Section A: CPH to complete	
Name:	*Robin Ireland, Alexandra Holt & Simon Capewell**
Job titles:	CEO & Researcher, Health Equalities Group; *Professor of Clinical Epidemiology
Address:	Health Equalities Group, 2nd Floor, 151 Dale Street, Liverpool, L2 2JH
Guidance title:	Disability, dementia and frailty in later life - mid-life approaches to prevention
Committee:	PHAC D
Subject of expert testimony:	Population based approaches to prevention
Evidence gaps or uncertainties:	

Do population-based approaches to behavioural risk factors for dementia, disability and frailty in later life work?
Are they useful for mid-life intervention, in order to prevent dementia, disability and frailty in later life?

Promoting brain health: Developing a prevention agenda linking dementia and non-communicable diseases

Preventing cardiovascular diseases globally – gains achieved from tackling the major risk factors

Research over the past five decades has shown with increasing clarity that there are four major risk factors for non-communicable diseases. These are poor diet, tobacco, alcohol and inactivity. There is mounting evidence to suggest that dementia is influenced by the same four major risk factors. Thus preventing dementia and promoting brain health should take a similar approach as preventing other non-communicable diseases.

Needing a better understanding of the risk factor contributions to disease burden has encouraged a number of comparative studies. The Global Burden of Disease (GBD) Studies from 1990 have provided the first comparative assessments of death and disability adjusted life-years (DALYs) on a global scale. (Murray & Lopez, 1996).

A follow-up study, GBD 2010, re-assessed the burden of disease and demonstrated major trends, with a shift in disability adjusted life years (DALYs) from communicable diseases, mainly in children, to non-communicable diseases for this twenty year period. (Lim et al, 2013). In 2010, the five leading risk factors for men were tobacco smoking including second-hand smoke, high blood pressure, alcohol use, diet low in fruits, and high fasting plasma glucose. These were found to be major causes of adult chronic disease, especially cardiovascular diseases and common cancers.

Crucially, the study found a large attributable burden for dietary risk factors which account for approximately 40% of all diseases globally.

Furthermore, high blood pressure was shown to be the biggest single risk factor for global disease, and primarily for cardiovascular disease. High blood pressure in turn powerfully reflects a number of different diet related factors, particularly high salt intake, also high alcohol intake and obesity.

The GBD analyses are supported by earlier, simpler reviews. In 2009, Danaei et al. estimated the number of deaths attributable to major dietary, lifestyle, and metabolic risk factors in the United States. Tobacco smoking and high blood pressure were shown to be responsible for an estimated 467,000 and 395,000 deaths respectively, accounting for about one in every five or six deaths in US adults. Overweight–obesity and physical inactivity were each responsible for nearly one in ten deaths. The dietary risks with the largest mortality effects were high dietary salt, low dietary omega-3 fatty acids, and high dietary trans-fatty acids.

Death rates from coronary heart disease (CHD) have been falling in the UK, although not as fast as in some other countries. For example, in the UK the death rate for men aged 35-74 fell by 37% between 1986 and 1996, however it fell by 45% in Denmark and Norway and by 43% in Australia. For women in the UK, the death rate fell by 36%, however in Australia, Finland and New Zealand the rate fell more steeply, by 49%, 44%

and 44% respectively. (Lim et al, 2013).

The effect of diet and lifestyle on disease and especially CHD becomes particularly apparent when looking at countries such as China and Japan. Heart disease is the second most prominent cause of mortality in Japan, and CHD accounts for approximately half of heart disease–related deaths. The CHD mortality rate in Japan has traditionally been one-third to one-fifth that of the United States. However there is now growing concern about a possible increase in the incidence of, and mortality from CHD in Japan, due to the adoption of westernized lifestyles, high-fat diets and sedentary work patterns; all associated with major socioeconomic development since the 1960s.

Eastern European countries such as the Ukraine and the Russian Federation suffer some of the highest and increasing cardiovascular disease (CVD) rates in the world. That is in marked contrast to most economically stable European countries where declines in CVD mortality rates have been experienced over the past 30 years. In 2001, there were 7.3 million deaths and 58 million DALYs lost due to CHD worldwide. (Gaziano et al, 2010). Three quarters of global deaths and 82% of the total DALYs due to CHD occurred in the low and middle-income countries. For example, cardiovascular disease mortality rate is 6-fold higher among men and women in the Ukraine compared with people in France.

In order to understand the effects that risk factors have on cardiovascular disease and life expectancy Berry et al (2012) carried out the Cardiovascular Lifetime Risk Pooling Project. The project was designed to collect and pool data from numerous longitudinal epidemiologic cohort studies conducted in the United States over the previous 50 years, and estimated the risk of men experiencing a cardiovascular disease event and/or death at age 90 based on four major risk factors at age 45, these being high cholesterol, high blood pressure, diabetes and smoking.

