Dadansoddi ar gyfer Polisi

YMCHWIL GYMDEITHASOL Y LLYWODRAETH

GSR

GOVERNMENT SOCIAL RESEARCH

Analysis for Policy

Llywodraeth Cynulliad Cymru
Welsh Assembly Government

www.cymru.gov.uk

Ymchwil gymdeithasol
Social research

Number: /2010

Assessing the costs to the NHS associated with alcohol and obesity in Wales

Assessing the costs to the NHS associated with alcohol and obesity in Wales

Ceri J. Phillips
Christie Harper
Jaynie Rance
Angela Farr

Final report submitted 2010

Views expressed in this report are those of the researcher and not necessarily those of the Welsh Assembly Government

For further information please contact:
Name: Janine Hale
Department: Social Research Division
Welsh Assembly Government
Cathays Park
Cardiff
CF10 3NQ
Tel: 029 2082 6539
Email: janine.hale@wales.gsi.gov.uk

Welsh Assembly Government Social Research, 2011
ISBN

Table of contents

1. Introduction

It is generally accepted that a healthy, balanced diet and regular physical activity are essential components of healthy living and that poor diet and lack of physical activity are amongst the leading causes of avoidable illness and premature death in Europe. Complex environmental factors have contributed to the rising prevalence of obesity in Wales and across the world, which while being a major public health concern also represents an increasing burden on stretched healthcare resources. The World Health Organisation report that approximately 1.6 billion adults (age 15+) are overweight and at least 400 million adults are obese. These figures are projected to rise so that by 2015, approximately 2.3 billion adults will be overweight and more than 700 million will be obese. Obesity has been identified as one of the major challenges to face the UK due to its increasing prevalence and impact on levels of morbidity. The increasing rate of obesity in Wales broadly parallels that in most other Western countries (WAG 2009).

The Welsh Health Survey (WAG 2009) classified 57% of adults as overweight or obese, including 21% in the obese category. Levels of overweight and obesity remained unchanged between 2007 and 2008, following a slight increase in earlier years. Recent data from Public Health Wales have demonstrated that obesity in adults in Wales has increased from 18% in 2003/04 to 21% in 2008 and this upward trend is of particular concern and likely to continue given that 21% of boys and 18% of girls aged 15 are overweight or obese, one of the highest percentages in the western world and substantially higher than in Scotland and England. In addition, only 29% of boys and 36% of girls eat fruit daily, similar to children in Scotland but lower than in England.

In response to the rise in prevalence in obesity in the UK, the government's Foresight programme commissioned a project aimed at a long-term approach to tackling obesity (Butland et al., 2007). This project predicted that if current trends continue by 2025 40% of the population could be classified as obese. By 2050 Britain could be predominantly obese, with women in the healthy weight category dropping from 40% to 10%.

It has been estimated that the impact of obesity through its recognised co-morbidities has placed a significant and increasing burden on the National Health Service in the UK, estimated to be £4.2 billion in 2007, the rise in the costs attributable to elevated BMI is predicted to be £9.7 billion by 2050 (McPherson et al 2007).

It is estimated that alcohol is the third highest factor for ill-health in the European Union behind tobacco and high blood pressure. The World Health Organisation has estimated that worldwide alcohol causes 1.8 million deaths (3.2% of total) and 58.3 million (4% of total) Disability-Adjusted Life Years (DALYs). In the UK, the increase in alcohol consumption has impacted on the demand for NHS services, with an estimated expenditure of £2.7 billion in 2006/2007 (NHS confederation, 2010). This represents a doubling of costs for alcohol related conditions between 2001 and 2006/07. NICE has appraised the clinical and cost-effectiveness of a number of alcohol abuse treatment strategies, resulting in a summary guideline which recommends hospital admission and pharmacological management for alcohol withdrawal symptoms, as well as specialist referral for alcohol related renal impairment. Specific roles such as alcohol specialist nurses have also been advocated (Swain, 2010). NHS costs for alcohol related morbidity are therefore set to increase through such dedicated strategies.

The Welsh Assembly Government recently launched a 10 year strategy for substance misuse (WAG, 2008). This strategy sets out to reduce harm caused by alcohol (and other substances). Alcohol use in children and young people is of particular concern.

In Wales, 23% of boys and 20% of girls aged 13 drink alcohol weekly, more than in England and Scotland. There were also around 1,160 referrals for alcohol treatment in under 20-year-olds in the year 2008/09. Self-reported measures of drinking above guidelines and binge drinking are as common in the most deprived as in the least deprived communities. Alcohol-attributable mortality rates, however, show substantial inequalities with rates more than twice as high in the most deprived areas compared to the least deprived. An estimated 1,050 deaths are attributable to alcohol each year in Wales, with drink a factor in more than 1 in 25 male deaths. It is recognised that approximately 1.5% of all adult hospital admissions between 2002 and 2006 can be attributed to alcohol and currently there are 33,200 hospital admissions in men and 20,800 in women each year that are attributable to alcohol, and which place a substantial burden on the health service. In addition to those conditions directly related to alcohol misuse, a number of conditions not directly related, but attributable to alcohol misuse add to the burden on the NHS. It is estimated that approximately five per cent of all admissions to hospital in Wales between 2002 and 2006 were for alcohol attributable conditions (Gartner, 2009).

