Measuring and Monitoring Scotland's Health Inequalities: New Approaches

[Background to presentations by Rob Young and Frank Popham, held at SCPHRP, Edinburgh, Dec. 16, 2010]

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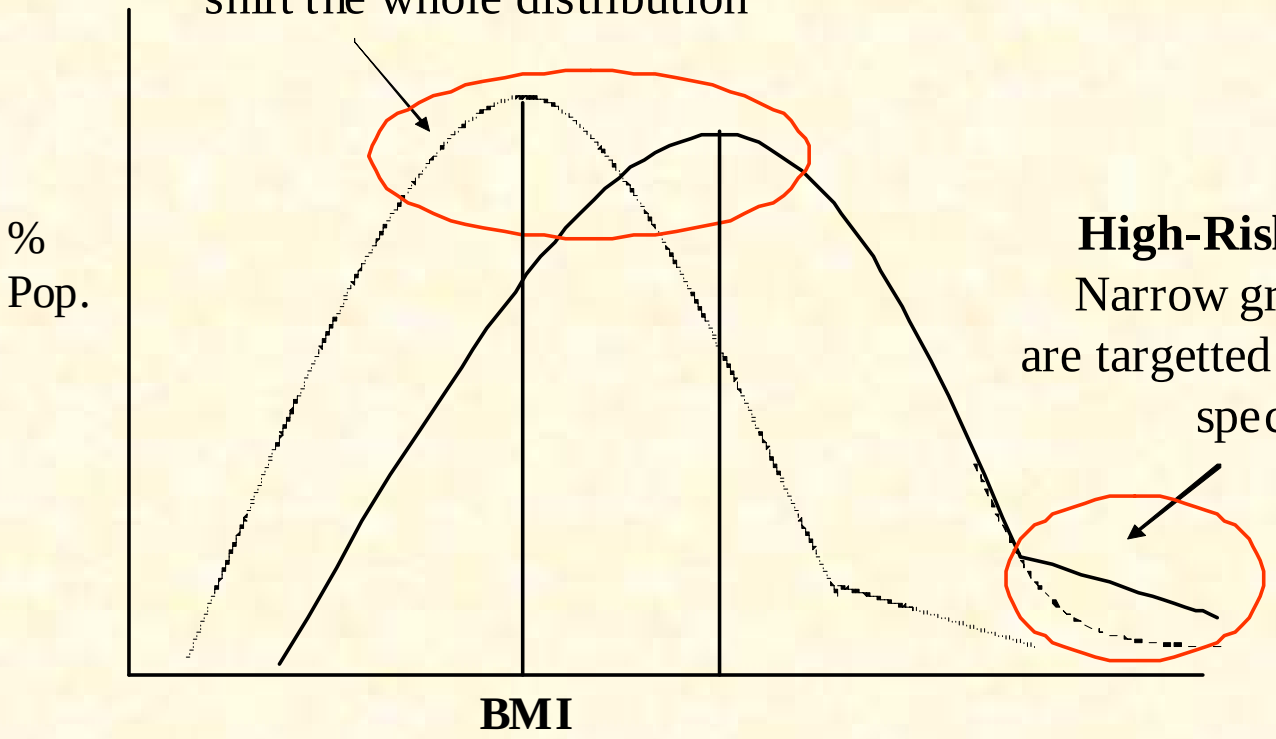
Population and High Risk Designs

Population

Lower the mean level of risk factor within the population to shift the whole distribution



