although in absolute numbers, there were an estimated higher numbers of alcohol-related deaths in older people, the proportion of all deaths that are alcohol-related declined with age. The estimated top three causes of alcohol-related deaths amongst older people included liver diseases, malignant neoplasms and cardiovascular diseases (Table 2), conditions for which there tend to be long durations between consumption and outcome, and long durations for benefit to accrue following reductions in alcohol-consumption (Rehm et al 2007).

Figure 5 Estimated number (% of all deaths in each age group) of UK male deaths attributable to alcohol consumption by age and type of condition (2005). Source: Jones et al (2008).

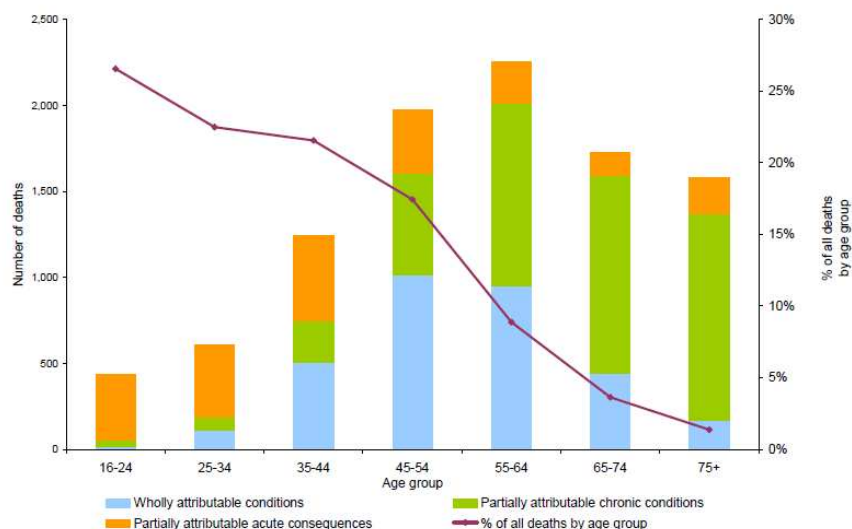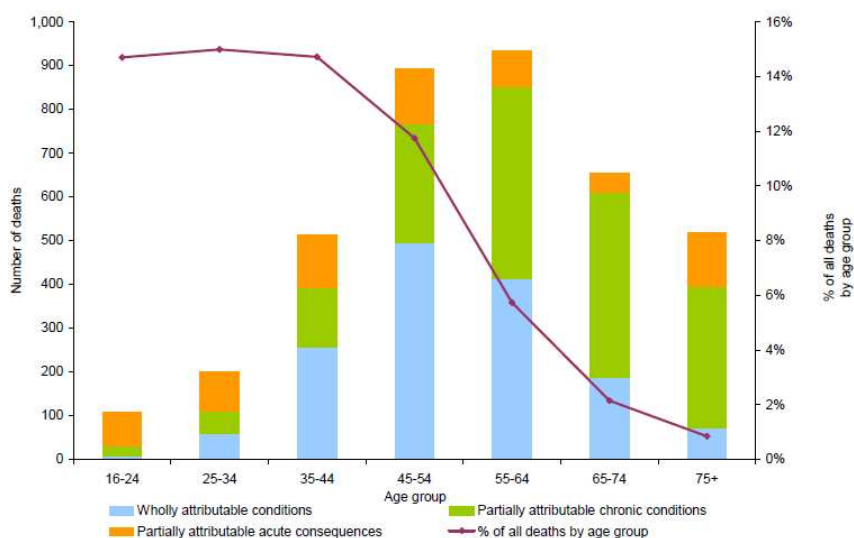
Figure 6 Estimated number (% of all deaths in each age group) of UK female deaths attributable to alcohol consumption by age and type of condition (2005). Source: Jones et al (2008).

Table 2 Estimated top three causes of alcohol attributable deaths by age and sex. Source: Jones et al (2005).

Age	Males Condition	n	Females Condition	n
16-24	Road traffic accidents - non pedestrian	185	Intentional self-harm	48
	Intentional self-harm	142	Road traffic accidents - non pedestrian	19
	Pedestrian traffic accidents	34	Epilepsy and Status epilepticus	18
25-34	Intentional self-harm	249	Intentional self-harm	71
	Road traffic accidents - non pedestrian	126	Alcoholic liver disease	41
	Alcoholic liver disease	61	Epilepsy and Status epilepticus	33
35-44	Alcoholic liver disease	382	Alcoholic liver disease	208
	Intentional self-harm	323	Intentional self-harm	95
	Road traffic accidents - non pedestrian	113	Malignant neoplasm of breast	48
45-54	Alcoholic liver disease	827	Alcoholic liver disease	427
	Intentional self-harm	251	Malignant neoplasm of breast	99
	Unspecified liver cirrhosis	131	Intentional self-harm	89
55-64	Alcoholic liver disease	802	Alcoholic liver disease	362
	Malignant neoplasm of oesophagus	278	Malignant neoplasm of breast	154
	Unspecified liver cirrhosis	178	Unspecified liver cirrhosis	69
65-74	Alcoholic liver disease	388	Alcoholic liver disease	167
	Malignant neoplasm of oesophagus	295	Malignant neoplasm of breast	109
	Haemorrhagic stroke	158	Unspecified liver cirrhosis	90
75+	Malignant neoplasm of oesophagus	339	Cardiac arrhythmias	396
	Cardiac arrhythmias	212	Malignant neoplasm of breast	194
	Haemorrhagic stroke	207	Hypertensive diseases	153

Jones et al (2008) also analyzed hospital admission in the United Kingdom, and described similar findings, Figures 7-8.

Amongst older people, estimated hospital admissions for wholly attributable conditions were quite low, compared with younger populations, whereas estimated admissions for partially attributable conditions were quite high.

The estimated top three conditions amongst older people included mental and behavioural disorders due to alcohol, hypertensive disease and cardiac arrhythmias and in the oldest age group, falls, Table 3. But, again, the same problems of over-inflation of the estimates apply.

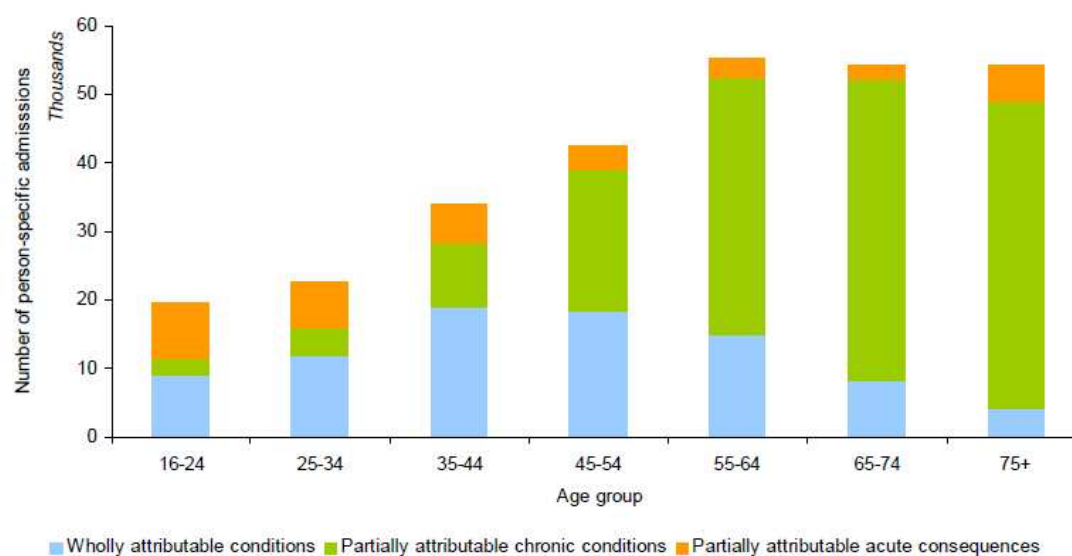**Figure 7** Number of UK male hospital admissions by type of condition (April 2005-March 2006). Source: Jones et al (2005).
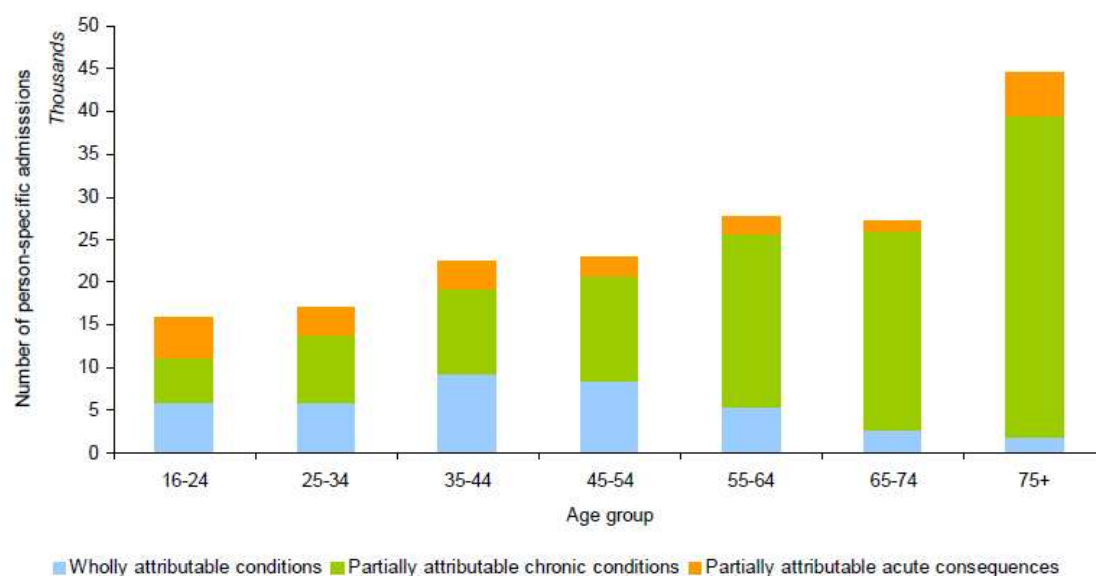

Figure 8 Number of UK male hospital admissions by type of condition (April 2005-March 2006). Source: Jones et al (2005).

Table 3 Estimated top three causes of hospital admissions deaths by age and sex. Source: Jones et al (2005).

Age	Males Condition	n	Females Condition	n
16-24	Mental and behavioural disorders due to use of alcohol	7,164	Intentional self-harm	3,310
	Assault	3,016	Mental and behavioural disorders due to use of alcohol	3,242
	Falls	1,925	Ethanol	2,452
25-34	Mental and behavioural disorders due to use of alcohol	9,554	Spontaneous abortion	3,603
	Epilepsy	1,966	Mental and behavioural disorders due to use of alcohol	3,595
	Assault	1,907	Epilepsy	2,757
35-44	Mental and behavioural disorders due to use of alcohol	15,396	Mental and behavioural disorders due to use of alcohol	6,075
	Hypertensive diseases	4,119	Epilepsy	3,062
	Epilepsy	2,558	Hypertensive diseases	2,476
45-54	Mental and behavioural disorders due to use of alcohol	14,527	Mental and behavioural disorders due to use of alcohol	14,527
	Hypertensive diseases	12,368	Hypertensive diseases	12,368
	Cardiac arrhythmias	2,649	Cardiac arrhythmias	2,649
55-64	Hypertensive diseases	23,317	Hypertensive diseases	23,317
	Mental and behavioural disorders due to use of alcohol	11,606	Mental and behavioural disorders due to use of alcohol	11,606
	Cardiac arrhythmias	7,058	Cardiac arrhythmias	7,058
65-74	Hypertensive diseases	25,438	Hypertensive diseases	12,593
	Cardiac arrhythmias	12,337	Cardiac arrhythmias	6,686
	Mental and behavioural disorders due to use of alcohol	6,527	Mental and behavioural disorders due to use of alcohol	1,972
75+	Cardiac arrhythmias	20,431	Cardiac arrhythmias	19,495
	Hypertensive diseases	19,292	Hypertensive diseases	13,699
	Falls	4,623	Falls	4,428

n = number of person-specific hospital admissions

Data from April 2005 to March 2006

6. ALCOHOL AND WELL-BEING

Chapter summary A number of cross sectional studies and longitudinal studies suggest that, compared with not drinking and heavier drinking, light or moderate drinking (10-20g alcohol a day) might improve the social inclusion and quality of life amongst older people. However, whether or not or the extent to which this is due to other factors is not known: compared with older non-drinkers, older lighter drinkers may just simply be healthier, wealthier and better socially integrated people.