2. Aims and objectives

The aim of this project is to derive an estimate of the costs to NHS Wales associated with alcohol misuse and obesity. The specific objectives are to:

- estimate the extent and duration of hospital admissions attributable to alcohol misuse and obesity in Wales;
- identify the number of outpatient attendances by patients with illnesses related to alcohol misuse and obesity;
- estimate the number of GP and other primary care consultations as a result of alcohol misuse and obesity;
- identify prescription costs for treating patients with alcohol-related problems and obesity;
- utilise published unit cost data to derive an estimate of the total costs for treating conditions related to alcohol misuse and obesity.

3. Design and methods

The costs associated with alcohol misuse and obesity are assessed from the perspective of NHS Wales and therefore include resource utilisation related to hospital admissions, outpatient visits, GP and practice nurse consultations and prescriptions. According to the WHO report on Best Practice for estimating the costs of alcohol (2010), this type of study should be referred to as a "health spending" study, which does not take into account crime spending, lost productivity and non-financial welfare losses. Furthermore, no positive implications of alcohol use are examined (e.g. financial benefits of the food and alcohol trade) and no future costs are explored (e.g. the cost impact of premature death on healthcare and society).

The methodologies employed in this study are based on a previous study to derive an estimate of the costs attributable to smoking in Wales (Phillips and Bloodworth, 2009)

Identification of conditions attributed to alcohol misuse and obesity

The identification of conditions attributable to alcohol misuse and obesity was determined through reviews of literature and discussions with public health experts. The literature search was not systematic given the budget and timescale for the work, rather it comprised of gathering key reports and publications identified through database searches and from discussions with expert advisors.

Members of the research team contacted experts in the areas of obesity and alcohol misuse and asked if they could identify literature or reports that would help to inform the current study. Experts from academia and from public health services responded to e-mail requests from the research team. A number of key publications and research papers were identified through this route. In addition five experts indicated that they were willing to be contacted by telephone should the research team wish to discuss this in more detail. Subsequently a number of telephone calls were made and discussions with public health experts led to identification of co-morbid conditions all of which were recognised within the literature.

Tables of identified attributable conditions for alcohol misuse (Appendix 1) and for obesity (Appendix 2) were developed from this review process. Where data were available regarding

the relative risks or proportions for attributable co-morbid conditions, these data have been included within the tables.

Alcohol misuse

Guidelines for sensible drinking currently recommend that men should regularly drink no more than 3-4 units of alcohol per day and women not more than 2-3 units of alcohol per day (DOH 2007). Patterns of alcohol consumption have been categorised by the World Health Organisation (2008) into: Hazardous Drinking (patterns of use that are of public health significance despite absence of any current disorder in the individual user) and Harmful drinking (patterns of alcohol use that cause harm to physical and/or mental health and commonly but not always, have adverse social consequences). Hazardous drinking is considered as consumption of between 22-50 units per week for men, and between 15-35 units per week for women. Drinking is considered as harmful when consumption exceeds 50 units per week for men and 35 units per week for women. The majority of literature reviewed for the identification of co-morbid conditions either referred to alcohol misuse without specifying a category, or specifically referred to harmful drinking. Therefore for the purposes of the current study the co-morbid conditions detailed in Appendix 1 are considered to be those attributable to harmful levels of alcohol consumption. Again, where relative risks or attributable proportions were available, these are reported.

Obesity

The majority of literature utilises the World Health Organisation (WHO 2000) classification of adult weight by Body Mass Index (BMI). Attributable conditions listed in table are therefore those associated with having BMI of 30 or more. Some reports identify relative risk associated more specific BMI classifications and where appropriate these are identified within the table Appendix 2.

Coding of attributable co-morbid conditions

The current study makes use of HRG (Health Care Resource Group v. 3.5) codes to estimate costs related to each co-morbid condition. Hence the next stage of the process involved transformation of the data into HRG codes. Following transformation the HRG codes were then matched against existing costs data to estimate costs per condition.

Data relating to healthcare utilisation were obtained from published sources and personal communications with officials at Welsh Assembly Government, Health Solutions Wales and Programme Management Unit, NHS Wales.

Costing

Where prevalence rates were not identified in the literature, data from the Welsh Health Survey (WAG 2008) were utilised to enable estimates of prevalence and resource utilisation. The attributable proportions for each condition were estimated, and applied to the total number of hospital in-patient admissions, outpatient attendances and primary care consultations to estimate numbers attributable to alcohol and obesity in Wales. The costs to Wales were then estimated by multiplying the attributable number by estimates of Welsh unit costs.