High-Risk Individuals

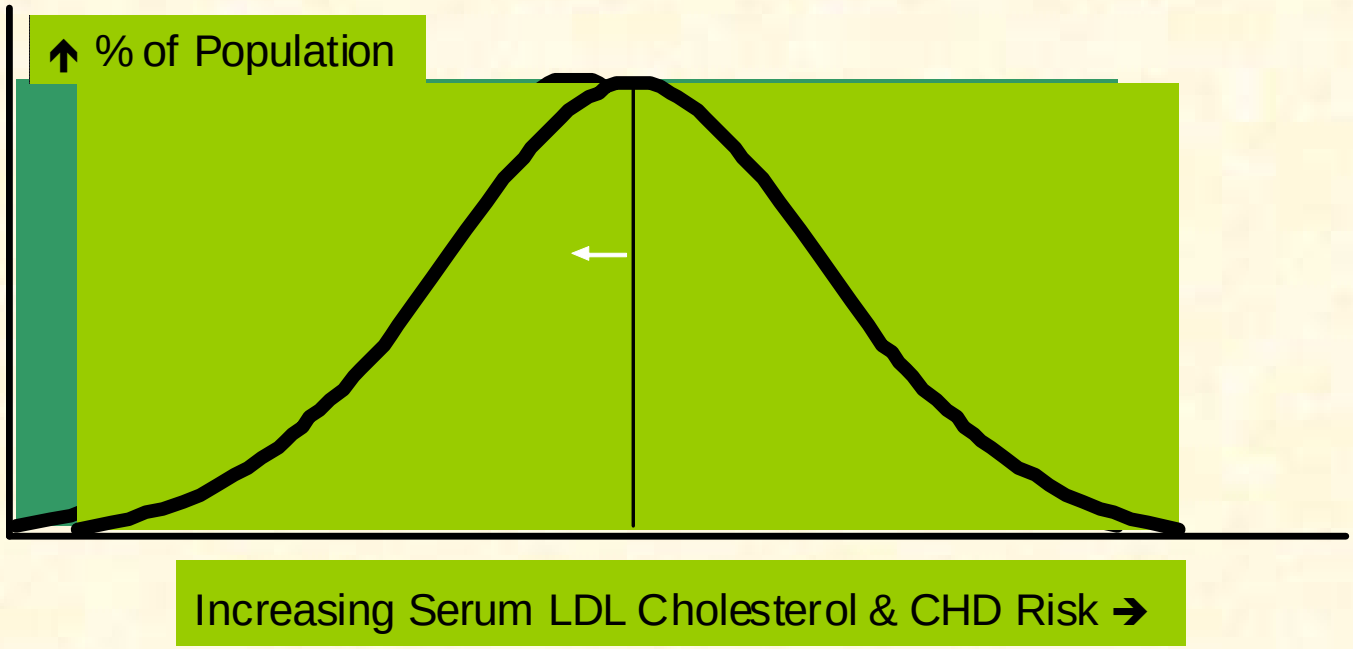
Narrow group of people are targetted to change a very specific risk

Source: Rose G. The Strategy of Preventive Medicine

Oxford Press, 1992

Seek the Cause in Incidence Not the Cause of Cases

To substantially reduce a population's level of chronic disease, one needs to seek the "causes of incidence" that shift entire risk factor distributions at the population level, not simply the "causes of cases" at the individual level of analysis/clinical level of investigation.

