Factors Affecting Mortality

Factors Contributing to Mortality and Morbidity Variation

Rates vary by

- Age
- Gender
- Geographical Area
- Social Class
- Time

Important causal Factors (may be correlated)

- Occupation
- Nutirition
- Housing
- Climate
- Educational Attainment
- Lifestyle
- Genetics

How do you think L.A. companies can rate their polices forthese sort of factors

Adverse Selection

This is the tendency for high risk individuuals to be more likely to buy insurance

What do you think insurance companies can do about this:

Moral Hazard

Moral Hazard refers to the situation where a person takes more risk because he knows he has insurance

Is this a big issue for life insurance

How should companies repond to this risk

Single figure indices

The purpose of single figure indices is to summarise a death rate for a whole popil;ation for the purpose of comparing it with another population

Typically weighted averages would be used as they are better served for comparisons between different populations

What are the limitiations of such indices

Crude Death Rate

This is just the 'average' death rate

$$CDR = \frac{\sum_x E_x^c m_x}{\sum_x E_x^c}$$

That is simply the total observed deaths divided by the total exposed to risk

You can also think of this as:

$$CDR = \frac{\sum_x d_x}{\sum_x E_x^c}$$

Directly standardised Death Rate

$$DSDR = \frac{\sum_x {}^s E_x^c m_x}{\sum_x {}^s E_x^c}$$

If we write this as $DSDR = \frac{\sum_x {}^s E_x^c m_x}{\sum_x {}^s E_x^c} = \sum_x \beta_x m_x$ where

$\beta_x = \frac{{}^s E_x^c}{\sum_x {}^s E_x^c}$ then we can directly compare two populations as follows:

$$DSDR^I - DSDR^{II} = \sum \beta_x (m_x^I - m_x^{II})$$

Trying to do this for a crude mortality rate produces a distortion effect

Comparative Mortality Factor

The ***comparative mortality factor*** allows us to create a dimensionless index. It is defined as follows:

$$CMF = \frac{DSDR}{CDR^s} = \frac{\sum {}^s E_x^c m_x}{\sum {}^s E_x^c {}^s m_x}$$

which can also be written:

$$CMF = \frac{DSDR}{CDR^s} = \frac{\sum {}^s E_x^c {}^s m_x \left(\frac{m_x}{{}^s m_x}\right)}{\sum {}^s E_x^c {}^s m_x}$$

Standardized Mortality Ratio

The ***standardized mortality ratio*** is the ratio of the 'total observed deaths' to the 'total expected deaths'

$$SMR = \frac{\sum E_x^c m_x}{\sum E_x^{cs} m_x}$$

It is similar to the CMF but note the different weights used

Advantages and Disadvantages of Single Figure Indices

Advantages

Enables easy comparison to be made between many different experiences, whereas a comparison of age specific mortality rates would be difficult to assimilate, and often subject to large sampling error.

Some indices (such as the SMR) allow mortality of different experiences to be compared against a common standard.

Some indices have practical advantages: e.g. the CDR can be calculated entirely without age specific data; the SMR can be calculated without the need for regional age specific mortality rates; i.e. the individual m_x.

Disadvantages

Some indices (such as the CDR and SMR) may be sensitive to differences in age structure between populations as well as to differences in mortality, making the interpretation uncertain.

Single figure indices cannot show how the differences in mortality between regions may vary by age, hence important features of the comparisons may be overlooked.

Single figure indices are often biased towards a certain group.