The social distribution of health
Definition, measurement and context

Jacob Etches
Lupina Doctoral Fellow
Epidemiology program
Department of Public Health Sciences
Faculty of Medicine, University of Toronto

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Outline

• Terminology
• The textbook story
• Why do we care?
• Definition & measurement
• Trends and inter-jurisdictional comparisons
Terminology

- We can attempt to \textit{maximize} given measures of the health of populations
- This maximization can be \textit{efficient} or inefficient
- The maximand can be an \textit{aggregative} or a \textit{distributive} measure
- The common phrase “equity-efficiency trade-off” presupposes that the maximand is aggregative
Univariate vs. social inequalities

- **Univariate inequalities**: some people are healthier, or live longer, than others.
- **Social inequalities in health** (bivariate): socio-economic advantage is positively associated with health and longevity
Aggregative measures: health

- Health-Adjusted Life Expectancy
- Overall mortality rate
- Infant mortality rate
- Maternal mortality rate
- Prevalence of disability
- WSIB claims rates
Distributive measures: health

- Relative risk
- Risk difference
- Population attributable risk
- Agresti’s alpha
- Index of dissimilarity
- Slope index of inequality
- Concentration index

Common & very problematic

Uncommon & problematic

Uncommon & least problematic
The textbook story

• Just about every measure of socio-economic status shows a graded, positive association with health and longevity

• Common measures of socio-economic status include: education, occupation, income

• These are ordinal and can be finely graded, though in practice they are often measured coarsely
Figure 6-1. Mortality from all causes by year of follow-up and grade of employment, in Whitehall (U.K.) male civil servants, initially aged 40–64. Source: Marmot et al., 1991.
Figure 1. Male survival curves by earnings quintile for CPP contributors and for all Canada (conditional on survival to age 65).
Figure 6-3. Mortality of men by social class, housing tenure, access to cars and age at death, 1976–1981. Longitudinal study, England and Wales. Source: Goldblatt, 1990.
Survival on the Titanic

Chart 9
Total potential years of life lost (PYLL) (0-74) by cause of death (International Classification of Diseases chapters) and income-related excess PYLL (0-74), urban Canada, 1996

<table>
<thead>
<tr>
<th>Cause</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Neoplasms</td>
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<tr>
<td>Excess</td>
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<td>Injuries</td>
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<tr>
<td>Perinatal</td>
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<tr>
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<tr>
<td>Congenital</td>
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<tr>
<td>All other</td>
<td>13.5</td>
</tr>
</tbody>
</table>

Data sources: Canadian Mortality Database and supplemental address files; special tabulations of census population data

Note: Excess PYLL is defined as the difference between observed and expected PYLL, where expected PYLL is that which would have occurred if the age- and sex-specific mortality rates in the richest quintile had applied to the total population.

Chart 10
Income-related excess potential years of life lost (PYLL) by cause of death (International Classification of Diseases chapters), urban Canada, 1996

<table>
<thead>
<tr>
<th>Cause</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Circulatory</td>
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<td>Digestive</td>
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<tr>
<td>All other</td>
<td>14.5</td>
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</table>

Data sources: Canadian Mortality Database and supplemental address files; special tabulations of census population data

Note: Excess PYLL is defined as the difference between observed and expected PYLL, where expected PYLL is that which would have occurred if the age- and sex-specific mortality rates in the richest quintile had applied to the total population.
Effects of smoking and occupational status similar in magnitude

**Figure 6-14.** Ten-year mortality risk by smoking behavior and employment grade (age-adjusted figures) of Whitehall male civil servants. *Source:* Davey Smith and Shipley, 1991.

**Taken from:** Amick et al., 1995
In addition to socio-economic status, gender and race can play important roles.

Sen, *Sci Amer*, May 1993
Inequalities in health: who cares?

• Any argument for reducing inequalities in health is inherently normative.
• The phrase “reducing inequalities in health” is of such great rhetorical appeal that most researchers simply assume that it is a moral imperative.
• The small body of work on the ethics of inequalities in health varies greatly in quality.
A two-part argument

• Why equality?
• Equality of what?
Why equality?

- Sen suggests that every system of justice demands equity in some space
  - Libertarians: liberty
  - Utilitarians: equal valuation of utilities
  - Egalitarians: various
  - Human rights movement: rights
- It may be that no ethical system based on impartiality can avoid demanding equality of something.
Equality of what?