A number of cross sectional studies have suggested that light or moderate drinking might improve the quality of life amongst older people (e.g., Cawthon et al 2007), although heavy drinking is associated with poorer quality of life (e.g., Kirchner et al 2007; Breeze et al 2004). However, cross sectional studies cannot infer causation and self-reported measures may not reflect an accurate measure of performance (Gilbertson et al 2009).

In the UK based MRC Trial of the Assessment and Management of Older People in the community described above, never and ex-drinkers were less likely to live with a spouse and more likely to live alone or with other people compared with drinkers (Hajat et al 2004). Drinkers were also more likely to have contact with other people. Never and ex-drinkers were less likely to be home-owners, whereas those that drank were more likely to be home-owners.

In both sexes never drinkers were likely to be the most deprived and those that drink in moderation were likely to be the most affluent. When subjects were asked whether they have financial difficulties, those that did tended to be ex- and moderate drinkers. Heavier drinkers tended to have no financial hardship.

Participants completed the Mini Mental State Examination (MMSE). The MMSE is a widely used test of cognitive function and has been shown to be both valid and reliable (Tombaugh & McIntyre 1992). Those people who scored below 17 were designated severely cognitively impaired. Those who scored between 17 and 23 were considered mildly impaired, and those above 23 were judged to have no impairment. A clear gradient was observed with current drinking being more common amongst those who were not cognitively impaired. When subjects were asked about whether they had difficulties undertaking everyday activities such as cooking, washing and walking, again the two drinking groups were less likely to answer yes. Drinkers were also less likely to have had falls, more likely to have a good perception of their general health, and more likely to consider themselves physically active. Diabetes was more common in the nondrinking groups, but not previous heart attack. Little association was observed between alcohol intake and number of different medications used.

Participants completed the 15-item version of the Geriatric Depression Scale (GDS) (Sheik & Yesavage 1986). A cut-off point of 6 or more is commonly used to indicate depression. Depression tended to be slightly higher in the non-drinking groups for women, but otherwise very little association was observed. By contrast, reported anxiety was lower in the never drinkers and higher in the ex- and current drinking groups. A clear dose-response relationship was found for number of positive responses to anxiety questions and increasing alcohol consumption.

Little association was observed between alcohol intake and death or separation from a loved one in the last year. However, reporting a serious illness in a loved one or moving residence was more common in the drinking groups.

After adjustment for other variables, the odds of being a moderate drinker in females was 0.37 (95% CI 0.32, 0.42) compared with males. In addition, those people above 80 years of age, those with a

higher Carstairs score (an index of deprivation based on four variables available from the 1991 census: overcrowding, social class of head of household, car ownership and unemployment, Carstairs & Morris 1991) those that had a poor general health perception, and those that had difficulty with everyday activities were also statistically significantly less likely to be moderate drinkers. Drinkers also had significantly less cognitive impairment, were more likely to be smokers, were more likely to have experienced a serious illness in a loved one, were more likely to have suffered a heart attack, and had higher BMI. Anxiety was associated with drinking with an increased odds of 1.33 (95% 1.08, 1.63). Depression (GDS score) was not found to be an independent predictor in this model. Models run separately for men and women did not affect results to any large extent.

Disruption of lifestyle such as retirement and decreased social activity are thought to be some of the main contributory factors among people who develop alcohol problems later in life.

Isolation and loneliness in old age can lead to increased drinking, but the above study suggested that those that have a regular drink are, in fact, those that are also more likely to be living with a spouse. Other studies have also observed that the stresses of ageing, such as widowhood and retirement, are not associated with increased problem drinking (Barnes 1979). A study of 2641 community-dwelling non-disabled people aged 65 years and over registered at a general practice in London found that after adjustment for age, sex, income, and educational attainment, living alone was associated with multiple falls, functional impairment, poor diet, smoking status, risk of social isolation, but not hazardous alcohol use (Kharicha et al 2007).

A systematic review of behavioural determinants of healthy aging identified alcohol use as protective (Peel et al 2005). For example, a longitudinal study of non-demented people aged 65 years and older noted that those who drank 5 or more drinks a year (alcohol content of drink not defined) and without alcohol-related problems had improvements over the four year follow-up period for activities of daily living, instrumental activities of daily living and performance based physical function compared with those who drank less than five drinks a year or who had alcohol-related problems (Wang et al 2002).

In their systematic review of the health-related effects of alcohol use in older persons, Reid et al (2002) found four studies in which an average weekly consumption of either ≥10 drinks per week (alcohol content of drink varied across countries and not defined), a history of heavy use, or an increasing number of drinks consumed per occasion were associated with greater risk for functional disability when compared with non-drinkers or participants with no history of heavy drinking.

One additional study found that ≥14 drinks per week increased risk for functional disability among men, but not women. Exposure–outcome associations were not demonstrated in six studies. In contrast, two investigations found that increasing alcohol consumption decreased risk for functional disability.

The Alameda county study (Guralnik & Kaplan 1989) which investigated participants aged 65 to 89 years at 19 years follow-up, found that those who consumed between 1-60 drinks per month at baseline (alcohol content of drinks not defined) were three times as likely to show high physical functioning than be dead compared with abstainers, and over twice as likely to show high as opposed to low or moderate functioning for those still alive. Study participants consuming more than 60 drinks per month were more likely to be dead as opposed to be high functioning than the lighter drinkers and more likely to have low or moderate as opposed to high function than the lighter drinkers amongst those still alive, although in both cases, the results did not reach statistical significance.

Lang et al (2007) reported on the results of two similar longitudinal studies that followed up 13,333 individuals aged 65 and older for 4 to 5 years, studying functioning and mortality at follow-up compared with alcohol consumed at baseline - the Health and Retirement Study (HRS) from the US and the English Longitudinal Study of Aging (ELSA).

The alcohol consumption reference category was more than none to one drink per day (alcohol content of drinks not defined). Odds ratios (OR) in the more than one to two drinks per day range were not significantly different from the reference category, for disability outcomes alone or combined with mortality, in any of the analyses, controlling for baseline confounders. In the pooled model (Figure 9), the ORs in subjects drinking more than one to two drinks per day for the outcomes of interest were 0.96 (95% confidence interval (CI) 0.78–1.21) for activity of daily living problems (ADLs), 0.75 (95% CI5 0.56–0.99) for instrumental activity of daily living problems (IADLs), and 0.82 (95% CI50.64, 1.05) for poor cognitive function.
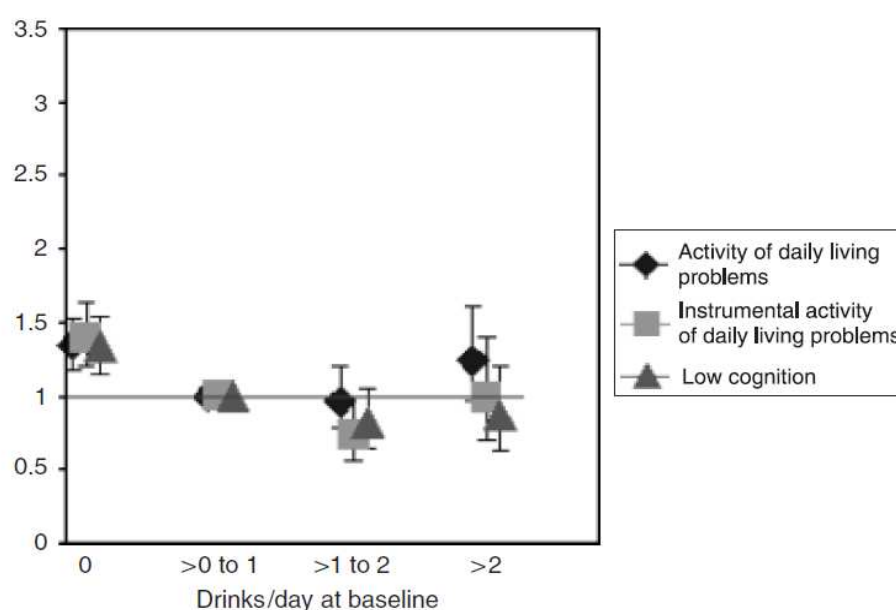
Figure 9 Odds ratios of incident disability in the pooled data in 2002 according to alcohol consumption in 1998/99.

For the HRS data set (Figure 10), combined mortality and functioning outcomes produced ORs in subjects drinking more than one to two drinks per day of 0.93 (95% CI50.68–1.28) for ADL problems or mortality, 1.06 (95% CI50.76–1.49) for IADL problems or mortality, and 1.00 (95% CI50.73–1.37) for decline in cognitive function or mortality.
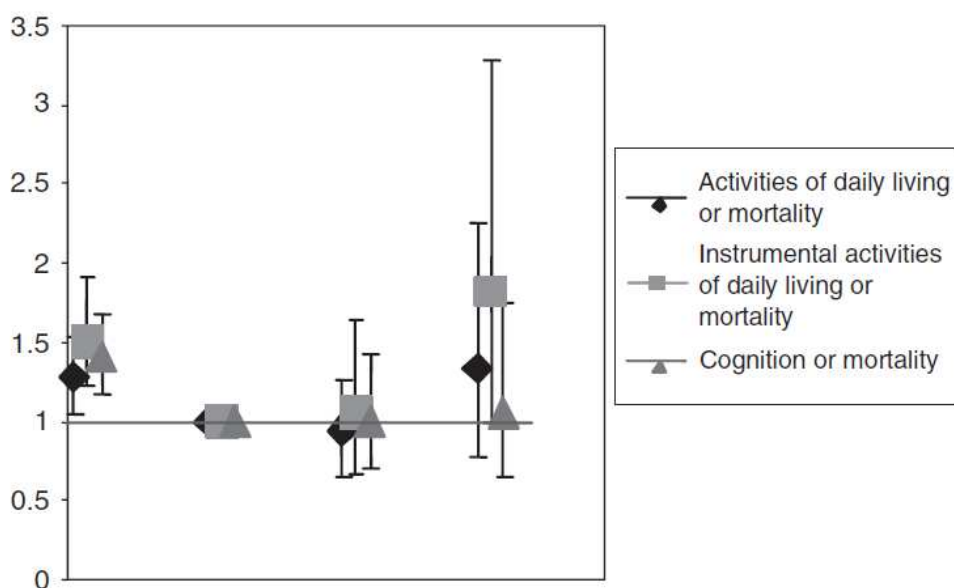
Figure 10 Odds ratios of incident disability plus mortality in HRS 2002 according to alcohol consumption in 1995.

In the ELSA models, the corresponding ORs were 0.94 (95% CI50.69–1.27) for ADLs, 0.72 (95% CI50.49–1.05) for IADLs, and 0.93 (95% CI50.63–1.37) for poor cognitive function, Figure 11.
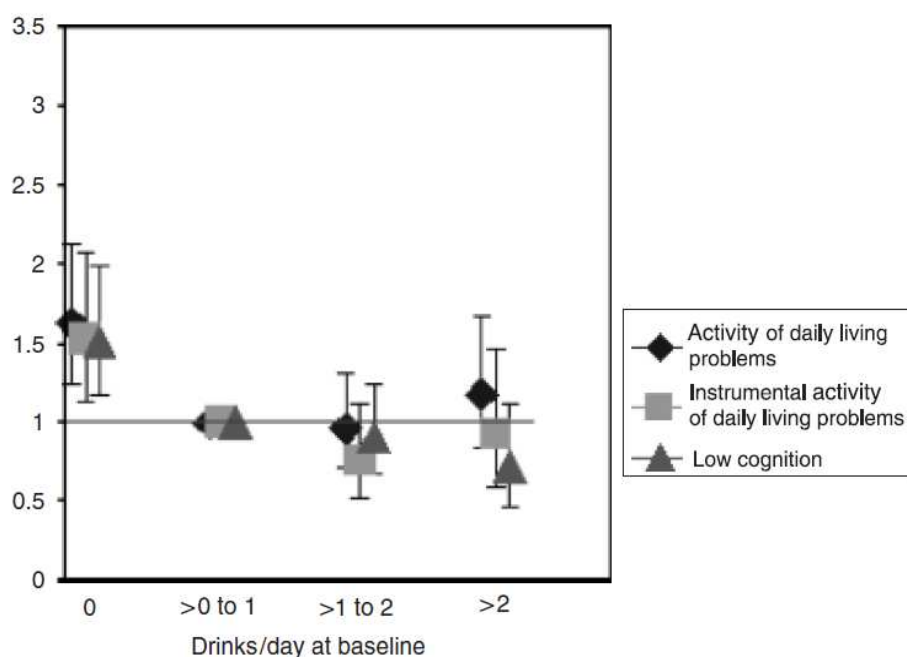
Figure 11 Odds ratios of incident disability in ELSA 2002 according to alcohol consumption in 1998/99.