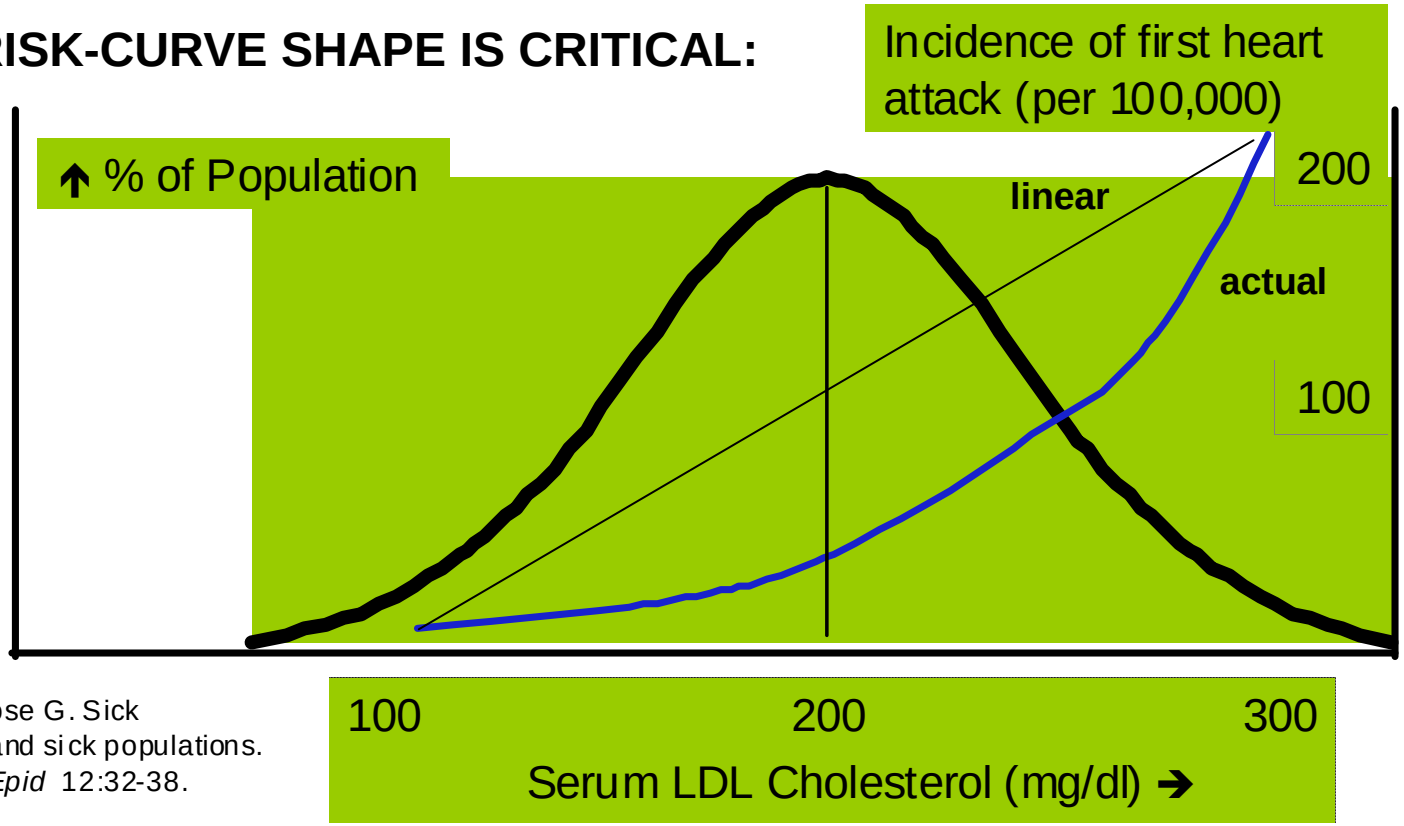


Source: Rose G. Sick Individuals and sick populations. 1985; *Int J Epid* 12:32-38.

Sick Individuals & Sick Populations: Sir Geoffrey Rose

In any given population, one will observe a near-normal distribution of a given risk factor. In the case of serum LDL cholesterol – or BMI or blood pressure -- each increasing level is brings higher CHD risk.

BUT THE RISK-CURVE SHAPE IS CRITICAL:



Source: Rose G. Sick Individuals and sick populations. 1985; *Int J Epid* 12:32-38.