4 a. Findings: Alcohol

The Welsh Health Survey 2009 is the latest edition for which data relating to alcohol consumption is available. The prevalence rate for drinking to excess is 45% with 24% reporting binge drinking.

3.1 Total Costs

The cost of excess alcohol to NHS in Wales amounted to between £69.9 million and £73.3 million in 2008/09, between £1.34 million and £1.41 million spent each week treating diseases caused by excess alcohol, and amounting to between £23.47 and £24.60 per person in Wales and between 1.27% and 1.33% of total healthcare expenditure.

3.2 Hospital Admissions

According to Welch et al (2008) admissions to ICUs in England and Wales with alcoholic liver disease tripled over the 10-year period from 1996 to 2005. In this study, the impact of excess drinking on hospitalisations in Wales amounted to over £6.57 million or over £7.82 million – depending on whether the prevalence of binge drinking or drinking to excess is used - in 2008/09, which represents around 0.5% total expenditure on in-patients. A detailed breakdown of expenditure on hospitalisations due to alcohol is available from the authors.

3.3 Outpatient costs

There is no published evidence relating to the impact of alcohol excess on outpatient attendances for Wales. Within the EU a summary of net and gross costs of alcohol in Sweden in 2002 (million SEK) estimated that outpatient care: net = 2,189, Gross = 3, 294 (Jarl et al.,2009). In a study from Germany, Konnopka & Konig (2007) suggest that approximately one-third of total direct costs of alcohol (€8441 million) were attributable to outpatient treatment. A report evaluating the costs of alcohol misuse for the NHS in London estimate the cost of outpatient attendances as £8.35 million (Dodgson et al., 2003).This estimate was based on estimates from other regions of the UK where 8% of total outpatient attendances are linked to alcohol misuse (Catalyst, 2001). Using this percentage for Wales results in an estimate of £24,426,334 for outpatient expenditure that can be attributed to alcohol, based on total attendances of 2,315,299 and an unit cost of £131.

3.4 Costs of accident and emergency attendances

It is known that between 33% and 35% of all A+E attendances are attributable to alcohol. In Wales in 2009 there were 1,060,000 A+E attendances and the unit cost was £101. Therefore, alcohol related A+ E attendances accounted for expenditure of between £35,329,800 and £37,471,000 in 2008/09 in Wales.

3.4 Primary care costs

There is little published literature that identifies the specific impact of alcohol misuse in relation to primary care consultations in Wales although it has been suggested that drinkers often present to hospital having had very little primary care contact (NHS confederation briefing, 2010). There are some estimates of alcohol related primary care consultations, one from London, for example, estimated that alcohol use contributed to 0.83% of all primary care consultations (34% directly attributable to alcohol) This equates to an estimate of £3,500,383 in Wales for alcohol related primary care consultations. In England in 2009, there were 150,445 prescription items for drugs for the treatment of alcohol dependency prescribed in primary care settings or NHS hospitals and dispensed in the community, which represents 0.02% of all prescriptions (NHS IC 2010).Using this percentage for Wales, results in an estimate of £99,189 for prescription expenditure related to alcohol.

4 b. Findings: Obesity

The Welsh Health Survey 2008 is used as the source of prevalence data for obese and overweight people in Wales, with the percentage of people classified as obese as 21% and the percentage as obese/overweight as 57%.

3.1 Total Costs

Obesity is estimated to cost the NHS in Wales over £73 million, which increases to nearly £86 million if obese and overweight people are included, in 2008/09, between more than £1.40 million and £1.65 million spent each week treating diseases resulting from obesity and amounting to between £25 and £29 per person in Wales and between 1.3% and 1.5% of total healthcare expenditure in Wales.

3.2 Hospital Admissions

According to the NHS IC report on obesity in England (2010), the number of Finished Admission Episodes (FAEs) in NHS hospitals with a primary diagnosis of obesity among people of all ages was 7,988 in 2008/09. This is over eight times as high as the number in 1998/99 (954) and nearly 60% higher than in 2007/08 (5,018). The number of Finished Consultant Episodes (FCEs) with a primary diagnosis of obesity and a main or secondary procedure of 'bariatric surgery' among people of all ages in 2008/09 was 4,221, more than double the number in 2006/07 (1,951) and 55% higher than in 2007/08 (2,724). The Counterweight project also demonstrated that obese patients were admitted to hospital significantly more often than normal weight patients ($p = 0.034$).

The impact of obesity on hospitalisations in Wales amounted to £3,470,007 in 2008/09, which represents 0.24 % of total expenditure on in-patients, while the amount is £6,028,347 – 0.42% -if overweight and obese people are included. A detailed breakdown of expenditure on hospitalisations due to obesity is available from the authors.