Modelling of risks separately for men and women produced similar estimates but with limited power, and the risks of disability at various levels of alcohol consumption were similar in men and women.

The methodological problem with many of the studies that relate alcohol consumption to measures of well-being, or its converse, for example, functional disability, is whether or not all potential confounders have been measured and controlled.   And, this does not seem to be the case.

The fact that non-drinkers tend to show poorer outcomes compared with the lighter drinkers could be due to the sick-quitter effect (that is people who are ill have stopped drinking because of their illness) or simply reflect the fact that lighter drinkers are wealthier, healthier and better socially integrated than non-drinkers or heavy drinkers. For example, in the UK based MRC Trial of the Assessment and Management of Older People in the community, the odds ratio of being a moderate drinker (less than 168g alcohol per week for men and less than 112g alcohol per week for women) as opposed to being a non-drinker decreased linearly with increasing deprivation.

Thus, whilst it might be observed that, compared with non-drinkers, light older drinkers (up to two drinks a day) experience better well-being, whether or not, or the extent that this is due to alcohol or to potential confounders is not known.

7. ALCOHOL AND HEALTH

Chapter summary Alcohol increases the risk of cancers, neuropsychiatric conditions, gastrointestinal conditions, infectious diseases and injuries in a dose-dependent manner with no level of consumption risk free. For some cardiovascular conditions (for example ischaemic heart disease and ischaemic stroke), alcohol has a biform relationship with low doses decreasing the risk and high doses increasing the risk, whereas for other cardiovascular conditions (for example, hypertension and haemorrhagic stroke), alcohol increases the risk on a dose dependent manner. Amongst older people, there are mixed findings for many conditions. Some studies find that alcohol increases the risk of low bone mineral destiny, falls and fractures, whereas others do not. There is some evidence that alcohol reduces the risk of dementia and Alzheimer's' disease, but not vascular dementia or cognitive decline. Also, amongst older people, alcohol appears to reduce the risk of coronary heart disease (although the size of the protective effect may be overestimated), as well as reducing the risk of lower extremity arterial disease. Alcohol appears to reduce the risk of type 2 diabetes, and increase the risk of macular degeneration. Although alcohol theoretically interacts with a range of prescribed medicines, there is little evidence to demonstrate that this is a real experienced significant risk. Compared with non-drinkers, the use of alcohol by older people appears to reduce the risk of death over five to ten year follow-up periods, although the extent to which this is due factors other than alcohol itself is not known.

For the adult population as a whole, both the volume of lifetime alcohol use and a combination of frequency of drinking and amount drunk per occasion increase the risk of alcohol-related harm, largely in a dose-dependent manner (World Health Organization 2009).

Alcohol is an intoxicant affecting a wide range of structures and processes in the central nervous system which, interacting with personality characteristics, associated behaviour and sociocultural expectations, are causal factors for intentional and unintentional injuries including interpersonal violence, suicide, homicide, and drink-driving fatalities.

Alcohol is neurotoxic to the brain leading, in middle age, to reduced brain volume. Alcohol is a dependence-producing drug, similar to other substances under international control, through its reinforcing properties and neuroadaptation in the brain. It is an immunosuppressant, increasing the risk of communicable diseases, including pneumonia and tuberculosis. Alcoholic beverages are classified as a carcinogen by the International Agency for Research on Cancer, increasing the risk of cancers of the oral cavity and pharynx, oesophagus, stomach, colon, rectum and breast in a linear dose–response relationship. Acetaldehyde, which occurs in alcoholic beverages as well as being produced in ethanol metabolism, is a potential pathway for cancer risk, with a global average of lifetime cancer risk from alcoholic beverages of 7.6 in 10 000. Alcohol has a bi-form relationship with coronary heart disease. In low and apparently regular doses (as little as 10g every other day), alcohol appears to be cardio-protective, but at high doses, particularly when consumed in an irregular fashion, it is cardio-toxic. It should be noted that considerable concern remains about the extent to which the observed cardio-protection is due to systematic definition errors, drinking patterns and genetic factors, and the extent to which the size of the protective effect is overestimated.

7.1 Injuries

A systematic review of risk factors for low bone mineral density (BMD) in healthy men aged 50 years or older, found fifteen studies (five longitudinal, ten cross-sectional) that assessed BMD and moderate alcohol consumption, not defined (Papaioannou et al 2009).

There was inconsistent evidence from the cross-sectional studies: five studies found a positive association between moderate alcohol consumption and BMD at the hip and/or lumbar spine, while five others did not find an independent association at either BMD site. Moderate alcohol intake was not predictive of the rate of bone loss in several longitudinal studies. On the other hand, a cross European study found a positive association between alcohol use and osteoporotic mandibular bone less in middle and older aged women (Nackaerts et al 2009).

Similarly, there are mixed findings between alcohol intake and the risk of fractures, with some studies finding no relationship (Roy et al 2003), and others finding that light drinking protects against the risk of fractures, whilst problems drinking increases the risk of fractures (Cawthon et al 2006).

In their systematic review of the health-related effects of alcohol use in older persons, Reid et al (2002) found 26 studies, four of which found an increased risk for falls or fall injuries associated with exposures ranging from daily use to an average weekly consumption of ≥21 drinks when compared with non-drinkers or individuals consuming ≤1 drink per week (alcohol content of drinks not defined).

Twenty-one studies found no association between increased alcohol use and falls or fall injuries. In contrast, one study found that participants who reported daily use of alcohol had decreased risk for falls compared with non-drinkers.

As might be expected, older drivers with a diagnosis of alcohol dependence have a higher relative risk of a motor vehicle accident than drivers without such a diagnosis (Marshall 2008).

Some studies (e.g. Sorock et al 2006) have suggested that drinkers have an increased risk of death from a motor vehicle accident than non-drinkers, but such studies often suffer for failing to take into account the amount of driving (it may be that drinkers drive more than non-drinkers and are thus more likely to have an accident).

Data from Great Britain show that drink drive accidents amongst drivers aged 60 years or over are a tiny proportion (4%) of all accidents even accounting for distance driven (Department of Transport 2009), Table 4.

Table 4 Car drivers in reported drink drive road injury accidents: accidents per licence holder and per mile driven, GB 1997 and 2007.

Number

	Car driver drink drive accidents		Drink drive accidents per 100 thousand licence holders		Drink drive accidents per 100 million miles driven	
	1997	2007	1997 [1]	2007	1997 [1]	2007
Under 17	70	40	..	..	..	..
17–19 [2]	980	1,000	66	61	22	22
20–24	2,010	1,920	70	62	13	12
25–29	1,670	1,340	44	42	6	7
30–34	1,320	920	32	28	4	4
35–39	1,020	880	28	23	4	3
40–49	1,270	1,210	20	16	2	2
50–59	640	600	12	10	2	1
60 or over	350	330	6	4	1	1
All ages [3]	9,440	8,340	28	22	4	3

Sources: National Travel Survey and STATS19

1 Based on NTS 1996–1998 average
2 Figures based on a small NTS sample.
3 Includes age not known.

7.2 Dementia and cognitive decline

A systematic review of alcohol, dementia and cognitive decline in the elderly identified 26 studies (Peters et al 2008). Fifteen papers (14 studies) found one or more statistically significant association with alcohol intake; three studies found an increased risk for either vascular dementia (VaD), Alzheimer's disease (AD) (when place of residence only was controlled for), dementia as a whole or poorer performance on a visual reproduction test. The remaining 11 studies were positive, with one finding that reduced cognitive function was associated with abstinence before age 60. The reported results from all included studies as relative risks, odds ratios or hazard ratios were collated for meta-analyses in accordance with their outcome: dementia, AD, VaD and cognitive decline respectively. The combined risk ratios for each of the four outcomes were dementia 0.63 (95% CI 0.53–0.75), AD 0.57 (95% CI 0.44–0.74), VaD 0.82 (95% CI 0.50–1.35) and cognitive decline 0.89 (95% CI 0.67–1.17), respectively with alcohol intake.

To summarise, alcohol consumption appears to be protective for dementia and AD, but there is no evidence of a protective effect against VaD or impaired cognitive function. With regard to cognitive function, results for optimal consumption were mixed, either above/below or equal to one drink a month or day (in subjects with cardiovascular disease or diabetes, one–two drinks per week). For AD, optimal amounts were a weekly consumption of wine, one–six or more than two drinks per week, or more than three drinks/250–500 ml per day (usually wine), or where studied by gender, one–three per day in males. For dementia, benefit was shown for more than one drink per day, weekly or monthly wine consumption, 250–500 ml (usually wine) or more than three drinks per day and from 1–28 units per week. For VaD, one–three drinks per day in males were beneficial.

In summary, there was no close agreement among studies as to the optimal level of consumption and although most studies reported that light to moderate consumption was best with regard to incident decline or dementia the classification of light to moderate drinking varied very widely.
With regard to the alcohol type, 12 studies looked at beers, wines and spirits separately although for two, only wine was consumed in any quantity by the study population. One study reported examining red and white wine separately in their questions but did not report in detail regarding this. In four papers (two from the same population but with a different follow-up), wine intake was found to significantly reduce the risk.

In their systematic review of 49 studies, Panza et al (2009) concluded that light to moderate drinking is not harmful to cognition and dementia, although it was not possible to define a specific beneficial level of intake. In their systematic review of the health-related effects of alcohol use in older persons, Reid et al (2002) found ten studies with an increased risk of cognitive impairment associated with either a history of alcohol abuse, heavy drinking or an average weekly consumption of ≥10 drinks when compared with individuals without histories of alcohol abuse or heavy drinking or non-drinkers (alcohol content of drinks not defined). In two of the studies, the results varied according to the methods used to measure alcohol exposure. In one investigation, an increased risk for poorer cognitive function was found among participants who screened positive on a standard problem-drinking questionnaire as compared with screen-negative subjects, but was not evident when subjects' average daily intake of alcohol was analyzed. Similarly, one study demonstrated that increased risk for cognitive impairment was present among participants with histories of alcohol dependence, but the effect was not seen using subjects' average weekly alcohol exposures. Twenty-one studies found no relationship between cognitive impairment and alcohol exposures that ranged from any use to a history of heavy drinking to an average weekly consumption of ≥24 drinks. Finally, one study reported that consuming 14–35 drinks per week (as compared with non-drinkers) was associated with improved cognitive function in older women but not men. There is some evidence from cross-sectional (Weyerer et al 2008) and longitudinal (Bots et al 2008) studies that moderate

consumption, as opposed to abstention and heavier drinking decreases the risk of depression in older people. This is likely to be due to the relationship between drinking and a more active and sociable lifestyle.

7.3 Cardiovascular disease and other conditions

Epidemiologic data from more than 100 studies across 25 countries consistently demonstrate a U- or J-shaped association between alcohol consumption and coronary heart disease (Goldberg et al 2001), also amongst older adults (Mukamal et al 2006; Goldberg et al 1994). The U- or J-shaped curve in Figure 12 depicts the risk reduction of early death among aging drinkers (Danish women and men aged >50 years), relative to the risk in abstainers and in those who consume more than an average of four drinks per day (Gronbaek et al 1998).
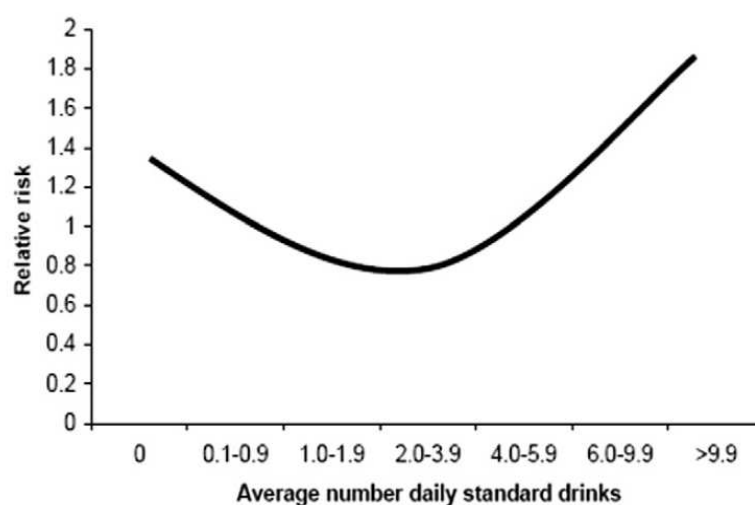

Figure 12 Alcohol consumption and relative risk (RR) of mortality in Danish women and men older than age 50 years. RR is the ratio comparing the probability of mortality/disease in drinkers with the probability of that outcome in non-drinkers (RR<1 indicates decreased risk, RR=1 indicates no difference in risk, and RR>1 indicates increased risk).