Starting at age 45, men with healthy features (non-smoking, low cholesterol, low blood pressure and no diabetes) had a 40% chance of being alive and disease free through to age 90. (of the remainder, approximately 30% experienced a non-fatal CVD event and 30% died). Conversely, already having all four risk factors at the age of 45 year had double the chance of a CVD event (63%), with a 40% chance of death. NONE would be alive and free of cardiovascular disease at age 90. (Berry et al 2012)

Cardiovascular disease and coronary heart disease are eminently preventable, simply by reducing these major risk factors. Indeed, over the past 40 years, CHD deaths have fallen by 60%, 70% even 80% in high income countries. In the 1970s Finland was one of the world's unhealthiest nations. Diet was poor, smoking was high and heart disease was at record levels. At that time Finns consumed lots of butter, sausage, salt and cigarettes. Fruits and vegetables were rarely consumed and were often referred to as animal feed. From 1972, community-based activities and innovative programs were set up to increase awareness and take action against the CVD risk factors. As a result, CHD death rates in Finnish men plummeted 75%, and life expectancy increased by 10 years. Much of this mortality reduction came from dramatic reductions in smoking, and in high blood pressure and high cholesterol (reflecting healthier diets with decreased salt and saturated fat intake, along with increased fruit and vegetable consumption (Pietinen et al, 1996).

In the USA and UK , CHD mortality has halved since its peak in the 1970s. improvements

risk factor have made a bigger contributions from than improvements in medical treatments (Ford et al, 2007).

Thus, between 1980 and 2000 CHD mortality in the United States fell by approximately 60%. Improvements in total cholesterol, blood pressure, and smoking contributed approximately 24%, 20% and 12% of the decreases in CHD deaths, respectively. However, the substantial increase in obesity and the 3% absolute increase in diabetes prevalence generated approximately 70,000 additional deaths overall, which , in isolation would have increased CHD mortality by 17%. (Ford et al, 2007).

These results have been supported by a number of further studies, with as much as a 74% fall in CHD mortality attributed to improved risk factors being recorded in Iceland between 1981 and 2006 (Aspelund et al, 2010), 55% in Scotland (Capewell, Morrison & McMurray, 1999) and 53% in England and Wales (Unal, Critchley & Capewell, 2004). Thus in the UK between 1980 and 2010, smoking prevalence fell from 40% to 20%, systolic blood pressure decreased from 143mmHg to 133mmHg, and cholesterol from 6.5mmol/l to 5.8mmol/l (Unal, Critchley & Capewell, 2004; Bajekal et al 2012)).

How were these impressive improvements achieved?

The reduction in smoking prevalence can be mainly attributed to systematically addressing the "3As": Affordability, Accessibility and Acceptability. Affordability in terms of taxes, price and a crackdown on smuggling; availability in regards to retailer licencing and age checks; and acceptability in terms of advertising bans and Smoke Free laws (TCS 2008 Joosens)

The same "3As" may also be suitable for planning the systematic reduction and control of junk food consumption. Affordability relates to taxes, price and the subsidisation of healthy options, Acceptability refers to warning labels and advertising bans, and Availability to junk free schools and incentivising retailers for healthy options.

Population policies can be far more powerful than individual approaches. But why??

Individual-based approaches require continuous and expensive screening processes to identify high-risk individuals. In contrast, we know from the successes that have been seen with tobacco, alcohol and salt that population level policies require no screening or targeting, and also have much greater impact in reducing disease, and reducing inequalities. (NICE 2010, Capewell & Graham 2011). An upstream approach using the "3 As", where the focus is on population-wide prevention rather than individual behavior modification and treatment has much more impact and can be cost-saving (Barton BMJ).

Diet is a powerful common determinant of cardiovascular disease, obesity, diabetes, and several cancers. Unfortunately both the optimal dietary targets and evidence based interventions to achieve them have been unclear for decades. However, recent scientific advances allow eight dietary targets to be prioritised for the prevention of cardiovascular disease. Six are aimed at increasing consumption of healthy foods, including nuts, wholegrains, fruit and vegetables, and two at limiting specific harmful nutrients: salt and trans fats. The proposed targeted changes are modest, reflect changes achieved in population based interventions, and are supported by observed consumption distributions within and across countries. Meeting any one target would produce substantial benefit. (Mozaffarian & Capewell, 2011) . Achieving all eight targets together could halve global CVD mortality, annually preventing more than five million

premature deaths from CVD (and 10 million deaths from cardiovascular disease overall). Plus simultaneously reducing obesity, diabetes, and common cancers. In less than one decade, these modest dietary improvements could prevent one million CVD deaths in the US and 30 million CVD deaths worldwide. (Mozaffarian & Capewell, 2011) .

Other speakers will demonstrate that dementia is powerfully influenced by the same four major risk factors. In conclusion, including dementia in the non-communicable disease agenda will therefore greatly strengthen the case for slowing age-related cognitive decline along with the prevention of premature cardiovascular disease and common cancers. Thus, <u>preventing dementia and promoting brain health should take a similar approach as preventing other non-communicable diseases</u>.

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