CIHR IRSC

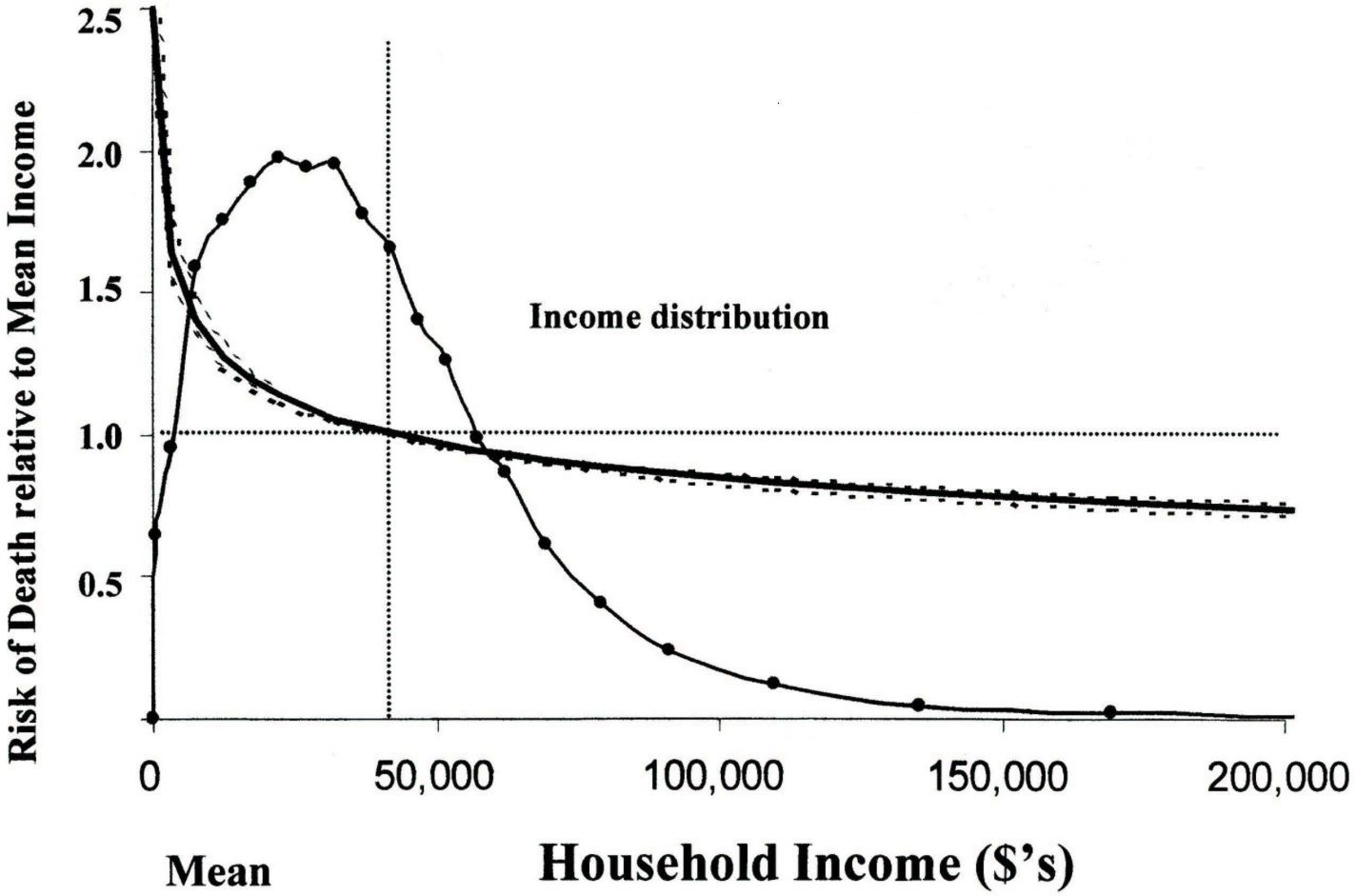
Canada

Given that income distribution – after taxes and transfers – is often changed in major ways by changes in tax and welfare policy, and can be targeted to "lift all boats" OR decrease poverty: **for SES and health (e.g. income vs. mortality), what shape is the "dose-response" risk-curve graphed against SES?**

- Some studies suggest rather linear patterns (e.g. Canadian Pension Plan record-linkage to mortality files)

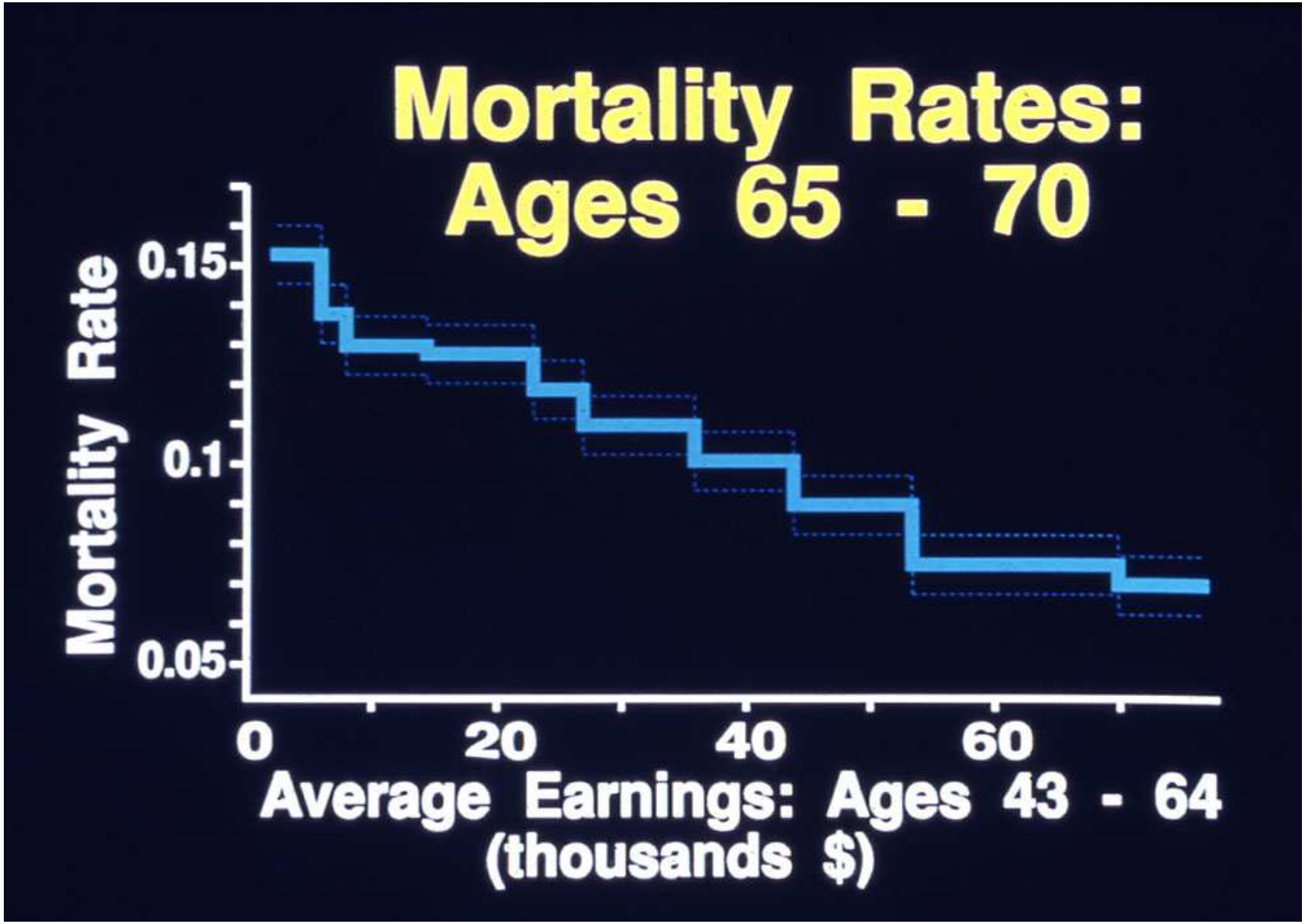
- Some studies suggest strongly curvilinear patterns, with death rates steeply rising at very low incomes (e.g. U.S. NHIS linkage to mortality files)