There have been many methodological critiques of the relationship between alcohol consumption and ischaemic heart diseases (for example Fillmore et al 2006). In general, though, it does seem that there is a beneficial effect, although the size of the effect may have been overestimated. It also needs to be remembered that relative risks for risk factors for coronary heart disease converge towards 1.0 with increasing age (Abbott *et al.* 1997), including alcohol (Abrams *et al.* 1995). The Honolulu heart study found that comparing drinkers with non-drinkers, the relative risk converged towards 1.0, with increasing age, such that there was no evidence for a protective effect in men aged 75 years or older (Abbott *et al.* 2002). Further, in this age group, there is an increased over-recording of coronary heart disease on death certificates. The Framingham Heart Study found that over-recording of heart disease on death certificates increased exponentially with age, such that at an age of death of 85 years or more, over-recording was estimated to be doubled (Lloyd-Jones *et al.* 1998).

Few studies of the relation of alcohol intake to lower-extremity arterial disease (LEAD) have included clinical events and objective measurements repeated longitudinally. As part of the Cardiovascular Health Study, a study of older adults from four US communities, 5,635 participants reported their use of beer, wine, and spirits yearly (Mukamal et al 2008). Incident LEAD was identified by hospitalization surveillance. Technicians measured ankle-brachial index 6 years apart in 2,298 participants. A total of 172 cases of LEAD were documented during a mean of 7.5 years of follow-up between 1989 and

1999. Compared with abstention, the multivariable-adjusted hazard ratios were 1.10 (95% confidence interval (CI): 0.71, 1.71) for <1 alcoholic drink per week, 0.56 (95% CI: 0.33, 0.95) for 1–13 drinks per week, and 1.02 (95% CI: 0.53, 1.97) for ≥14 drinks per week (p for quadratic trend ¼ 0.04). These relations were consistent within strata of sex, age, and apolipoprotein E genotype, and neither lipids nor inflammatory markers appeared to be important intermediates. Change in ankle-brachial index showed a similar relation (p for quadratic trend ¼ 0.01). Thus, an alcohol consumption of 1–13 drinks per week in older adults may be associated with lower risk of LEAD, but heavier drinking is not associated with lower risk.

The literature suggests that alcohol has a complex non-linear relationship with ischaemic stroke, with low or moderate intakes associated with reduced and high intake with increased risk; in contrast haemorrhagic stroke has a linear association with increasing alcohol intake, some studies of older people suggest a linear dose response relationship between alcohol consumption and risk of total and ischaemic stroke (Stott et al 2008).

Alcohol is shown to reduce the risk of diabetes in both older men and women at least up to a consumption of 20-30g alcohol per day (Beulens et al 2005; Djoussé et al 2007).

Individuals with the metabolic syndrome, a condition characterized by disturbed glucose and insulin metabolism, dyslipidemia, hypertension, and central obesity, are at greater risk of developing type 2 diabetes mellitus and cardiovascular disease, but there is evidence that alcohol intake is not related to the risk of metabolic syndrome in older people (Wannamethee et al 2006; Buja et al 2010).

There is some evidence that alcohol increases the risk of age-related macular degeneration (Coleman et al 2010).

7.4 Cancers

Alcoholic beverages are classified as a carcinogen by the International Agency for Research on Cancer, increasing the risk of cancers of the oral cavity and pharynx, oesophagus, stomach, colon, rectum and breast in a linear dose–response relationship (Baan et al 2007). Acetaldehyde, which occurs in alcoholic beverages as well as being produced in ethanol metabolism, is a potential pathway for cancer risk, with a global average of lifetime cancer risk from alcoholic beverages of 7.6 in 10 000 (Lachenmeier et al 2009).The amount of drinking 15-20 years ago reflects the formation of cancer. Thus, if people quit drinking, their relative risks compared to lifetime abstainers decrease slowly, and only after 15-20 years is a level similar to lifetime abstainers reached (Rehm et al 2007).

For countries like Italy or France, which in 2002 had high alcohol-attributable cancer proportions within all alcohol-attributable deaths (both > 30%), this also reflected the success of their alcohol policies (Rehm et al 2010b). As consumption and total alcohol-attributable diseases and injuries have been going down over the past 30 years, the relative weight of alcohol-attributable cancers went up.

7.5 Interaction with medications

Older adults who drink alcohol and who take medications can be at risk for a variety of adverse consequences depending on the amount of alcohol and the type of medications consumed (Moore et al 2007).

Types of risks include increased BALs, increased and/or decreased drug metabolism, disulfiramlike reactions, exacerbation of therapeutic effects and adverse effects of medications, and interference with the effectiveness of medications. These risks may cause disorders such as liver and

gastrointestinal disease, sedation, dizziness, problems with coordination leading to falls and injuries, gouty flares, therapeutic failure or overdose, hypotension, hypertension, insomnia, worsening of depression, and poor control of seizure disorders and diabetes mellitus.

A number of studies have investigated the prevalence of alcohol/ medication interactions in older adults. Using data from 83,321 participants aged 65 to 106 years in the Pennsylvania PACE program (a state-funded program providing prescription benefits to older persons with low to moderate incomes), the researchers found that 19% of those consuming alcohol (20.3% of the sample) took medications that could have negative interactions with alcohol (Pringle et al 2005).

In another study among 311 drinkers (mean [SD] age, 83 [6] years) in 3 retirement communities in suburban Milwaukee, Wisconsin, 38% used drugs that could have negative interactions with alcohol (Adams 1995).
 A third study among a sample of 667 community-dwelling older adults (mean [SD] age, 74 [7] years) living in northeast New York estimated that 25% of them drank alcohol and took medication that could negatively interact with alcohol (Forster et al 1993).
A fourth study, using data from the Italian Group of Pharmacoepidemiology in the Elderly study, found that the prevalence of adverse drug reactions among 22,778 older hospitalized persons (mean [SD] age, 70 [16] years) was 3.7% among abstainers and 4.1% among those who drank <40 g of alcohol per day (Onder et al 2002). After adjusting for potential confounders, moderate drinkers were 24% more likely to experience an adverse drug reaction compared with abstainers.
 A fifth study among 166 older adults (mean age, 73 years; age range, 60–93 years) in primary care settings in Los Angeles, California, considered at-risk drinkers and found that more than 70% of them were believed to be susceptible to problems because of the amount of alcohol they drank combined with the medications they took (Moore et al 2002).

7.6 Overall mortality

In their systematic review of the health-related effects of alcohol use in older persons, Reid et al (2002) found four studies which reported that increased alcohol use was associated with a greater risk for all-cause mortality. As compared with nondrinking men, older men who reported a history of heavy drinking were at an increased risk for all-cause mortality. Another investigation found that an average weekly consumption of ≥14 drinks (relative to non-drinkers) increased risk for death among older men but not women (alcohol content of drinks not defined). This level of exposure (≥14 drinks per week) was also associated with an increased risk for all-cause mortality when compared with non-drinkers in one of three population-based cohorts. Finally, consumption of ≥29 drinks per week as opposed to no alcohol use was associated with an increased risk for mortality among older male physicians.

Thirteen studies found no association between increased alcohol use and all-cause mortality. In contrast, four studies demonstrated a protective effect from increased alcohol consumption. A decreased risk for all-cause mortality was observed among participants reporting an average weekly consumption of ≥14 drinks in two of three population-based cohorts. Individuals who reported an average weekly consumption of ≥28 drinks per week and were judged to be at high (but not low) cardiovascular risk were found to have a decreased risk for all-cause mortality when compared with non-drinkers. One study demonstrated that an average weekly consumption of ≥28 drinks was associated with a decreased risk for mortality among men when compared with non-drinkers. In this investigation, the highest exposure category for older women (15–28 drinks per week) was not related to improved survival. Finally, participants who reported a history of moderate or heavy alcohol use had improved survival when compared with all other categories of exposure in one cohort study.

Data from longitudinal studies in six European countries found that any alcohol use was protective of the risk of death amongst older people followed up for five years (hazard ratio, 0.81(95% CI, 0.71-0.93) (Noale et al 2005). Similar findings were apparent for a ten year follow-up in another study of eleven European countries (Hazard ratio, 0.78, 95%CI, 0.67-0.91) (Knoops et al 2004).

8. ALCOHOL POLICY AND OLDER PEOPLE

Chapter summary Although there is a very strong evidence base for the impact of a range of alcohol policies, none of these have been specially evaluated with respect to their differential impact on older people. Of the known effective alcohol policies summarized, the policy option that is likely to have the biggest impact on older people is price. Increasing the price of alcohol relative to other goods and disposable income reduces alcohol consumption, heavy drinking, alcohol dependence and the chronic conditions related to the use of alcohol, such as liver cirrhosis. Prevention and education programmes, which have not been specifically evaluated amongst older people, in general show no impact on alcohol-related behaviour. Comprehensive community based programmes can reduce harmful patterns of drinking, but have not been evaluated for their specific impact on older people. Work place based programmes have some limited impact in reducing alcohol-related harm and could be implemented as pre-retirement measures.

Although there are many reviews of the impact of alcohol policy (Babor et al 2010), none have specifically considered the impact of alcohol policy on older as opposed to younger people. Of the effective alcohol policies summarized in Table 5, from a recent WHO review, the policy option that is likely to have the biggest impact on older people is price (Anderson 2009). Restricting the availability of alcohol, through reductions in outlet density or days and hours of sale also reduce harm, although this has been most evaluated with its impact on alcohol-related violence and injuries.

Table 5 Summary of the evidence of the effectiveness of alcohol policies

Degree of evidence	Evidence of action that reduces alcohol-related harm	Evidence of action that does not reduce alcohol-related harm
Convincing	Alcohol taxes Government monopolies for retail sale Restrictions on outlet density Restrictions on days and hours of sale Minimum purchase age Lower legal BAC levels for driving Random breath-testing Brief advice programmes Treatment for alcohol use disorders	School-based education and information
Probable	A minimum price per gram of alcohol Restrictions on the volume of commercial communications Enforcement of restrictions of sales to intoxicated and under-age people	Lower taxes to manage cross-border trade Training of alcohol servers Designated driver campaigns Consumer labelling and warning messages Public education campaigns
Limited-suggestive	Suspension of driving licences Alcohol locks Workplace programmes Community-based programmes	Campaigns funded by the alcohol industry

Price of alcoholic beverages

Drinkers respond to changes in the price of alcohol as they do to changes in the prices of other consumer products. When other factors are held constant, such as income and the prices of other goods, a rise in alcohol prices leads to less alcohol consumption and less alcohol-related harm, and

vice versa (Cook 2007). A meta-analysis of 132 studies found a median price elasticity for all beverage types of -0.52 in the short term and -0.82 in the long term, elasticities being lower for beer than for wine or spirits (Gallet 2007). An elasticity of -0.52 means that for every 10% increase in price, consumption would fall by 5.2%. Another meta-analysis of 112 studies found mean price elasticities for beer of -0.46, for wine of -0.69, and for spirits of -0.80 (Wagenaar et al 2009).

Beverage elasticities are generally lower for the preferred beverage (beer, spirits or wine) in a particular market than for the less-preferred beverages, and tend to decrease with higher levels of consumption. Consumers tend to shift to more expensive beverages if relative prices decrease, either within the same beverage category or across beverage categories. If prices are raised, consumers reduce their overall consumption and tend to shift to cheaper beverages, with heavier drinkers tending to buy the cheaper products within their preferred beverage category.

Price increases reduce the harm caused by alcohol, which also indicates that heavier drinking has been reduced (Cook 2007). Cirrhosis mortality is responsive to small changes in price: in the United States, increases in taxes have been shown to lead to an immediate reduction, which doubles over the long run (Cook & Tauchen 1982). More recent estimates found that a 10% increases in tax in the United States was associated with a 32% decrease in the death rate from cirrhosis (Cook 2007).

Consistent with this, studies have reported that increases in the price of alcohol result in a reduction in heavy drinking and alcohol dependence. A study of survey data of 43 000 adults in the United States found a price elasticity for heavier drinking of -1.325 (p=0.027), for physical and other consequences of drinking of -1.895 (p=0.003), and for alcohol dependence of -1.487 (p=0.012) (Farrell et al 2003). Studies in Alaska found statistically significant reductions in the numbers and rates of deaths caused by alcohol-related disease beginning immediately after alcohol tax increases in 1983 and 2002 (Wagenaar et al 2009).