3.3 Outpatient costs

The Counterweight project identified that obese patients made significantly more visits to their GP, practice nurses and outpatients than normal weight persons (Counterweight

Project, 2005). However, it has not been possible to identify the extent of additional outpatients attendances due to obesity and these have not been factored into our estimates.

3.4 Primary care costs

The costs of obesity to primary care include the increased treatment costs from drugs and investigations relating to co-morbid conditions, as well as increased contact time necessary with primary care staff.

The Counterweight project showed that for all drugs prescribed in primary care in the UK, 16% of costs can be attributable to obesity, with one-quarter of costs attributable to overweight and obesity. Further analyses within the counterweight project suggested that obesity more than doubled prescribing in primary care in most drug categories. Using this source it is estimated that the cost of prescriptions issues in primary care for obese people in Wales was £17,924,000 and £28,006,250 if obese and overweight people were included. Similarly the NICE costing report 2006 estimates 64% additional contacts with the GP per year as a result of Obesity, equating to approximately £51,630,647 and nearly 12% of all costs in Wales. According to the NHS IC report on obesity in England (2010), in 2008, the number of prescription items dispensed for the treatment of obesity was 1.28 million; this is ten times the number in 1999 (127,000).

The Counterweight project also demonstrated that obese patients made significantly more visits to the general practitioner (GP) and practice nurse (PN) (all $p < 0.001$). For both GP and PN visits, the relationship remained after adjusting for age, sex, social deprivation category, country, and number of comorbidities. Among obese patients, there was an increasing relationship between frequent GP visits (at least four appointments) and greater BMI, which remained significant after adjustments had been made for age, sex, deprivation, country, and number of comorbidities.

5. Discussion

It is highly probable that the estimates for expenditure relating to alcohol and obesity in Wales are highly conservative due to:

- Difficulty in determining full range of conditions affected by alcohol and obesity
- Difficulty in assigning HRG codes to some conditions
- Lack of evidence re attribution and relative risks
- Strength of evidence re attribution and relative risks

A systematic literature review was outside of the time constraints and budget for this project. Nonetheless, the review was extensive and wide ranging, while the response from experts in the field, was somewhat patchy. We believe that the most relevant studies were included in the review and the findings have informed the analysis.

According to WHO (2010) definitions this analysis should be known as a "health spending" study. According to these guidelines, the following impacts might also warrant further investigation if the study were to be expanded:

- crime,
- employment and productivity
- non-financial welfare costs
- positive economic benefits of the alcohol and food trade
- future cost implications
- avoidance of premature death

However, it is clearly evident that further work is needed on establishing relative risks and attribution factors, in order to further inform the analysis. The level and detail of data available to inform the previous Smoking Review was the major contributory factor in deriving what could be regarded as a more likely estimate.

References

Bergstrom, A, Pisani, P., Tenet, V., Wolk, A., Adami, H.O. Overweight as an avoidable cause of cancer in Europe. International Journal of cancer 2001;91:421-30.

Butland, B. Jebb, S. Kopelman, P. McPherson, K. Thomas, S. Mardell, J. Parry, V (2007) Foresight Tackling Obesities: Future Choices - Project report.

Birmingham, C.L., Muller, J.L., Palepu, A., Spinelli, J.J., Anis, A. (1999) The cost of Obesity in Canada: Canadian Medical Association Journal, 160: 483-8.

Britton, A., McKe, M. (2000) Relation between alcohol and cardiovascular disease in Eastern Europe: Explaining the paradox. J Epidemiol Commun Health, 54: 328-332

Cargiulo, T (2007) Understanding the impact of alcohol dependence. American Journal of Health-Syst Pharm, vol 64, Mar 1, 2007, suppl 3. Pp5-11.

Catalyst (2001) Alcohol Misuse in Scotland: Trends and Costs. Scottish Executive.

Clegg, A.J., Colquitt, J., Sidhu, M.K., Royle, P., Loveman, E., Walker, A. (2002) The clinical effectiveness and cost effectiveness of surgery for people with morbid obesity: a systematic review and economic evaluation. Health technology Assessment 6 (12)

Counterweight Project Team (2005) Obesity Impacts on General Practice Appointments. Obesity Research Vol. 13 (8) 1442-9

Department of Health (2007) Safe. Sensible. Social – The next steps in the National Alcohol Strategy. Department of Health, www.dh.gov.uk/publications

Dodgson, J., Bramley-Harker, E., Spackman, M., Aslam, S., Barham, L. (2003) Alcohol in London: A cost-benefit analysis. A final report for the greater London Authority.

Foresight: Tackling Obesities: Future Choices- Modelling Future Trends in Obesity and Impact on Health (2nd edition). Government Office for Science (2007)

Garbaciak, J.A, Richter, M., Miller, S., Barton, J.J. Maternal weight and pregnancy complications. American Journal of Obstetrics and Gynaecology 1985: 152:238-43.