USA: Relative Risk of Death by Income & Income Distribution



Wolfson, Kaplan,Lynch, Ross,Backlund, BMJ 1999; 319:953-7.

CANADA:



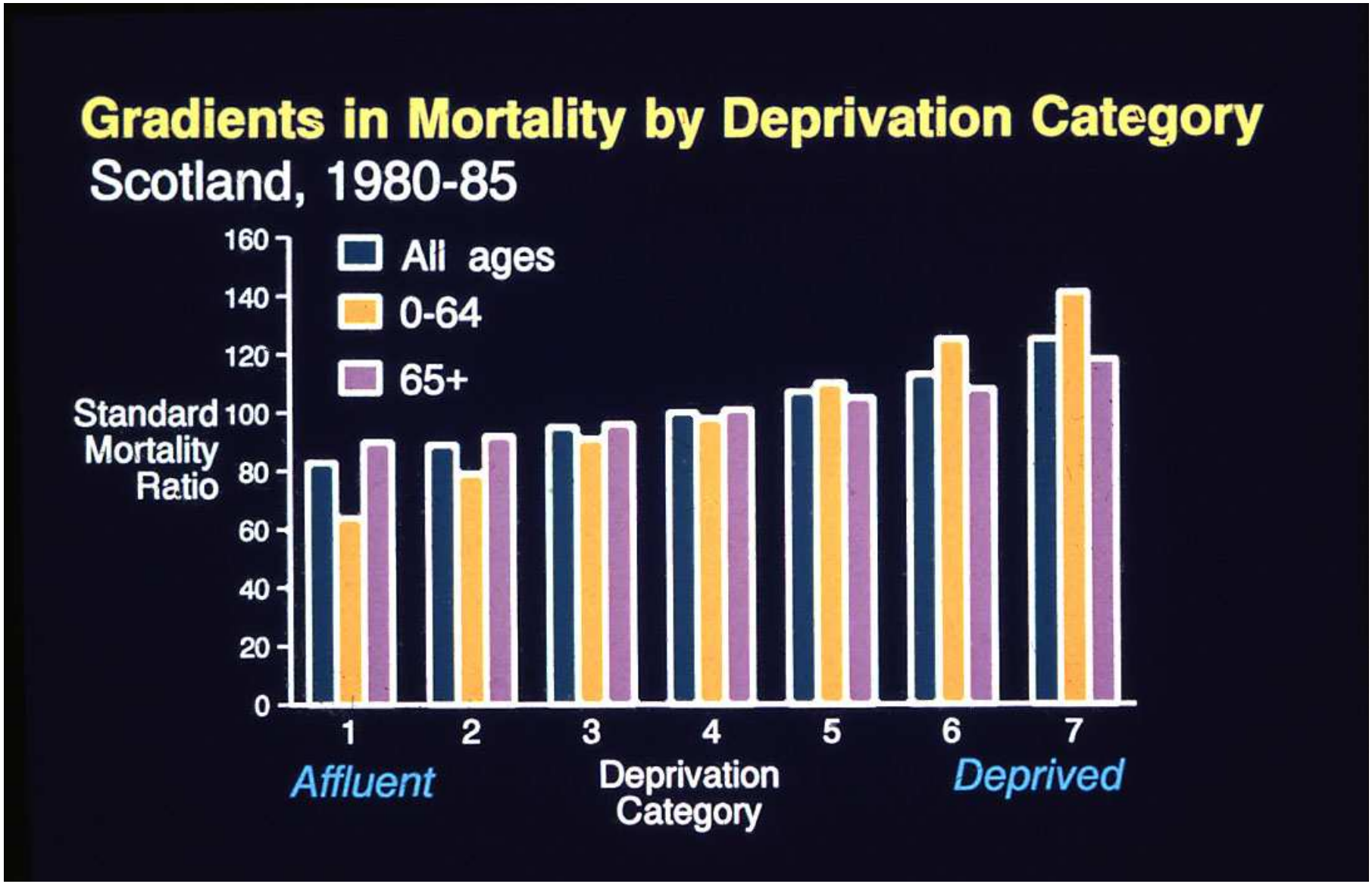
Source: Wolfson M, Rowe G, Gentleman JF, Tomiak M. Career earnings and death, a longitudinal analysis of older Canadian men. *J Gerontol 1993; 48(suppl):167-179*.