Prevention and education programmes

While the provision of information and education is important to raise awareness and impart knowledge, by themselves information and education do not lead to sustained changes in alcohol-related behaviour (see Anderson 2009). Education can, however, be a tool for awareness and raising support, and an important feature of a broader alcohol strategy. Campaigns and health education messages funded by the alcohol industry seem to have negative effects, serving to advance the interests of both the industry's sales and public relations. Although warning labels have little impact on behaviour, they are important in helping to establish a social understanding that alcohol is a special and hazardous commodity. Most studies of educational approaches have evaluated impact amongst younger people, and the impact of educational approaches amongst older people is not known.

There is some evidence that community-based programmes can have an impact on creating safer drinking and living environments and reducing underage drinking, harmful patterns of drinking and drink-driving accidents, although they can be costly to implement and sustain (See Anderson 2009). Such programmes should include controls on venues for the sale and consumption of alcohol, other regulations reducing access to alcohol, enhanced law enforcement and surveillance, and the development of community organization and coalitions supported by education and information campaigns, media advocacy, counter-advertising and health promotion.
As with educational approaches, most studies of community-based programmes have evaluated impact amongst younger people, and the impact of such approaches amongst older people is not known.

Alcohol use can increase the risk of absenteeism and poor performance at work, and structural factors at work can increase the risk of harmful alcohol use (Anderson 2010). The available evidence suggests that workplace-based interventions have some limited impact in reducing alcohol-related harm, and could thus be implemented as pre-retirement measures.

9. EARLY IDENTIFICATION AND BRIEF INTERVENTIONS AMONGST OLDER PEOPLE

Chapter summary Although there is an extensive evidence base for the impact of early identification and brief intervention programmes in reducing hazardous and harmful alcohol consumption and their sequelae amongst adults, very few studies have particularly investigated older people. However, those studies that have investigated older people suggest identification and screening instruments work just as well for older as opposed to younger adult populations, and that outcomes of brief interventions do not differ between older and middle-aged populations.

A systematic review of the utility of self-report alcohol screening instruments in the elderly identified 18 studies (O'Connell et al 2004). Factors affecting the performance of alcohol screening instruments include the culture, the clinical setting, patient characteristics and the prevalence of alcohol use disorders (AUDs) in the population being studied. Factors affecting the overall usefulness of a screening instrument should also take into account patient acceptability and its ease of use.

The vast majority (72%) of studies reviewed were from the US and results may not be generalizable to other cultures. Furthermore, a large proportion of US studies (39%) have focussed on US veterans (people who have served in the armed forces) populations, a specific patient group with a well-established higher prevalence of AUDs than the general population.

The majority (72%) of studies focussed on community dwelling and outpatient populations. The documented higher rates of AUDs in elderly hospital inpatients and elderly Emergency Department attendees, with higher rates of medical comorbidities and greater associated economic burden, should direct further research to these groups. Elderly people with psychiatric illness are also an understudied group, and carry a high risk of AUDs. While CAGE sensitivity has been shown to be very poor in this group, the AUDIT-5 has had promising results to date. Overall, however, AUDIT-5 utility has been examined in only one study, whereas CAGE utility has been examined in several studies involving over 6000 individuals and yielding a median sensitivity of 66.5% and a median specificity of 89%.

No study focussed on elderly people with cognitive impairment, a particularly vulnerable group where a valid screening instrument is needed.

The MAST and variations of this screening instrument were found to be robust screening instruments in these elderly populations, but less research has focussed on the MAST than the CAGE questionnaire. Furthermore, the MAST questionnaire, and its variations, may take up to 5 minutes to complete, making it more difficult to apply and possibly less patient acceptable than the CAGE.

All screening instruments generally performed well in populations with high prevalence rates of AUDs.

A more recent systematic review of eight studies (Berks & McCormick 2008). When using pen-and-paper alcohol screens in primary care, the selected studies in the 60 years and over age-group gave similar findings to those in the more general adult population.
Using traditional definitions of hazardous and harmful drinking, the AUDIT and AUDIT-C appeared superior screens to the CAGE and various forms of the MAST. From the limited data, the AUDIT-C appeared as good if not better than the AUDIT.
Optimum cut-offs for both these tests were difficult to ascertain from the data, and it is certainly possible that lower cut-offs than eight for the AUDIT and three for the AUDIT-C might be more efficient in the 60 and over age-group. In comparison, one of the few pieces of research on screening

elderly psychiatric patients suggested that both the AUDIT and a cut-down version, the AUDIT-5, were equally good at detecting hazardous and harmful drinking, and both were superior to the CAGE for this indication.

A systematic review of 27 systematic reviews provided a considerable body of evidence supportive of the effectiveness of brief interventions for hazardous and harmful alcohol consumption in reducing alcohol consumption, mortality, morbidity, alcohol-related injuries, alcohol-related social consequences, healthcare resource use and laboratory indicators of hazardous and harmful alcohol consumption (NICE 2009). Six systematic reviews demonstrated that interventions delivered in primary care are effective in reducing alcohol-related negative outcomes. Three systematic reviews specifically focusing on the use of brief interventions in emergency care found limited evidence for the effectiveness of brief interventions for hazardous and harmful alcohol consumption in emergency care settings. A further review presented inconclusive evidence of the effectiveness of brief interventions in inpatient and outpatient settings. A systematic review of brief interventions for alcohol misuse in the workplace presented limited and inconclusive findings for the effectiveness of interventions in this setting. Brief interventions are effective in reducing alcohol consumption in both men and women.

The majority of included primary evidence was drawn from adult populations with an age range of 12 to 70 years. Therefore, brief interventions for adults have been shown to be effective amongst adult populations. In the identified systematic reviews, no studies particularly looked at brief interventions amongst older people per se. However, the limited literature suggests no differing outcomes between older and middle-aged populations (Copeland et al 2003; Gordon et al 2003; Lee et al 2009).

A randomized controlled trial of health risk appraisal in British general practice promoting health in older people included an intervention that led to computer-generated individualised written feedback to participants and general practitioners, integrated into practice information-technology systems (Harari et al 2008). All primary care staff received training in preventative health in older people. The main outcome measures were self-reported health behaviour and preventative care uptake at 1-year follow-up. Intervention group respondents reported slightly higher pneumococcal vaccination uptake and equivocal improvement in physical activity levels compared with controls. No significant differences were observed for any other categories of health behaviour, including no or moderate alcohol use, or preventative care measures at 1-year follow-up.

10. Overall Conclusions

Chapter summary Compared with younger people, there is a paucity of data describing alcohol use, alcohol-related harm and effective policy and preventive approaches amongst older people. Nevertheless, compared with their younger counterparts, older people do not suffer from disproportionally higher levels of harm: in general, they drink less, drink less hazardously, and suffer less harm. Albeit at a lower rate than younger adults, older people do run into alcohol-related harm: thus, older people should be included as a target of existing alcohol policy responses, including the delivery of brief interventions and treatments for hazardous and harmful alcohol use. On the other hand, average life expectancy is rising and the number of older Europeans will increase enormously over the coming years - in the next twenty years alone, people aged 65 years and older will increase in number from the current 87 million to 123 million, and people over 80 years of age will increase from the current 23 million to 36 million. These people are the present middle age, who have high levels of both frequency and volume of drinking. The middle aged are also the group of people with the highest levels of wholly attributable alcohol related hospitalization and death. To prevent burgeoning alcohol-related problems amongst older people over the coming twenty years, it is important to target policy on the present middle age, which will also have an immediate impact in reducing alcohol-related hospitalizations and deaths. Further, many alcohol-related conditions, and in particular cancers, have a long latency period in terms of both cause and reduction in risk. Thus, if one wishes to prevent an increase in alcohol-related cancers in older people, action should also be taken on the middle-aged. Form a policy perspective, actions that reduce the consumption of the middle aged, will not only prevent problems for a future cohort of older people but, at the same time, reduce patterns of hazardous and harmful alcohol consumption amongst the existing cohort of older people.

10.1 Older people are not so different

Compared with younger people, there is a paucity of data describing alcohol use, alcohol-related harm and effective policy and preventive approaches amongst older people. However, from this review, compared with their younger counterparts, older people do not suffer from disproportionally higher levels of harm. In general, they drink less than their younger counterparts,, drink less hazardously, and suffer less harm. Within their drinking volumes, their drinking patterns, determinants and associations appear no different from the younger adult population.

What is clear though is that, when compared with younger people, there is a dearth of literature on alcohol and older people, and often poor sampling of older people and less reporting about the drinking habits of older people in national surveys. It is thus clear that more research and better data on alcohol and older people are needed.

Although the pharmacokinetics of alcohol amongst older people might suggest that at any given alcohol intake, higher blood alcohol concentrations are reached, few data are available to state whether or not there are any substantive or special factors with regard to alcohol-related health outcomes.

In their systematic review of the health-related effects of alcohol use in older persons, Reid et al (2002) noted that 17 (20%) of the 84 studies demonstrated harm associated with increased alcohol exposures, 59 (70%) found no association between increased alcohol use and any of the selected outcomes, and eight (10%) reported benefit from greater alcohol use, Figure 13.
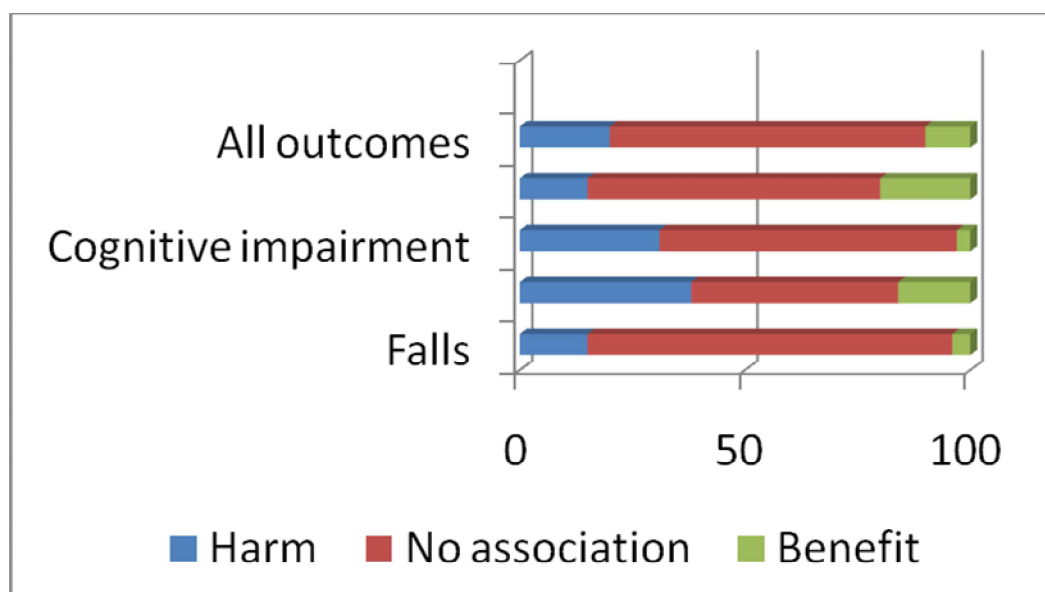
Figure 13 Distribution of outcomes (%) for studied categories. Source: Reid et al 2002.

Indeed, a number of studies suggest that older people who do drink have a better quality of life and less risk of dying than those who do not drink. The level of alcohol consumption that shows benefit is uncertain, but Kirchner et al (2007) found similar health parameters (eg, perceived health, depressive/ anxiety symptoms, and social support) between those who drank one to seven drinks weekly and those who consumed eight to 14 drinks weekly.

Indeed, most studies show that drinkers of alcohol have better life outcomes and less risk of dying than non-drinkers. For those who do drink, there is certainly no evidence that those who consume 20g alcohol per day are any worse or any better off than those who drink less. Of course, this may just mean that those who are healthier, wealthier and better socially adjusted are more likely to be light drinkers than abstainers or heavy drinkers.

10.2 Alcohol policy, interventions and older people

The specific impact of alcohol policy on older people has not been studied. However, there is no reason other than to assume that those policies that have immediate effect in reducing the consumption and burden of the middle aged, would not also work equally effectively for older people. Further, although there is scarce evidence, it seems that older people respond equally well to screening instruments and brief interventions as do younger adults. Thus, for older people who are at risk of or who are currently experiencing negative alcohol-related outcomes, the implementation of existing evidence based alcohol policy should be business as usual.