Gartner, A (2009). A profile of alcohol and health in wales. Wales centre for health. http://www.wales.nhs.uk/sites3/Documents/568/Alcohol%20and%20Health%20in%20Wales_WebFinal_E.pdf

Gutjahr, E., Wilsnack, R., Dawson, D., Vogeltanz, N (1998) Relationship between average alcohol consumption and disease. An overview. European Addiction Research, 7, 117-127.
Hart, C.L., Morrison, D.S, Batty, G.D., Mitchell, R.J., Smith, G.D. (2010) Effect of body mass index and alcohol consumption on liver disease: analysis of data from two prospective cohort studies

Jarl, J., Gertham, U.G., Selin, K.H. (2009) Medical net cost of low alcohol consumption – a cause to reconsider improved health as the link between alcohol and wage? Cost effectiveness and resource Allocation, 2009, 7 (17) doi:10.1186/1478-7547-7-17

Jones, L., Bellis, M.A., Dedman., D., Sumnall, H., Tocque, K. (2008) Alcohol-attributable fractions for England: Alcohol-attributable mortality and hospital admissions. Centre for Public Health, Liverpool John Moores University/ North West Public Health Observatory.

Konnopka, A., König, H. (2007). Direct and Indirect Costs Attributable to Alcohol Consumption in Germany PharmacoEconomics, Volume 25, Number 7, 2007 , pp. 605-618

Liu, B., Balkwill, A., Reeves, G., Bereal, V. (2010) Body Mass Index and risk of liver cirrhosis in middle aged UK women: prospective study. BMJ 2010; 340c912doi:10.1136/bmj.c912.
National Obesity Forum Report (2007)

McPherson, T., Marsh, M. (2007) Fore*sight:* Tackling Obesities: Future Choices –Modelling Future Trends in Obesity and the Impact on Health 2nd Edition. Government office for Science.

NHS IC (information centre), (2010). Statistics on alcohol in England. http://www.ic.nhs.uk/pubs/alcohol10

NHS IC (information centre), (2010). Statistics on obesity, physical activity and diet in England (2010). http://www.ic.nhs.uk/webfiles/publications/opad10/Statistics_on_Obesity_Physical_Activity_and_Diet_England_2010.pdf

NICE clinical guideline 43 (2006) Obesity: guidance on prevention, identification, assessment and management of overweight and obesity in adults and children. Costing report Implementing NICE guidance in England.

NICE (2006) Obesity: full guidance (December 2006)

NHS Confederation (2010). Too much of the hard stuff. What alcohol costs the NHS. WWW.NHSCONFED.ORG/PUBLICATIONS/DOCUMENTS

Obesity in Scotland: AN epidemiology briefing (2007) ScotPHO: Public Health Information for Scotland.

Oliveria, S.A., Felson, D.T., Cirillo, P.A., Reed, J.I. Walker. A.M. Body weight, body mass index and incident symptomatic osteoarthritis of the hand, hip and knee. Epidemiology 1999: 10:161-6

Phillips, C.J., Bloodworth, A. Costs of smoking to the NHS in England. Swansea University.

Rappanage, D.R., Brouwer, W.B.F., Hoogenveen, R.T., and VanBaal, P. (2009) Healthcare Costs and Obesity Prevention: Drug Costs and Other Sector-Specific Consequences. Pharmacoeconomics, vol 27 (12) 1031-1044.

Rehm,J.T., Room, R., Monteriro, M., Gmel., G., Graham, K., Rehn, N., Sempos, C.T., Frick, U., Jernigan, D: LAcohol as a risk factor for global burden of disease. European Addiction Research, 9: 157-164.

Room, R., Graham, K., Rehm., J., Jernigan, D., Monteiro, M. (2003) Drinking and its burden in Global Perspective: Policy Considerations and Option. European Addiction Research, 9: 165-175.

Room, R., & Rossow, I. (2001) The share of violence attributable to drinking. J substance Use, 6: 218-228.

Shaw, G.M., Velie, E.M., Schaffer, D. Risk of neural tube defect affected pregnancies among obese women. JAMA 1996:275:1093-43

Shultz, J.M., Rice, D.P., Parker, D.L., Goodman, R.A., Stroh, G., Chalmers, N. (1991) Quantifying the disease impact of Alcohol with ARDI software. Public Health reports, July-august 1991, vol 106 (4) 443-450.

Smith-Warner, S.A., Spiegelman, D., Yaun. S>S et al., Alcohol and breast cancer in women: a pooled analysis of cohort studies. Journal of the American Medical Association, 1998: 279:535-40.