- **Rawls**: primary goods (health is off the table)
- **Sen**: capabilities (health is central)
- **Others**: liberty, rights, resources, welfare, income…
- Due to human diversity, equality in one space will often necessitate inequality in other spaces
  - Eg. Criticisms of minimum income schemes: the poor are not of uniform need
Arguments for why people *claim* to want reduction in inequalities in health

1. If the poor were healthier, economies would grow more quickly.
2. Inequalities in health demand economic equalization, which will solve all social problems and promote health too (by reducing inequalities).
3. Population health promotion through the reduction of inequalities in health.
4. Inequalities in health are unfair, unjust, or inequitable.
Health equity promotes economic growth

- Maximand is production (aggregative)
- Health and its equitable distribution are valued only instrumentally for contributing to productivity
- No conflict between aggregative and distributive measures of health acknowledged

Circular argument?

- Production in an affluent society: valued instrumentally for economic security, which at least in part is valued for consequent health...
Economic equalization will promote equity in health (among other things)

- This is an argument for a type of intervention
- *not an argument for why inequalities in health should be reduced*
- No conflict between aggregative and distributive measures of health acknowledged
- Space to be equalized poorly defined
Health promotion through health inequality reduction

• Maximand is aggregative health
• No conflict between aggregative and distributive measures of health acknowledged
• Whether reducing inequalities could actually improve the aggregative health of the population may be an empirical question
Health equality is just, fair or equitable

- Conflict between aggregative and distributive measures of health rarely acknowledged
- (including “health as a human right”)
- Many arguments conflate equitable resource allocation with the equitable distribution of health
Criteria for inequity

• **Avoidability**: potential for equalization is not an argument for equalization (though many make this leap).

• **Not free choice**: freedom to act on one’s desires without coercion is rarely distinguished from freedom from contextually-determined desires.

• **Responsible agent**: if no one is demonstrably culpable, and no agent is charged with rectifying unequal distributions of goods, does inequity exist?
  – Is this not a defining aspect of governance?
Conflict between maximands

If we are at C, then by implementing those pro-equality interventions that most maximize aggregate health first, we have nothing to worry about until we reach B.
Less optimism – more dilemmas

Rate of some health problem

Individual advantage
Definition and measurement

- Measurement reveals the inadequacy of our definitions
- “The idea of inequality is both very simple and very complex. At one level it is the simplest of all ideas and has moved people with an immediate appeal hardly matched by any other concept. At another level, however, it is an exceedingly complex notion which makes statements on inequality highly problematic.” –Amartya Sen, 1973
## Distributive measures: health

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<tr>
<th>Measure</th>
<th>Health input</th>
<th>SES input</th>
<th>Effect/Shortfall/Inequality</th>
<th>Relative/Absolute</th>
<th>Detects reverse gradients</th>
<th>Detects group size</th>
<th>Detects any redistribution</th>
<th>Detects pop’n size</th>
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* as from logistic regression
### Absolute v. relative measures

Sundquist & Johansson, 1996 (Sweden)
Education: high v. low; ages 25-59

<table>
<thead>
<tr>
<th></th>
<th>Absolute: Crude rate difference /100,000 py</th>
<th>Relative: Crude rate ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Men</td>
<td>4340.5</td>
<td>2.2</td>
</tr>
<tr>
<td>Women</td>
<td>3183.5</td>
<td>3.0</td>
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Detecting reverse gradients
Index of dissimilarity

Obs-Exp

Expected deaths

D1
D2
D3
D4

Low SES High
The effect of group size
Rate difference and ratio
PAR

RATE
mean

A1  A2  A3

Low  SES  High
Concentration Index (CI/Clg)

Cumulative proportion by SES

1 or $\mu$

Cumulative health burden

Low   High
Gender differences in mortality inequality

• Problem: is there a difference in social inequality in mortality between men and women in OECD countries

• What are the measurement decisions that must be made in order to answer this question
Methods

• Identify & review published studies
• Extract gradient data
• Review methods for the summary measurement of socioeconomic gradients in health
• Calculate all possible summary measurements with extracted data
Proportion of pairs where men experience more inequality

<table>
<thead>
<tr>
<th>Measure</th>
<th>Absolute</th>
<th>Relative</th>
</tr>
</thead>
<tbody>
<tr>
<td>RR/RD</td>
<td>.97</td>
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<td>.53</td>
</tr>
<tr>
<td>Agresti</td>
<td>NA</td>
<td>.50</td>
</tr>
</tbody>
</table>
Relative and absolute inequality in child mortality in developing countries

