Monitoring Health Inequalities by SES: Lessons from Scotland

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How are we monitoring health status and inequalities over time?

- In report after report, across almost all developed nations, the great majority of health outcomes monitored at the population level are based on:
  - Mortality statistics, often summarized across all ages as life expectancy and sometimes combined with quality-of-life/morbidity data, as “health expectancy” – our most holistic routine measure of population health status
  - Routinely collected birth outcomes, especially birth-weight, gestational age, and combinations thereof
  - Hospitalization rates, usually by cause (often affected by small-area-variation due to health-care factors, independent of disease burden)
  - Cancer – and, rarely, other (apart from notifiable infections’) – disease incidence, ideally from multi-source registries
  - Self-reported survey data – e.g. self-assessed health status, smoking, height & weight, activity levels, food intake, etc. (“warts and all” – some cultural framing occurs; e.g. self-assessed health status in Newfoundland!)
Overarching Questions:

1) Are Scottish health inequalities by socio-economic status -- *some of the steepest in all of Europe* (see slides to follow) -- as measured by these international standard indicators, moving in the right direction?

2) If not, why not? Could it be partly because these routinely collected health statistics are now in fact rather *insensitive indicators of health inequalities, inherently difficult to budge in less than a human generation* (i.e. with feasible policy and program interventions, once they reach present levels)?

3) What sort of broader indicators, of *health and function in the “healthy” population*, might be more amenable to demonstrating in achieving *equitable health improvement “within a decade”*?
Scottish HI Indicators in Current Use

• Recent Scottish analyses of health inequalities’ time-trends and patterns, by SES, over the last decade or more, are among the most statistically sophisticated in the world – BUT...

• The rich-poor gaps in about a dozen key Scottish health outcomes appear, over the last dozen years, to be frozen in time (virtually static)...

• While one might conclude – and there is some truth in this – that insufficient policy and program effort has gone into actually reducing the “rich-poor” and “educated-uneducated” gaps in Scottish society, there are compelling reasons to believe that the population health indicators currently in use in Scotland aren’t very responsive to any feasible PH interventions likely to be actually carried out.

[Frank J and Haw S. The Milbank Quarterly 2011;89 (4):658-93.]
Absolute Range: Healthy Life Expectancy (Males)

Absolute Range: Healthy Life Expectancy (Females)

Criticism: major causes of mortality – and many other routinely collected health outcomes -- are no longer “sensitive to change”, in the short run

- Conventional wisdom among epidemiologists: “Improved medical care – and indeed most deliberate health policies and programs – at least in developed countries, now only reduce broad categories of mortality rather slowly, and all-cause mortality very slowly.”

- Life expectancy, and even all-cause mortality rates, seem subject to “epidemiological momentum / inertia:” they are hard to shift quickly, especially when deaths occur mostly among the elderly, where chronic disease – developed over a lifetime of habitual risk-factor exposures -- and competing risks -- matter!

- The life-course epidemiological perspective, and the work of David Barker et al. further suggest that “embedding” of early life exposures and experiences has a very long reach, impacting late-life health and mortality – so that living conditions one average lifetime ago can act to *damp* current policies’ and programs’ progress on late-life mortality.
Absolute Range: Alcohol-Related Mortality
45-74y – Scotland 1998-2008
(European Age-Standardised Rates per 100,000)

**Question:** Are the poorest drinkers dying more often, or are more heavy drinkers just dying in the poorest places (after losing house and job)??

*Source: Scottish Government Health Analytical Services (2010) Long-term monitoring of health inequalities*
“SES Dose-Response Relationship”: Alcohol-Related Mortality and SIMD of Residence (at death)

Might the poorest have *artificially* worse rates, based on post-codes of “residence,” through *reverse causation*?

The cup is half-full: all SES group’s rates have come down, equally. But the trend in the Relative Index of Inequality doesn’t show that..

The RII has steadily increased over time – illustrating a disadvantage of the RII (when adverse outcomes are improving)

SES gap not decreasing proportionately faster than overall rate: RII goes up over time – and the Minister is unhappy (“Why should our record look bad if things are improving?”)
Absolute range: First-ever hospital admissions for heart attack < 75y – Scotland 1997-2008 – i.e. those “arriving alive”

Something odd is happening here – why is the ratio of poorest- to richest-decile admitted-alive cases only about 2 to 1, when for deaths it is closer to 3.5 to 1? Which sorts of people’s deaths are more likely missing in admissions data?

All hospital-based studies omit a substantial fraction of “sudden deaths” dying before admission.

In Scotland, the MONICA Glasgow Study, with a population-based registry that included all CHD deaths (including sudden and untreated) also showed:

» Only 66% of “coronary death cases” aged 25-64 reached hospital and 2/3 of all deaths were out of hospital, with clear SES gradients in total and out-of-hospital mortality, but none in the subset who reached hospital (Morrison et al BMJ 1997;314:541)
Of 93,701 incident AMI events, 50,075 (53%) resulted in death, of which 42,189 (84%) died within the first day – ergo, surely prevention is at least as important as care?

Should there be a focused research program on sudden death here?
Local Scottish data now show 5-fold+ gaps across SES extremes

Source: Wald and Nicolaides – Bouman, 1993; Bridgewood et al, 2000

Smoking among the proportion of women who smoke has declined sharply but the gap in prevalence between poorer and better off groups is widening
NO PROGRESS OVERALL -- BUT DOES IT MAKE SENSE TO COMBINE ALL CANCERS IN ONE STATISTIC, WHEN THEY DIFFER SO WIDELY IN THEIR SES GRADIENTS’ DIRECTION AND SHAPE?