Swain, S. (2010). Diagnosis and clinical management of alcohol related physical complications: summary of NICE guidance BMJ 340:c2942

Vingilis, E. (1994) Moderate drinking and traffic crashes: A case for health or for safety. Contemp Drug Problems, 21:111-123.

Welch C, Harrison D, Short A, Rowan K (2008). The increasing burden of alcoholic liver disease on United Kingdom critical care units: secondary analysis of a high quality clinical database. J Health Serv Res Policy. 2008 Apr;13 Suppl 2:40-4.

Welsh Assembly Government (WAG) 2008. The Welsh Health Survey. http://wales.gov.uk/topics/statistics/theme/health/health-survey/?lang=en

Welsh Assembly Government (WAG) 2009. The Welsh Health Survey. http://wales.gov.uk/topics/statistics/theme/health/health-survey/?lang=en

Werler, M.M., Louik, C., Sharpiro, S., Mitchell, A.A. Prepregnant weight in relation to risk of neural tube defect. JAMA 1996: 275:1089-92

World Health Organization. World Health Report 2002.

World Health Organization (200). Obesity and Overweight. http://www.who.int/mediacentre/factsheets/fs311/en/ Fact sheet 311.

World Health Organization. Comparative Quantification of Health Risks: Global and Regional Burden of Disease Attributable to Selected Major Risk Factors. WHO: Geneva, 2004

World Health Organisation (2008) lexicon of alcohol and drug terms. Available at URL: http://www.who.int/substance_abuse/terminology/who_lexicon/en/index.html.

World Health Organisation (2010) Best Practice in estimating the costs of alcohol. WHO: Denmark, 2010.

Young, T., Palta, M., Dempsy, J., Skatrud, J., Weber, S., Badr, S. The occurrence of sleep-disordered breathing among middle aged adults. Nwe England Journal of Medicine 1993; 328: 1230-5.

Zhao, W., Zhai, Y., Hu., J., Wang, J., Yang, Z., Kong, L., Chen., C. (2008) Economic burden of obesity-related chronic diseases in Mainland China. Obesity reviews 9 (Suppl.1)., 62-67.

Appendix 1. Identified conditions attributable to Alcohol misuse

Alcohol	
Alcoholic hepatitis (acute and chronic)	Shultz et al (1991) AAF = 100%
Alcohol abuse	Shultz et al (1991) AAF = 100%
Alcoholic cirrhosis of liver	Shultz et al (1991) AAF = 100%
Alcohol dependence syndrome	Shultz et al (1991) AAF = 100%
Alcoholic fatty liver	Shultz et al (1991) AAF = 100%
Alcoholic gastritis	Shultz et al (1991) AAF = 100% Jones et al (100%
Alcohol induced chronic pancreatitis	Jones et al (2008) RR 100%
Alcoholic liver damage (unspecified)	Shultz et al (1991) AAF = 100% Jones et al (2008) 100%
Alcoholic myopathy	Jones et al (2008) 100%
Alcoholic polyneuropathy	Shultz et al (1991) AAF = 100% Jones et al (2008 100%
Alcoholic psychosis	Shultz et al (1991) AAF = 100%
Alcohol induced pseudo-Cushing's syndrome	Jones et al (2008) 100%
Alcoholic poisioning	Shultz et al (1991) AAF = 100% Jones et al (2008) RR 100%
Alcoholic cardiomyopathy	Shultz et al (1991) AAF = 100% Jones et al (2008) 100%
Air-space transport accidents	*Shultz et al (1991) AAF = 16%*
Accidents caused by fires	*Shultz et al (1991) AAF = 45%*
Breast cancer	Room et al., (2005): 7% attributable to Alc. Worldwide Smith –Warner et al (1998): 10g per day = 9% inc risk; 30-60g per day – 41% inc risk. Jarl, et al. (2009); RR 1.59 (F)
Cardiac arrhythmias	Jarl, et al. (2009); RR 2.23 (F); 2.23 (m)
CHD (this is tricky as some evidence that moderate drinking is protective for CHD)	
Cardiovascular disorders	Britton & McKee., 2000
Cerebrovascular disease	Shultz et al (1991) AAF = 6.5%
Cirrhosis of the liver	Room et al., (2005): 32% attributable to Alc. Worldwide Shultz et al (1991) AAF = 50% Jarl, et al. (2009); RR 13.00 (F); 13.0 (m)
Cholelithiasia	Jarl, et al. (2009); RR 0.50 (F); 0.50 (m)