- DHS data includes household wealth & child mortality
- On the wealth measure see:
  - Filmer D, Pritchett LH. Estimating wealth effects without expenditure data--or tears: an application to educational enrollments in states of India. *Demography* 2001 Feb;38(1):115-32
Relative and absolute measures of social inequality in health

Forty-four poor countries, five wealth divisions of equal size

[Graph showing a scatter plot with country names such as Brazil, India, Senegal, and others plotted on a line that indicates the generalized concentration index (rank 0 is best).]
Relative social inequality in child mortality and average child mortality

- Concentration index
- Average child mortality rate per thousand

Countries represented on the graph include:

- Kazakhstan
- Uzbekistan
- Zimbabwe
- Namibia
- Tanzania
- Haiti
- Uganda
- Comoros
- Togo
- Nepal
- Burkina Faso
- Malawi
- Niger
- Mozambique
- Pakistan
- Dominican Republic
- Bolivia
- Egypt
- Peru
- Brazil
- India
- Korea

World Bank Data
Absolute social inequality in child mortality and average child mortality

[Graph showing the relationship between generalized concentration index and average child mortality rate per thousand for various countries.]
Relative vs. absolute

Relative inequality = \frac{\text{Absolute inequality}}{\text{Mean level of health}}

The same units (so they cancel)

No units (dimensionless)

Q: Should we value units of absolute inequality as a function of the mean level of health?
Relative or absolute?

• Relative measures assume that the marginal value of units of health depends on the average level of health - *but the direction of the changing marginal value depends on the scale in question.*

• Absolute measures may be more appropriate for policy, while relative ones may be more useful for analysis of mechanisms.
Trends and comparisons

• Aggregative trends
  – Determine the association of absolute and relative distributive measures

• Distributive trends and inter-jurisdictional comparisons using distributive measures
Figure 1.2 Trends in life expectancy by demographic region, 1950–90

Life expectancy at birth (years)


- Sub-Saharan Africa
- India
- China
- Other Asia and islands
- Latin America and the Caribbean
- Middle Eastern crescent
- Formerly socialist economies of Europe
- Established market economies

Source: Appendix A.
Country with highest life expectancy
This and the previous chart are from: Oeppen & Vaupel, *Science*, 10 May 2002.
Distributive trends and comparisons

• Two kinds of problems
  – Lack of quality data
    • Often only two time points for trends
    • Often only self-assessed health
  – Inappropriate analytic methods
    (often no analysis)
A time of uniquely great international inequality in health?

What about individual-level social inequalities?

World Bank Development Report 1993
Fig 1  Probability of men in non-manual and manual classes dying between the ages 45 and 65⁷⁹
FIGURE 1—All-cause mortality by social class, men aged 35 through 54 years, North Carolina, 1984 through 1993.

Note. Three-year running average rates are graphed. For all four class groups, Black men are represented by closed symbols and solid lines, and White men by open symbols and dashed lines. Triangles = primary white collar; circles = secondary white collar; diamonds = primary blue collar; squares = secondary blue collar.
Chart 3
Infant mortality rates, by neighbourhood income quintile, urban Canada, 1971 to 1996

Deaths per 1,000

- Q1 - Richest
- Q2
- Q3
- Q4
- Q5 - Poorest

Data sources: Canadian Mortality Database and supplemental address files; special tabulations of census population data

Wilkins et al., Suppl Health Rep, 13, 2002
Wilkins et al., 
*Suppl Health Rep*, 13, 2002
Men aged 20-64, all-cause mortality England & Wales

Rate ratio

Rate difference

Rate

Data from: Acheson Report, 1998
Fig. 2. Concentration curves for SAH (in terms of deviations from the diagonal).
Figure 6-13. Mortality amenable and nonamenable to medical care, in England and Wales, for men aged 15–64, by social class. Source: Mackenbach et al., 1989.
Health education: improving the aggregate at the expense of the distributive?

Conclusions

• Definition and measurement of inequality in health is beginning, but developmental
• Justifications for reducing inequalities in health are often poorly argued
• Limited research, poor data, weak and heterogeneous analytic methods prevent general comparative statements about health inequality in space and time
Future directions

• Applications pending to link the LAD to the Canadian Mortality Data Base
• Investigating appropriateness of the PSID for comparative American data
• CIHR doctoral award will provide support for the next three years (or so)
Jacob Etches

e-mail: jetches@iwh.on.ca

slides: http://individual.utoronto.ca/etches/