10.3 Focus on the middle aged

The GENACIS study convincingly demonstrated that, during the early 2000s, the middle aged (those aged 50-65 years) drank frequently and with high volume and that over the early adult age, these parameters of drinking did not decrease (Wislnack et al 2009).
Most alcohol-related deaths occur amongst the middle aged, and it is in this age group that, where a country's overall alcohol consumption is increasing, the steepest increases in alcohol-related deaths occur.

Data from Russia also show that, although alcohol-related deaths amongst older people (aged 55-74 years) were very high and responsive to socio-economic changes, a much higher proportion of deaths in the 1990s amongst those aged 15-54 years (59% of men and 33% of women) were due to alcohol than amongst those aged 55-74 years (22% of men and 12% of women) (Zaridze et al 2009), Figure 14.
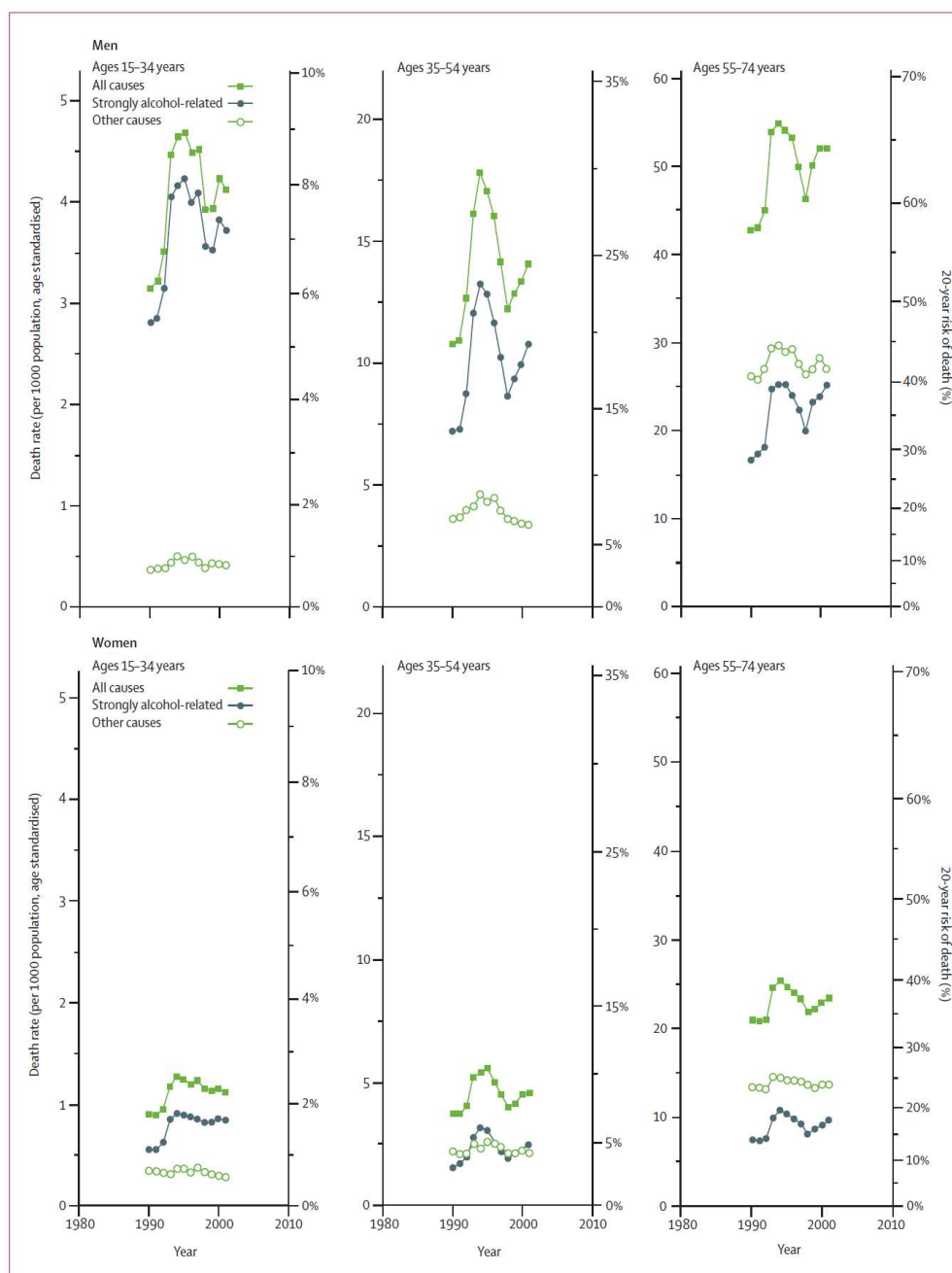

Figure 14 Mortality from all causes, from causes strongly related to alcohol, and from other causes in the Altay and Tomsk regions of Russia, 1990–2001. Source: Zaridze et al 2009.

This suggests that alcohol policy should target the middle age, since policy can have an immediate impact in reducing alcohol-related deaths amongst the segment of the population in which they are most occurring (Anderson 2009). Such policy is also likely to reduce the alcohol consumption of the middle age, thus preventing alcohol related problems amongst the future older population.

Further, there is some evidence that heavier drinking cohorts during times of less comprehensive and stricter alcohol policies continue their heavier drinking patterns as they age (Rosen & Haglund 2006).

It is becoming increasingly recognized that it is lifetime exposure to alcohol that is of importance in increasing risk of negative health outcomes. This has been well demonstrated in the relationship between lifetime exposure and reductions in brain gray matter volume (Taki et al 2006), and increases in female breast cancer (Collaborative group on hormonal factors in breast cancer 2002) and overall death (Rehm et al 2008).

Figure 15, for example, demonstrates that the lifetime risk of an alcohol-related death increases linearly with increasing alcohol consumption, even at very low doses.
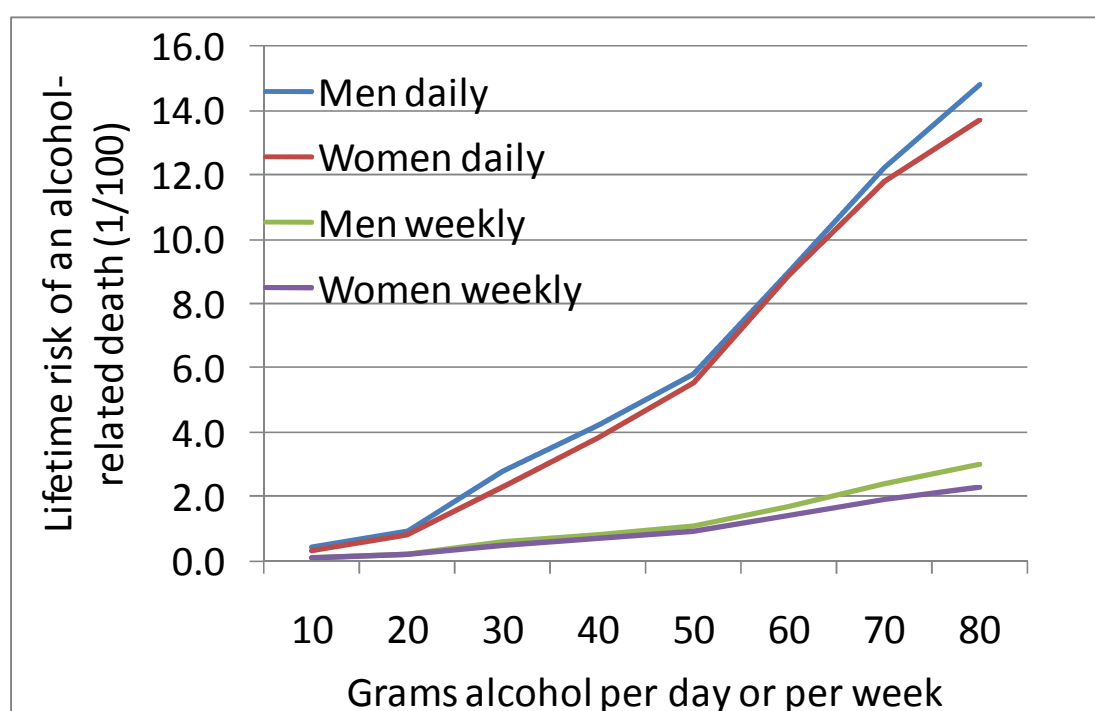

Figure 15 Lifetime attributable risk of dying from alcohol related to gram alcohol/day for men and women living in Australia. Source: Australian Guidelines 2009.

Given the importance of lifetime exposure, the maintenance of high frequency and high volume drinking of the middle age referred to above is likely to lead to upward pressure on the ill-health of the growing number of older people. For this reason also, if a country wanted to diminish the risk of alcohol-related ill-health continuing into older age, the target of alcohol policy should be the middle aged (Anderson 2009).

Fortunately, there are policy options that reduce the amount of alcohol consumed, with immediate effect (Anderson et al 2009; Anderson 2009; Babor et al 2010).

Clearly, any reduction in the dose of alcohol consumed, as well as in the frequency of drinking occasions and the amount drunk on a single occasion will have an immediate impact in reducing alcohol-related injuries and those cardiovascular events related to heavy episodic drinking (Rehm et al 2010b).

In fact, this was illustrated by the rapid decreases in injury and cardiovascular deaths during the 1980s Gorbachev campaign in the former Soviet Union (Zaridze et al 2009). Even some chronic

conditions, such as mortality from liver cirrhosis, also demonstrate an immediacy of impact from reductions in consumption. In France, rapid reductions in cirrhosis mortality occurred following wine shortages during the Second World War (Coppéré et al 1986). Other conditions, such as alcohol-related cancers will have longer time spans before interventions could show effects, with some reductions in risk occurring soon after changes in consumption, but with the full extent of reductions in risk not occurring until some 15 -20 years after reductions of alcohol use (Rehm et al 2007).

Modelling evidence in the United Kingdom has demonstrated that increasing taxes on alcohol and introducing a minimum price per gram of alcohol have immediate impact in reducing alcohol-related harm and mortality, with incremental gains achieved over a ten year time span (Brennan et al 2008).

In addition, primary health care based screening and advice based programmes are effective amongst the middle aged, with evidence of immediate impact in reducing alcohol consumption and related harm, as well as alcohol-related mortality (NICE 2007).

However, over the very long term, it remains important to continue with policies that delay the age of drinking onset, since an early age of drinking onset is associated with the development of alcohol dependence in later life (Grant & Dawson 1997). Individuals who grew up in US states where alcohol could be purchased before age 21 years were 30% more likely to develop alcohol use disorders into their 40s and 50s, than those who grew up in states where the legal drinking age was 21 (Norberg et al 2009). For the young, policy should focus on managing economic and physical availability (Babor et al 2010), rather than school-based education (Jones et al 2007) and prevention programmes (Spoth et al 2008), for which the evidence suggests little impact in reducing alcohol-related harm.

RECOMMENDATIONS

For existing older people

1. More and better data and reporting, standardized across Europe, is needed on alcohol use, consumption patterns and alcohol-related consequences amongst older people, including those aged 65 years plus and those aged 80 years plus, including also measuring lower levels of alcohol consumption and potential alcohol related consequences and health outcomes. This should include both longitudinal surveys and the incorporation of alcohol-related questions in studies of aging.

2. More and better research is needed on the absolute risk of alcohol over the life course and to older people including those aged 65 years plus and those aged 80 years plus.

3. More and better research is needed of the differential impact of existing alcohol policy measures, preventive programmes and health care based interventions on older people including those aged 65 years plus and those aged 80 years plus.

4. Although there is no specific evidence, there is no reason to think other than that existing alcohol policy measures, particularly those that impact on economic and physical availability, will also work amongst older people and should thus continue to be implemented.

5. Although there is limited evidence, screening and BI programmes for hazardous and harmful alcohol consumption seem to work just as well for older as opposed to younger people and should be implemented also for the older populations, supported by enhanced training for primary care providers.

For future older people

6. To reduce the alcohol-related burden in older people over the next 20 and coming years, alcohol policies and programmes should target and be intensively implemented toward the existing middle aged to get them urgently to drink less.

7. Given that alcohol-related harm is likely to increase amongst older people over the coming years, alcohol policies and programmes should become integral parts of strategies to promote healthy ageing.

References

Anderson P., Baumberg B. (2006) Alcohol in Europe – A public health perspective. Report to the European Commission. London: Institute of Alcohol Studies; 2006 June.

Anderson, P. (2009a). Evidence for the effectiveness and cost-effectiveness of interventions to reduce alcohol-related harm. Copenhagen, World Health Organization 2009.

Anderson, P. (2009b). Time for the middle aged to own up to the problem. Addiction 2009 104 1501-1502.