Degeneration of nervous system due to alcohol	Gartner (2009)
Depression (unipolar)	Rehm et al., 2003 Room et al., (2005): 2% attributable to Alc. worldwide
Diabetes mellitus	Shultz et al (1991) AAF = 5% Jarl, et al. (2009); RR 1.13 (F); 0.73 (m)
Drownings	Room et al., (2005): 10% attributable to Alc. Worldwide Shultz et al (1991) AAF = 38%
Epilepsy	Room et al., (2005): 18% attributable to Alc. Worldwide Jarl, et al. (2009); RR 7.52 (F); 6.83 (m)
Excess blood alcohol	Shultz et al (1991) AAF = 100%
Falls	*Room et al., (2005): 7% attributable to Alc. Worldwide* *Shultz et al (1991) AAF = 35%*
Haemorrhagic stroke	Room et al., (2005): 10% attributable to Alc. Worldwide Jarl, et al. (2009); RR 1.94 (F); 1.54 (m)
Head and neck cancer	Room et al., 2003;
Homicide	*Room et al., (2005): 24% attributable to Alc. Worldwide* *Shultz et al (1991) AAF = 46%*
Hypertension	Shultz et al (1991) AAF = 7.6% Jarl, et al. (2009); RR 4.10 (F); 4.10 (m)
Ischaemic Heart disease	Britton & McKee., 2000 Room et al., (2005): 2% attributable to Alc. Worldwide Jarl, et al. (2009); RR 1.00 (F); 1.12 (m)
Ischaemic Stroke	Room et al., (2005): -1% attributable to Alc. Worldwide Jarl, et al. (2009); RR 1.53 (F); 1.19 (m)
Injuries	Rehm et al., (2003) DALY 42% accounted for by in Britton & McKee., 2000
Injuries from fights and violence	Room and Rossow, 2001
Laryngeal Cancer	Shultz et al (1991) AAF = 50% Jarl, et al. (2009); RR 4.93 (F); 4.93 (m)
Lip, oral cavity, pharynx cancer	Shultz et al (1991) AAF = 50%
Liver cancer	Room et al., (2005): 25% attributable to Alc. Worldwide

	Shultz et al (1991) AAF = 15% Jarl, et al. (2009); RR 3.60 (F); 3.60 (m)
Mouth and oropharynx cancers	Room et al., (2005): 19% attributable to Alc. Worldwide Jarl, et al. (2009); RR 5.39 (F); 5.39 (m)
Motor Vehicle accidents	*Room et al., (2005): 20% attributable to Alc. Worldwide* *Shultz et al (1991) AAF = 42%*
Oesophageal cancer	Room et al., (2005): 29% attributable to Alc. Worldwide Shultz et al (1991) AAF = 75% Jarl, et al. (2009); RR 4.36 (F); 4.36 (m)
Oesophageal varices	Jarl, et al. (2009); RR 9.54 (F); 9.54 (m)
Overdose	Room et al., 2000
Pancreatitis (acute)	Shultz et al (1991) AAF = 42%
Pancreatitis (Chronic)	Shultz et al (1991) AAF = 60%
Pancreatitis (acute and chronic)	Jarl, et al. (2009); RR 3.2 (F); 3.2 (m)
Pneumonia and influenza	Shultz et al (1991) AAF = 5%
Poisonings	*Room et al., (2005): 18% attributable to Alc. worldwide*
Psychiatric problems (alcohol use disorders)	Rehm et al., 2003: 38% of total DALY's Room et al., (2005): 100% attributable to Alc. worldwide
Psoriasis	Jarl, et al. (2009); RR 2.20 (F); 2.20 (m)
Road vehicle accidents (other than motor vehicle)	*Shultz et al (1991) AAF = 20%*
Respiratory tuberculosis	Shultz et al (1991) AAF = 25%
Self inflicted injuiries	*Room et al., (2005): 11% attributable to Alc. worldwide*
Stomach cancer	Shultz et al (1991) AAF = 20% Jarl, et al. (2009); RR 1.32 (F); 1.32 (m)
Suicide	*Shultz et al (1991) AAF = 28%*
Traffic related injuries	*Vingilis (1994)*
Water transport accidents	*Shultz et al (1991) AAF = 20%*
Pregnancy	
Foetal Alcohol Spectrum Disorders	Cargiulo (2007)
Spontaneous abortion	Gutjahr et al,(2001)