Factors Possibly Explaining These Two Studies' Discrepant Findings

- Study design differences
  - U.S. follow-up too short: ↑ reverse causation (whereby illness → ↓ income and ↑ mortality);
  - Canadian study population is only pensionable workforce → "Whitehall-like" curve, due to "left-truncation" of U.S. curve.
- Valid country differences
  - Social Welfare Policy Blanket;
  - 100% Universal Medicare in Canada;
  - Truly different steepness in SES gradients.

- **What do we know about Scotland?**

SCOTLAND (1980s):



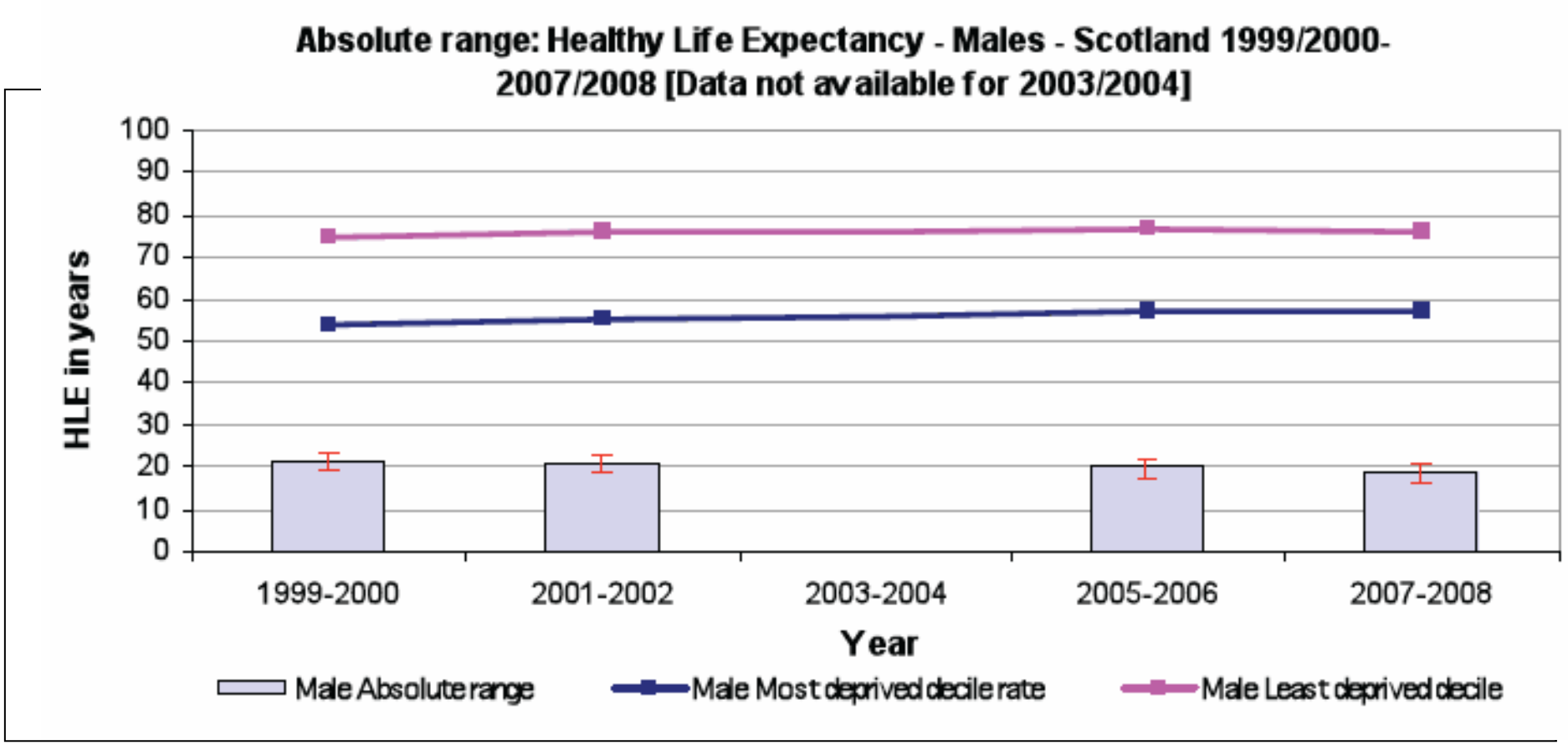
Reporting of Scottish Health Inequalities Now

- Recent Scottish analyses of health inequalities – both "dose-response" patterns across SES, and trends across time – are among the most statistically sophisticated in the world.