Anderson, P. (2010). Alcohol and the workplace. A report on the impact of work place policies and programmes to reduce the harm done by alcohol to the economy. http://www.faseproject.eu/content/bestanden/literature-study-alcohol-and-the-workplace.pdf.

Anderson, P., Chisholm, D., Fuhr, D.C. Effectiveness and cost-effectiveness of policies and programmes to reduce the harm caused by alcohol. Lancet. 2009 373 2234-2246.

Australian guidelines to reduce health risks from drinking alcohol. Canberra, National Health and Medical Research Council, 2009 (http://www.nhmrc.gov.au, accessed 4 July 2009).

Baan R, Straif K, Grosse Y, Secretan B, El Ghissassi F, Bouvard V, Alteri A, Cogliano V, on behalf of the WHO international agency for research on cancer monograph working group: Carcinogenicity of alcoholic beverages. *Lancet Oncol* 2007; 8: 292-3.

Babor T et al. Alcohol: No ordinary commodity. Research and public policy. 2nd edition. Oxford and London: Oxford University Press; 2010.

Barnes GM. Alcohol use among older persons: Wndings from a Western New York State general population survey. J Am Geriatr Soc 1979; 27: 244–50.

Berks J, McCormick R. Screening for alcohol misuse in elderly primary care patients: a systematic literature review. Int Psychogeriatr. 2008 Dec;20(6):1090-103. Epub 2008 Jun 9.

Beulens JW, Stolk RP, van der Schouw YT, Grobbee DE, Hendriks HF, Bots ML. Alcohol consumption and risk of type 2 diabetes among older women. Diabetes Care. 2005 Dec;28(12):2933-8.

Bots S, Tijhuis M, Giampaoli S, Kromhout D, Nissinen A. Lifestyle- and diet-related factors in late-life depression--a 5-year follow-up of elderly European men: the FINE study. Int J Geriatr Psychiatry. 2008 May;23(5):478-84.

Breeze E, Jones DA, Wilkinson P, Latif AM, Bulpitt CJ, Fletcher AE. Association of quality of life in old age in Britain with socioeconomic position: baseline data from a randomised controlled trial. J Epidemiol Community Health. 2004 Aug;58(8):667-73.

Brennan A, Purshouse R, Rafia R, Taylor K, Meier P, Booth A, et al. Independent Review of the Effects of Alcohol Pricing and Promotion: Part B. Results from the Sheffield Alcohol Policy Model Sheffield: University of Sheffield; 2008. http://www.dh.gov.uk/en/Publichealth/Healthimprovement/Alcoholmisuse/DH_4001740

Buja A, E Scafato, G Sergi, S Maggi, M A Suhad, G Rausa, A Coin, I Baldi, E Manzato, L Galluzzo, G Enzi and E Perissinotto ILSA Working Group. Alcohol consumption and metabolic syndrome in the elderly: results from the Italian longitudinal study on aging *European Journal of Clinical Nutrition* (2010) **64,** 297–307; doi:10.1038/ejcn.2009.136; published online 25 November 2009

Carstairs V, Morris R. Deprivation and Health in Scotland. Aberdeen: Aberdeen University Press, 1991.

Cawthon PM, Fink HA, Barrett-Connor E, Cauley JA, Dam TT, Lewis CE, Marshall LM, Orwoll ES, Cummings SR; for the Osteoporotic Fractures in Men Research Group. Alcohol use, physical performance, and functional limitations in older men. J Am Geriatr Soc. 2007 Feb;55(2):212-20.

Cawthon PM, Harrison SL, Barrett-Connor E, Fink HA, Cauley JA, Lewis CE, Orwoll ES, Cummings SR. Alcohol intake and its relationship with bone mineral density, falls, and fracture risk in older men. J Am Geriatr Soc. 2006 Nov;54(11):1649-57.

Coleman AL, Seitzman RL, Cummings SR, Yu F, Cauley JA, Ensrud KE, Stone KL, Hochberg MC, Pedula KL, Thomas EL, Mangione CM; Study Of Osteoporotic Fractures Research Group. The association of smoking and alcohol use with age-related macular degeneration in the oldest old: the Study of Osteoporotic Fractures. Am J Ophthalmol. 2010 Jan;149(1):160-9. Epub 2009 Oct 1.

Collaborative group on hormonal factors in breast cancer. (2002) Alcohol, tobacco and breast cancer - collaborative reanalysis of individual data from 53 epidemiological studies, including 58,515 women with breast cancer and 95,067 women without the disease. *British Journal of Cancer*, 87, 1234 – 1245.

Cook PJ, Tauchen G. The effect of liquor taxes on heavy drinking. *Bell Journal of Economics*, 1982, 13(2):379–390.

Cook PJ. *Paying the tab. The costs and benefits of alcohol control*. Princeton, Princeton University Press, 2007.

Copeland LA, Blow FC, Barry KL. Health care utilization by older alcohol-using veterans: effects of a brief intervention to reduce at-risk drinking. Health Educ Behav. 2003 Jun;30(3):305-21.

Coppéré H, Audigier JC. Trends of mortality from cirrhosis in France between 1925 and 1982. *Gastroenterol Clin Biol* 1986; Jun-Jul: 10(6-7):468-74.

Department of Transport (2009). Reported Road Casualties Great Britain: 2008 - Annual Report. http://www.dft.gov.uk/pgr/statistics/datatablespublications/accidents/casualtiesgbar/rrcgb2008.

Djoussé L, Biggs ML, Mukamal KJ, Siscovick DS. Alcohol consumption and type 2 diabetes among older adults: the Cardiovascular Health Study. Obesity (Silver Spring). 2007 Jul;15(7):1758-65.

European Commission (2009) Europe's changing population structure and its impact on relations between the generations. Accessed from the Commission's website on 26 March, 2006: http://europa.eu/rapid/press-

Farrell S, Manning WG, Finch MD. Alcohol dependence and the price of alcoholic beverages. *Journal of Health Economics*, 2003, 22:117–147.

Fell, J.C., Fisher, D.A., Voas, R.B., Blackman, K. & Tippetts, A.S.The relationship of underage drinking laws to reductions in drinking drivers in fatal crashes in the United States Accident Analysis & Prevention Volume 40, Issue 4, July 2008, Pages 1430-1440

Ferreira MP, Weems MK. Alcohol consumption by aging adults in the United States: health benefits and detriments. J Am Diet Assoc. 2008 Oct;108(10):1668-76.

Gallet CA. The demand for alcohol: a meta-analysis of elasticities. *The Australian Journal of Agricultural and Resource Economics*, 2007, 51:121–135.

Gilbertson R, Ceballos NA, Prather R, Nixon SJ. Effects of acute alcohol consumption in older and younger adults: perceived impairment versus psychomotor performance. J Stud Alcohol Drugs. 2009 Mar;70(2):242-52.

Goldberg IJ, Mosca L, Piano MR, Fisher EA, Nutrition Committee, Council on Epidemiology and Prevention, and Council on Cardiovascular Nursing of the American Heart Association. AHA science advisory: Wine and your heart: A science advisory for health care professionals from the nutrition committee, council on epidemiology and prevention, and council on cardiovascular nursing of the American Heart Association. *Circulation*. 2001;103:472-475.

Goldberg RJ, Burchfield CM, Reed DM, Wergowske G, Chiu D. A prospective study of the health effects of alcohol consumption in middle-aged and elderly men. The Honolulu heart program. *Circulation*. 1994;89:651-659.

Gordon AJ, Conigliaro J, Maisto SA, McNeil M, Kraemer KL, Kelley ME. Comparison of consumption effects of brief interventions for hazardous drinking elderly. Subst Use Misuse. 2003 Jun;38(8):1017-35.

Grant BF, Dawson DA. Age at onset of alcohol use and its association with DSM-IV alcohol abuse and dependence: results from the National Longitudinal Alcohol Epidemiologic Survey. J Subst Abuse. 1997;9:103-10.

Gronbaek M, Deis A, Becker U, Hein HO, Schnohr P, Jensen G, Borch-Johnsen K, Sorensen TI. Alcohol and mortality: Is there a U-shaped relation in elderly people? *Age Ageing*. 1998;27:739-744.

Guralnik JM, Kaplan GA. Predictors of healthy aging: prospective evidence from the Alameda County study. Am J Public Health 1989;79:703– 8.

Hajat S, Haines A, Bulpitt C, Fletcher A. Patterns and determinants of alcohol consumption in people aged 75 years and older: results from the MRC trial of assessment and management of older people in the community. Age Ageing. 2004 Mar;33(2):170-7.

Hajat, S., Hianes, A., Bulpitt, C. & Fletcher, A. Patterns and determinants of alcohol consumption in people aged 75 years and older: results from the MRC trial of assessment and management of older people in the community. Age and Ageing 2004 33 170-177.

Hallgren, M., Hogberg, P. & Andreasson, S. Alcohol Consumption amongst elderly European Union citizens. Stockholm, Swedish National Institute of Public Health, 2009.

Hallgren, M., Hogberg, P. & Andreasson, S. Alcohol Consumption and harm among elderly Europeans: falling between cracks. European Journal of Public Health Advance Access published August 13, 2010.

Harari D, Iliffe S, Kharicha K, Egger M, Gillmann G, von Renteln-Kruse W, Beck J, Swift C, Stuck AE. Promotion of health in older people: a randomized controlled trial of health risk appraisal in British General Practice. Age and ageing 2008 37 565-571.

Jones L et al. A review of the effectiveness and cost-effectiveness of interventions delivered in primary and secondary schools to prevent and/or reduce alcohol use by young people under 18 years old. Alcohol and schools: review of effectiveness and cost-effectiveness. NICE: Main report (PHIAC 14.3a). Liverpool, John Moores University, 2007 (http://www.nice.org.uk/nicemedia/pdf/AlcoholSchoolsConsReview.pdf, accessed 15 July 2009).

Jones, L. et al. Alcohol-attributable fractions for England – alcohol-attributable mortality and hospital admissions. North West Public Health Observatory, 2008. Available at: www.nwph.net/nwpho/publications/forms/dispform.aspx?ID=186.

Kharicha K, Iliffe S, Harari D, Swift C, Gillmann G, Stuck AE. Health risk appraisal in older people 1: are older people living alone an "at-risk" group? Br J Gen Pract. 2007 Apr;57(537):271-6.

Kim SY, Breslow RA, Ahn J, Salem N, Jr.Alcohol consumption and fatty acid intakes in the 2001-2002 national health and nutrition examination survey. *Alcohol Clin Exp Res*. 2007;31:1407-1414.

Kirchner JE, Zubritsky C, Cody M, Coakley E, Chen H, Ware JH, Oslin DW, Sanchez HA, Durai UN, Miles KM, Llorente MD, Costantino G, Levkoff S. Alcohol consumption among older adults in primary care. J Gen Intern Med. 2007 Jan;22(1):92-7.

Kirchner JE, Zubritsky C, Cody M, Coakley E, Chen H, Ware JH, Oslin DW, Sanchez HA, Durai UN, Miles KM, Llorente MD, Costantino G, Levkoff S. Alcohol consumption among older adults in primary care. *J Gen Intern Med*. 2007;22:92-97.

Knoops KT, de Groot LC, Kromhout D, Perrin AE, Moreiras-Varela O, Menotti A, van Staveren WA Mediterranean diet, lifestyle factors, and 10-year mortality in elderly European men and women: the HALE project. JAMA. 2004 Sep 22;292(12):1433-9.

Lachenmeier DW, Kantares F, Rehm J. Carcinogenicity of acetaldehyde in alcoholic beverages: risk assessment outside ethanol metabolism. *Addiction*, 2009, 104:533–550.

Lang, I., Guralnik, J., Wallace, R.B. & Melzer, D. What level of alcohol consumption is hazardous for older people? Functioning and mortality in US and English national cohorts. J Am Geriatr Soc. 2007 55 49-57.

Lee HS, Mericle AA, Ayalon L, Areán PA. Harm reduction among at-risk elderly drinkers: a site-specific analysis from the multi-site Primary Care Research in Substance Abuse and Mental Health for Elderly (PRISM-E) study. Int J Geriatr Psychiatry. 2009 Jan;24(1):54-60.

Leifman, H (2002) Contemporary drug problems. A comparative analysis of drinking patterns in six EU countries in the year 2000. Federal Legal Publications Inc.

Marshall SC. The role of reduced fitness to drive due to medical impairments in explaining crashes involving older drivers. Traffic Inj Prev. 2008 Aug;9(4):291-8.

Moore AA, Whiteman EJ, Ward KT. Risks of combined alcohol/medication use in older adults. Am J Geriatr Pharmacother. 2007 Mar;5(1):64-74.