Items in italics are invalid for grouping by HRG codes

Appendix 2. Identified conditions attributable to Obesity

Obesity related conditions	
Angina	NAO (2001) Relative risk: 1.8 (F), 1.8 (M) NICE clinical guideline 43 (2006); ScotPHO(2007)
Asthma	Counterweight (2005)
Atrial fibrillation	NICE full guidance (2006)
Back pain	NICE (full guidance, 2006); Counterweight (2005);
Breast cancer (unspecified)	WHO (2002, 2004)
Breast Cancer (postmenapausal)	Foresight report (2007): Relative risk (BMI >30) 1.00 (F age<50), 1.25 (F, age >50) Birmingham et al, 1999; Bergstrom et al., 2001; estimate 25% excess risk
Colon cancer	Bergstrom et al., 2001;estimate 33% inc.risk NAO(2001) relative risk: 2.7 (F), 3(M)
Colorectal cancer	Foresight report (2007): Relative risk (BMI >30): 1.33 (M), 1.33 (F) Birmingham et al, 1999; NICE (2006); WHO (2002, 2004); SCotPHO (2007)
Cardiovascular disease (CHD, stroke, peripheral vascular disease)	Clegg et al., (2002)
Cancer (non-specific)	Pappanage et al., 2009
Cirrhosis of liver	NOF (2007); Liu et al., (2010) increased risk 28%
Coronary Heart Disease	Foresight report (2007): relative risk (BMI >30) 1.80 (M age<65), 1.20(M age>65), 2.00 (F<65), 1.25(F>65) Rappanage et al., 2009; Birmingham et al, 1999; Zhao et al., 2008; WHO (2002, 2004); Counterweight (2005)
Deep vein thrombosis	NOF(2007)
Depression /anxiety	Counterweight (2005)
Diabetes (type 2)	Foresight Report :relative risk:

	BMI 29-31:30.00 (M), 6.70 (F) BMI 31-33: 40.00 (M), 11.60 (F) BMI 33-35: 55.00 (M), 21.30 (F) BMI>35: 90.00 (M), 42.10 (F) NAO(2001) relative risk: 12.7 (F) 5.2 (M) Rappanage et al., 2009; Birmingham et al, 1999; Zhao et al., 2008; NICE(2006); Clegg et al., 2002; WHO (2002, 2004); Counterweight (2005); ScotPHO (2007)
Dyslipidaemia	NICE (full guidance, 2006); Counterweight (2005)
Eating disorder	Counterweight (2005)
Endometrial cancer	Foresight report (2007): Relative risks (BMI >30): 2.52 Bergstrom et al., 2001; estimate 152% inc.risk Birmingham et al, 1999; ScotPHO (2007)
Fatty liver	NOF (2007)
Gall bladder cancer	Bergstrom et al., 2001; 24%inc risk
Gallbladder disease	Foresight report (2007): relative risks (BMI >30) 1.78 (M), 1.78 (F) NAO (2001)1.8 (F), 1.8 (M) Birmingham et al., 1999; NICE (2006); ScotPHO (2007)
Gout	SCotPHO (2007)
Hiatus hernia	NOF (2007)
Heart Attack (MI)	NAO (2001) relative risk: 3.2 (F), 1.5 (M) NICE (2006); Counterweight (2005); ScotPHO (2007)
Hypertension	NAO(2001) relative risk: 4.2 (F), 2.6 (M)

	Rappanage et al., 2009; Birmingham et al 1999; Zheo et al., 2008; NICE (2006); Clegg, et al., 2002; WHO (2002, 2004); Counterweight (2005); ScotPHO (2007)
Hyperlipidemia	Birmingham et al, 1999;
IGT	Counterweight (2005)
Kidney cancer	Foresight report (2007); Relative risk (BMI 30+) 1.84 (M), 1.84 (F) Bergstrom et al., 2001; estimate 84% inc.risk
Liver cancer	NOF (2007)
Oesophageal cancer	Foresight report (2007): relative risks (BMI 30+) 1.00 (M), 1.00 (M)
Osteoarthritis	Foresight report (2007) Relative risks: BMI 30-35: 1.80 (M), 1.90 (F) BMI 35-40: 2.11 (M), 1.98 (F) BMI >40: 3.88 (M), 3.29 (F) NAO (2001) 1.4 (F), 1.9(M) NICE (2006); Oliveria et al., 1999; WHO (2002, 2004); Counterweight (2005); SCotPHO (2007)
Ovarian cancer	NAO (2001)relative risk: 1.7 NICE (2006); ScotPHO (2007);
Prostate cancer	Bergstrom et al., 2001; estimate 12% inc.risk SCotPHO (2007)
Pulmonary embolism	Birmingham et al, 1999;
Sleep apnoea	Young et al., 1993; NOF (2007); Counterweight (2005);
Stress incontinence	NICE (full guidance, 2006); NOF (2007)
Stroke	Foresight report (2007): relative risk (BMI 30+): 1.50 (M<65), 1.15 (M>65), 1.60 (F<65), 1.20 (F>65) NAO (2001) relative risk 1.3 (F), 1.3

	(M) Birmingham et al., 1999; Zhao et al., 2008; NICE (2006); WHO (2002,2040); Counterweight ; ScotPHO (2007)(2005);
Uterine cancer (corpus uteri cancer)	WHO (2002)
Varicose veins	NOF (2007)
Vascular problems	Counterweight (2005)
PREGNANCY	
Caesarean delivery	Garbaciak et al., 1985;
Gestational diabetes	Garbaciak et al., 1985;
Hypertension in pregnancy	Garbaciak et al., 1985;
Neural tube defect	Shaw et al., 1996; Werler et al., 1996.
Pre-eclampsia	Garbaciak et al., 1985;