

**Relevant points to include in the answers:**

Question 1

- a) DALY = YLL from colorectal cancers = sum (number of deaths from colorectal cancer at age  $a$  multiplied by remaining life expectancy in a fictitious low-mortality population) over age  $a$ .  
+ YLD from colorectal cancer = number of individuals with this disease multiplied by disability weight.
- b) Bere et al. find significant effect of free fruit/vegetables on intake of fruit/vegetables at school and the whole day, plus effect on intake of candy/soda/snacks among those whose parents had low education. Effect of paid fruit (i.e. giving parents opportunity to “subscribe”) only on intake of fruit/vegetables at school.

Question 2

- a). High education: knowledge about health, general analytical skills, job with fewer occupational hazards (higher income is controlled for), educated men more likely to be married (little about that in the course readings), neighbours/friends/colleagues/spouse/children also tend to have high education. And the estimate reflects selection: health in childhood, intellectual resources, self-discipline, parental education/income (course paper about that) affect both education and later health/mortality

High income: purchase health promoting goods, including health services. Same type of marriage/“network” argument, although control for the average at municipality level, and similar type of selection argument.

High average income in municipality: on the positive side high income in municipality/neighbourhood may lead to a nicer (and safer) physical environment encouraging outdoor physical activity, better availability of high-quality health care?, learn from or feel pressure from health behaviour of healthy neighbours. (Little about this in course readings). On the negative side: given own income, a higher average means lower relative income, which could cause a psychosocial stress affecting lifestyle or having bad health effects through more direct physiological mechanisms. (There is a course paper on relative deprivation) Selection also contributes.

High inequality: higher average score on relative deprivation (difficult point). A person’s health may be influenced by his/her feeling of relative deprivation, with possible implications for everyone. Differences in lifestyles/opportunities because of differences in income, plus overall strong feeling of deprivation, may undermine social cohesion in society, with implications for everyone. There is a course paper on what social capital/cohesion is, and the conclusion of the review is that there is not clear evidence on health effects. Some diffuse ideas in the literature about undermining acceptance for public spending, including on health. Selection also contributes.

- b). Average morality also depends on the average of the contribution from the individual income effect. Larger variation, given the average income, makes this contribution less negative/more

positive because of the diminishing beneficial effect of higher income as the income increases. Furthermore, some of the estimated effect of inequality is a result of selection.

### Question 3

a). Never-married: less support in daily life and when sick, no social control by spouse, with implications for life style; this affects the chance of developing diseases, and surviving them, and accident risks. Few never-married have children, who may have similar protective effects. Also some physiological effects of childbearing (primarily on cancer), among women.

Previously married: a version of these arguments (plus stress from having lost partner, especially if quite recently).

Selective effects: socioeconomic resources (controlled only partly by including education), earlier health and attitudes (including lifestyle preferences) affect marriage/cohabitation/childbearing as well as later health/mortality.

b). Yes, such patterns reported in the literature. Spouse's education has effects similar to own education, plus operates through the spouse's health, but barely mentioned in course readings. Selective influences also as for own education + people with certain characteristics that have not been controlled for are more likely to attract better educated spouse. (Little about this in the course readings.)

### Question 4

Differences between municipalities because of: people who live there are different in terms of sociodemographic and other characteristics (individual and aggregate-level effects of that) + man-made social/physical environment different for other reasons (e.g. quality of health care, air pollution) + unchangeable physical environment different (e.g. exposure to UV).

### Question 5

Advantage: timely, often used and thus comparable to other countries/times. Disadvantage: period I.e. hypothetical, reflects reality only when mortality is constant, which is unlikely. Period I.e. may be distorted by changes in age pattern of mortality. Extra credit to those who comment that life expectancy is expected value in  $d(x)$ , and that period compression may also be misleading.

### Question 6

Higher age at first birth -> effects on parents' education and long term income, lifestyle?, with further implications for health + biological effects for women (esp higher risk of breast cancer).

Effect on children of having older parents: higher risks of some diseases have been suggested (Down, diabetes, childhood cancer, some psychiatric conditions, but much of this quite rare anyway; details barely mentioned in the course readings). On the positive side: More mature, higher income.

Relevant in poor, but probably much less in rich settings: higher risk of low birth weight and high child mortality (at least compared to medium age), in part because of mother's accumulation of poor health over age + less likely to survive until child becomes an adult.

Course paper based on sibling model indicates positive impact on height and fitness (and education, which could have longer term health effects). Difficult point: Some of that may be a birth-cohort effect (can't get rid of that in spite of what authors claim); anyway, an accompanying birth cohort effect would be relevant to include also for this couple – assuming they are quite similar to those in the paper.