PATTERN A: ESSENTIALLY NO GRADIENT

[Wait a minute! Why are Scots women’s breast cancer incidence rates not showing the usual MDC pattern: strong “reverse” SES gradient – usually due to fewer, later lifetime pregnancies +/- prior HRT use, in privileged women?]

HINT: SES & smoking – primary and secondary (ETS)?
Cancer of the trachea, bronchus and lung (ICD-10 C33-C34)
Age-standardised incidence and mortality rates by SIMD 2006 deprivation quintile, persons

PATTERN B: CLASSICAL
GRADIENT: reflects smoking & SES
Malignant melanoma of the skin (ICD-10 C43)
Age-standardised incidence and mortality rates by SIMD 2006 deprivation quintile, persons

PATTERN C: REVERSE SES
GRADIENT: The “Lanzarote Effect”

NOTE: rich folks get it more often, but they pay no mortality penalty! Why?
Aside: Is Cancer Relatively Non-Responsive to Massive Societal Change?

- Historical evidence from the economic collapse of the old Soviet Union, in the 1990s, strongly suggests that *epidemic* psychosocial stressors have no measurable impact on cancer mortality *within the next few years’ time* (although much of the societal change in this case was accompanied by increased alcohol consumption, and so may not be typical of such crises)
All-Cause Mortality, USSR, 1984-94

What about early-life disparities? – the curious case of LBW (prevalence at birth: <2500 g.)

Q: How to explain the complete plateau-ing of high-SES LBW rates?
A: LBW = (SGA + true Pre-Term) Births, and these are moving in opposite directions int’ly, so LBW now very stable.
What about more functional indices of wellbeing in the entire population (e.g. from surveys)?

Time will tell how “sensitive to change” this is, but it is surely unpromising that extreme interdecile gap = only 10% of pop mean

Age specific contribution to inequalities of specific causes of death, across SIMD quintiles (Scots men 2000-02): “Two Scots Graveyards”

One, growing for the young poor, dying of “external causes”

The other, stable in size for the older poor, dying of chronic disease

How Do Scotland’s Inequalities Compare to the EU’s When Individually-Assigned SES is Analysed? New All-Cause Mortality Results from Scottish Longitudinal Study -- Popham & Boyle, 2010 -- commissioned by SCPHRP)

Figure 1 The Scottish education relative index of inequality (red line) for all-cause mortality in men 1991 to 1999 plotted against results for Europe (from Mackenbach et al. 2008)
Figure 2 The Scottish education relative index of inequality (red line) for women 1991 to 1999 plotted against results for Europe -- from Mackenbach et al. 2008
New SLS All-Cause Mortality Results from Popham & Boyle (2010) commissioned by SCPHRP – cont’d

Figure 3 The Scottish occupational class relative index of inequality (red line) for men (aged 30 to 59) 1991 to 1999 plotted against results for Europe -- from Mackenbach et al. 2008
Figure 8 The Scottish education relative index of inequality (red line) for self rated general health plotted against results for Europe -- from Mackenbach et al. 2008

SCOTLAND = 4.31 (MALES); 4.33 (FEMALES)

SCOTLAND = 1.46 (MALES); 1.58 (FEMALES)

Figure 9 The Scottish education relative index of inequality (red line) for current smoking and obesity plotted against results for Europe from Mackenbach et al. 2008
Given the “prompt sensitivity to feasible change” of early childhood cognitive and educational outcomes across social classes, and their strong predictive power for lifelong function and health, what might a robust ROUTINE surveillance system for such “upstream” indicators look like?

[AN EXAMPLE FROM THE HUMAN EARLY LEARNING PARTNERSHIP – THE BRITISH COLUMBIA KINDERGARTNERS’ READINESS-TO-LEARN SURVEILLANCE SYSTEM: www.earlylearning.ubc.ca]
“The Early Child Development (ECD) Mapping Project involves implementation of the Early Development Instrument (EDI) in British Columbia (Canada) school districts, to assess the aggregate state of human development, at the Kindergarten level, in local sequential birth cohorts.

Kindergarten teachers in B.C. began to collect EDI data triennially in 1999/2000, using one day of paid time on each wave. As of March 2004, all 59 school districts in B.C. had collected EDI data, which is fed back to all communities within the year.”
A Big Step Forward in Population-Based Monitoring of Child Function: The Early Development Instrument (EDI)

The EDI, filled out by the teacher gathers classroom-level data on five critical areas (or subscales) of children’s development, in the first months of kindergarten, that predict longer-term school, and thus life, success:

- Physical health and well-being
- Social competence
- Emotional maturity
- Language and cognitive development
- Communication skills and general knowledge.

AND IT CAN BE CHANGED IN <6 YRS!
In Mirrabooka (Perth) Australia, intensive local ECD program development reduced EDI vulnerability by 25%.

### Mirrabooka C4C - Change in AEDI Results from 2003-2009

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<thead>
<tr>
<th>Year</th>
<th>Proportion of Children Vulnerable</th>
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<tr>
<td>2003 (n=538)</td>
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<tr>
<td>2004 (n=354)</td>
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<td>2008 (n=228)</td>
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<td>2009 (n=589)</td>
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How to Reach Us ..... 

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