- The 2008, 2009, and 2010 SG Health Analytical Services Reports use deciles of 6505 Scottish datazones, rank-ordered into deciles by mean SIMD, to depict: a) "dose-response" risk patterns across SIMD; and b) time trends in the "gap" between topmost and bottom deciles; and c) calculate the Relative Index of Inequality (RII) for each year, utilizing information across all SIMD deciles, in a statistically optimum fashion.

- Of concern, **none** of the eleven health outcomes analyzed show major reduction in the rich-poor gap in the last decade: two – both related to alcohol consumption -- show widening gaps (to be illustrated), and only one shows much overall population-level improvement: coronary heart disease mortality (with a fairly unchanged gap, in absolute terms).

Absolute range: Healthy life expectancy



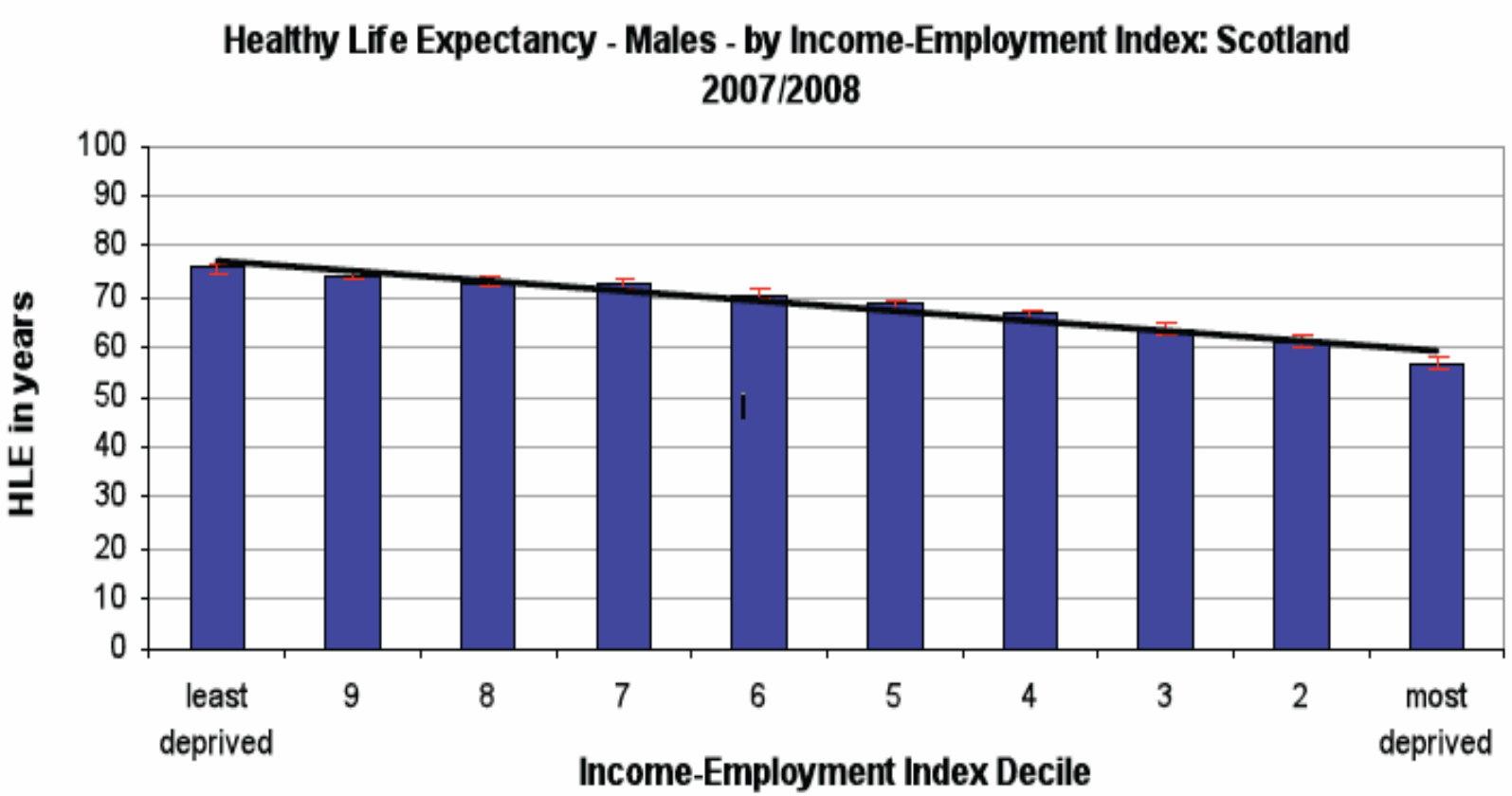
Source: Scottish Government Health Analytical Services (2010) Long-term monitoring of health inequalities