Mukamal KJ, Chung H, Jenny NS, Kuller LH, Longstreth WT Jr Mittleman MA, Burke GL, Cushman M, Psaty BM, Siscovick DS. Alcohol consumption and risk of coronary heart disease in older adults: The Cardiovascular Health Study. *J Am Geriatr Soc*. 2006; 54:30-37.

Mukamal, K.J., Kennedy, M., Cushman, M., Kuller, L.H., Newman, A.B., Polak, J., Criqui, M.H. & Siscovick, D.S. Alcohol consumption and lower extremity arterial disease among older adults. American Journal of Epidemiology 2008 167 34-41.

Nackaerts O, Horner K, Jacobs R, Karayianni K, Mitsea A, Berkas L, Mastoris M, Lindh C, van der Stelt PF, Marjanovic E, Adams JE, Pavitt S, Devlin H. Is self-reported alcohol consumption associated with osteoporotic mandibular bone loss in women? Eur J Oral Sci. 2009 Feb;117(1):7-12.

NIAAA. Alcohol Alert No. 40: Alcohol and Aging. National Institute on Alcohol Abuse and Alcoholism; 1998. Retrieved 070409 from: http://pubs.niaaa.nih.gov/publications/aa40.htm

NICE. Guidance Title: Prevention and early identification of alcohol use disorders in adults and young people.   Final draft of Report 2 to the National Institute for Health & Clinical Excellence. 2009.

Noale M, Minicuci N, Bardage C, Gindin J, Nikula S, Pluijm S, Rodríguez-Laso A, Maggi S; CLESA working group. Predictors of mortality: an international comparison of socio-demographic and health characteristics from six longitudinal studies on aging: the CLESA project. Exp Gerontol. 2005 Jan-Feb;40(1-2):89-99.

Norberg, K.E., Bierut, L.J. & Grucza, R.A. Long-Term Effects of Minimum Drinking Age Laws on Past-Year Alcohol and Drug Use Disorders. Alcoholism: Clinical and Experimental Research 2009 Volume 33 Issue 12, Pages 2180 - 2190

O'Connell, H., Ai-Vyrn Chin, Fiona Hamilton, Conal Cunningham, J. B. Walsh, Davis Coakley and Brian A. Lawlor A systematic review of the utility of self-report alcohol screening instruments in the elderly Int J Geriatr Psychiatry 2004; 19: 1074–1086.

O'Connell H, Chin AV, Hamilton F, Cunningham C, Walsh JB, Coakley D, Lawlor BA A systematic review of the utility of self-report alcohol screening instruments in the elderly. . Int J Geriatr Psychiatry. 2004 Nov;19(11):1074-86.

Office for National Statistics. Alcohol Deaths. http://www.statistics.gov.uk/CCI/nugget.asp?ID=1091. Accessed December 2009.

Oscar-Berman, M.; Shagrin, B.; Evert, D.L.; et al.(1997) Impairments of brain and behavior: The neurological effects of alcohol. Alcohol Health and Research World, 21(1): 65-75.

Panza F, Capurso C, D'Introno A, Colacicco AM, Frisardi V, Lorusso, M., Santamato A, Seripa D Pilotto A, Scafato, E., Vendemiale G, Capurso A, Solfrizzi V. Alcohol drinking, cognitive functions in older age, predementia, and dementia syndromes. Journal of Alzheimer's Disease 2009 17 7-31.

Papaioannou, A. & C. C. Kennedy & A. Cranney & G. Hawker & J. P. Brown & S. M. Kaiser &W. D. Leslie & C. J. M. O'Brien & A. M. Sawka & A. Khan & K. Siminoski & G. Tarulli & D. Webster & J. McGowan & J. D. Adach. Risk factors for low BMD in healthy men age 50 years or older: a systematic review. Osteoporos Int (2009) 20:507–518

Peel NM, McClure RJ, Bartlett HP. Behavioral determinants of healthy aging Am J Prev Med. 2005 Apr;28(3):298-304.

Peters, R., Peters, J., Warner, J., Beckett, N. & Bulpitt, C. Alcohol, dementia and cognitive decline in the elderly: a systematic review. Age and ageing 2008 37 505-512.

RAND Europe (2009): The affordability of alcoholic beverages in the European Union: Understanding the link between alcohol affordability, consumption and harms. RAND Corporation.

Rehm J, Patra J, Popova S. Alcohol drinking cessation and its effect on oesophageal and head and neck cancers: a pooled analysis. *International Journal of Cancer* 2007; 121(5): 1131-1137.

Rehm J, Room R, Taylor B. Method for moderation: measuring lifetime risk of alcohol-attributable mortality as a basis for drinking guidelines. Int J Methods Psychiatr Res 2008; 17(3):141-51.

Rehm, J., Baliunas, D., Borges, G.L.G., Graham, K., Irving, H.M., Kehoe, T.Parry, C.D., Patra, J., Popova, S., Poznyak,V., Roerecke, M., Room, R., Samokhvalov, A.V., & Taylor, B. (in press). The relation between different dimensions of alcohol consumption and burden of disease - an overview. *Addiction.*

Rehm, J., Zatonski, W., Taylor, B. & Anderson, P. Epidemiology and alcohol policy in Europe. Addiction, in press

Reid, M.C., Boutros, N.N., O'Connor, P.G., Cadariu, A. & Concato, J. The health related effects of alcohol use in older persons: a systematic review. Substance Abuse 2002 23 149-164.

Rosen, M. & Haglund, B. Trends in alcohol-related mortality in Sweden 1969-2002: an age-period-cohort analysis. Addiction 2006 101 835-840.

Roy DK, O'Neill TW, Finn JD, Lunt M, Silman AJ, Felsenberg D, Armbrecht G, Banzer D, Benevolenskaya LI, Bhalla A, Bruges Armas J, Cannata JB, Cooper C, Dequeker J, Diaz MN, Eastell R, Yershova OB, Felsch B, Gowin W, Havelka S, Hoszowski K, Ismail AA, Jajic I, Janott I, Johnell O, Kanis JA, Kragl G, Lopez Vaz A, Lorenc R, Lyritis G, Masaryk P, Matthis C, Miazgowski T, Gennari C, Pols HA, Poor G, Raspe HH, Reid DM, Reisinger W, Scheidt-Nave C, Stepan JJ, Todd CJ, Weber K, Woolf AD, Reeve J; European Prospective Osteoporosis Study (EPOS). Determinants of incident vertebral fracture in men and women: results from the European Prospective Osteoporosis Study (EPOS). Osteoporos Int. 2003 Jan;14(1):19-26.

Scafato, E. Alcohol and the elderly: the time to act is now! European Journal of Public Health Advance Access published August 13, 2010.

Sheik JI, Yesavage JA. Geriatric Depression Scale (GDS): Recent evidence and development of a shorter version. Clin Gerontol 1986; 37: 819–20.

Sorock GS, Chen LH, Gonzalgo SR, Baker SP. Alcohol-drinking history and fatal injury in older adults. Alcohol. 2006 Nov;40(3):193-9.

Spoth R, Greenberg M, Turrisi R. Preventive interventions addressing underage drinking: state of the evidence and steps toward public health impact. *Pediatrics* 2008; 121:S311–S336.

Stott DJ, Welsh P, Rumley A, Robertson M, Ford I, Sattar N, Westendorp RG, Jukema JW, Cobbe SM, Lowe GD. Adipocytokines and risk of stroke in older people: a nested case-control study. Int J Epidemiol. 2009 Feb;38(1):253-61. Epub 2008 Oct 24.

Taki Y, Kinomura S, Sato K, Goto R, Inoue K, Okada K, et al. Both global gray matter volume and regional gray matter volume negatively correlate with lifetime alcohol intake in non-alcohol-dependent Japanese men: A volumetric analysis and a voxel-based morphometry. Alcohol Clin Exp Res 2006; 30:1045-50.

Tombaugh TN, McIntyre NJ. The mini-mental state examination: a comprehensive review. J Am Geriatr Soc 1992; 40: 922–35.

Wagenaar AC, Maldonado-Molina MM, Wagenaar BH. Effects of alcohol tax increases on alcohol-related disease mortality in Alaska: time-series analyses from 1976–2004. *American Journal of Public Health*, 2009, 99(1):1–8.

Wagenaar AC, Salois MJ, Komor KA. Effects of beverage alcohol price and tax levels on drinking: a meta-analysis of 1003 estimates from 112 studies. *Addiction,* 2009, 104:179–190.

Wang L, van Belle G, Kukull WB, Larson EB Predictors of functional change: a longitudinal study of nondemented people aged 65 and older. J Am Geriatr Soc. 2002 Sep;50(9):1525-34.

Wannamethee SG, Shaper AG, Whincup PH. Modifiable lifestyle factors and the metabolic syndrome in older men: Effects of lifestyle changes. J Am Geriatr Soc. 2006 Dec;54(12):1909-14.

Weyerer S, Eifflaender-Gorfer S, Köhler L, Jessen F, Maier W, Fuchs A, Pentzek M, Kaduszkiewicz H, Bachmann C, Angermeyer MC, Luppa M, Wiese B, Mösch E, Bickel H; German AgeCoDe Study group (German Study on Ageing, Cognition and Dementia in Primary Care Patients). Prevalence and risk factors for depression in non-demented primary care attenders aged 75 years and older. J Affect Disord. 2008 Dec;111(2-3):153-63. Epub 2008 Mar 26.

Wilsnack R.W.,Wilsnack S. C., Kristjanson A. F., Vogeltanz- Holm N. D., Gmel G. Gender and alcohol consumption: patterns from themultinational GENACIS project. *Addiction* 2009; **104**: 1487–500.

Zaridze D, Brennan P, Boreham J, Boroda A, Karpov R, Lazarev A, Konobeevskaya I, Igitov V, Terechova T, Boffetta P, Peto R. Alcohol and cause-specifi c mortality in Russia: a retrospective case–control study of 48 557 adult deaths*. Lance*t 2009; 373: 2201–14.

Appendix

The Vintage Project Group is composed of:

Emanuele SCAFATO, Istituto Superiore di Sanità - Population Health and Health Determinants Unit-CNESPS - WHO Collaborating Centre for Research & Health Promotion on Alcohol and Alcohol-Related Health Problems, Rome, Italy (Project Leader)

Peter ANDERSON - Faculty of Health, Medicine and Life Sciences, Maastricht University, Netherlands

Lucia GALLUZZO - Istituto Superiore di Sanità - Population Health and Health Determinants Unit-CNESPS - WHO Collaborating Centre for Research & Health Promotion on Alcohol and Alcohol-Related Health Problems, Rome, Italy (Project Coordinator)

Onno VAN SCHAYCK - Maastricht University, School for Public Health and Primary Care: Caphri, Maastricht, Netherlands

Joan COLOM - Government of Catalonia, Department of Health, Program on Substance Abuse, Barcelona, Spain

Lidia SEGURA - Government of Catalonia, Department of Health, Program on Substance Abuse, Barcelona, Spain

Andrew McNEILL - Institute of Alcohol Studies, Huntingdon United Kingdom

Sandra RADOS KRNEL - Institute of Public Health, Research Centre, Ljubljana, Slovenia

Salme AHLSTROM – National Institute for Health and Welfare, Helsinki, Finland

Esa OSTERBERG - National Institute for Health and Welfare, Helsinki, Finland

Hana SOVINOVA – National Institute of Public Health, Coordination, Monitoring and Research Unit, Praha, Czech Republic

Claudia GANDIN - Istituto Superiore di Sanità - Population Health and Health Determinants Unit-CNESPS - WHO Collaborating Centre for Research & Health Promotion on Alcohol and Alcohol-Related Health Problems, Rome, Italy

Silvia GHIRINI - Istituto Superiore di Sanità - Population Health and Health Determinants Unit-CNESPS - WHO Collaborating Centre for Research & Health Promotion on Alcohol and Alcohol-Related Health Problems, Rome, Italy

Sonia MARTIRE - Istituto Superiore di Sanità - Population Health and Health Determinants Unit-CNESPS - WHO Collaborating Centre for Research & Health Promotion on Alcohol and Alcohol-Related Health Problems, Rome, Italy

Alessandra ROSSI - Istituto Superiore di Sanità - Population Health and Health Determinants Unit-CNESPS - WHO Collaborating Centre for Research & Health Promotion on Alcohol and Alcohol-Related Health Problems, Rome, Italy

Lucilla DI PASQUALE - Istituto Superiore di Sanità - Population Health and Health Determinants Unit-CNESPS - WHO Collaborating Centre for Research & Health Promotion on Alcohol and Alcohol-Related Health Problems, Rome, Italy