"Dose-Response" Patterns of Health Risks by SIMD in Scotland in the Last Decade

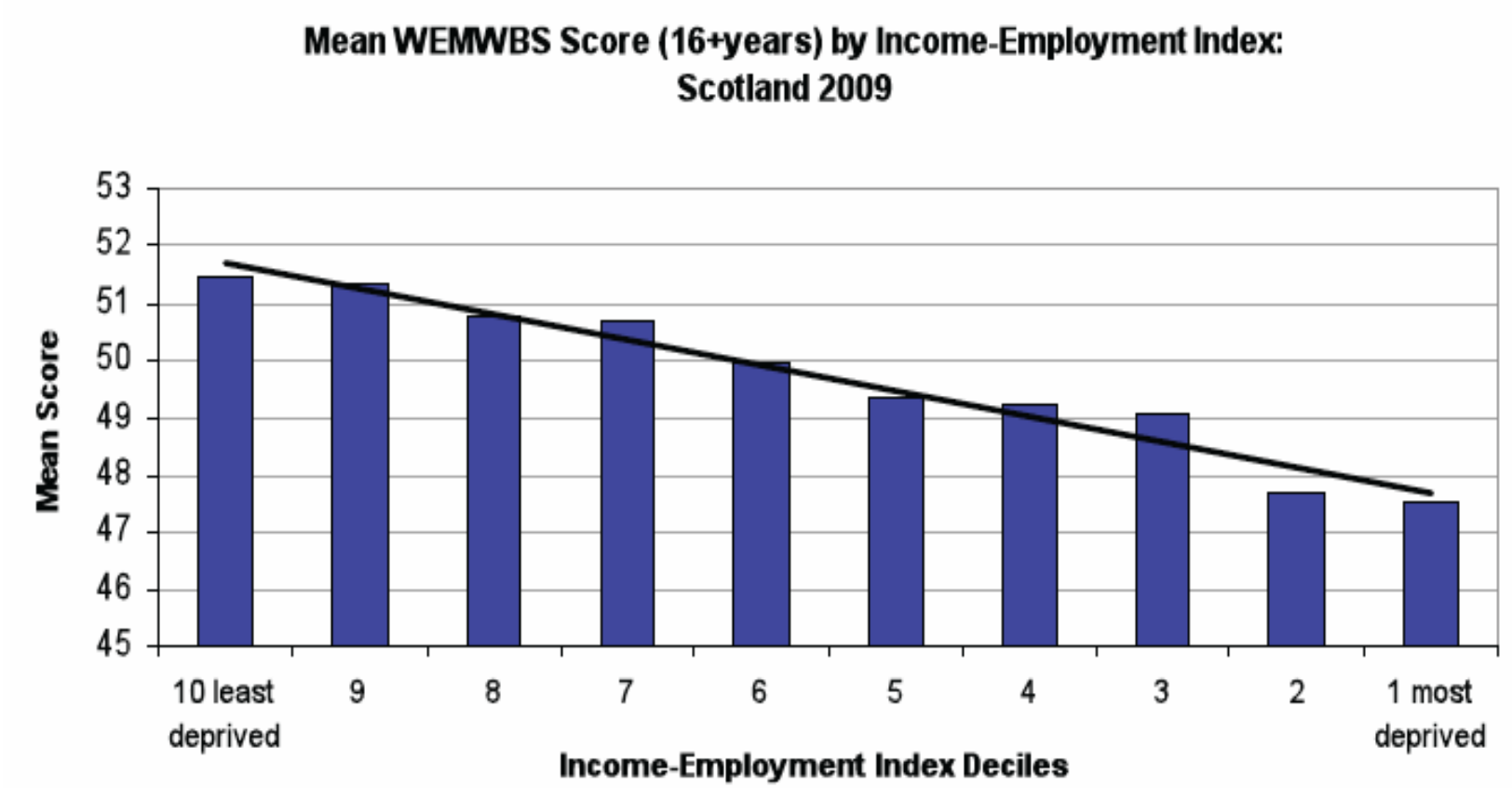
- For nine of eleven different, routinely-collected health outcomes analyzed by the 2008, 2009, and 2010 SG Reports, the relationship between SIMD and the risk of the outcome in question appears to be – astonishingly – absolutely linear, almost like the laws of physics!

- EXCEPT TWO -- both related to the same "toxic exposure"…

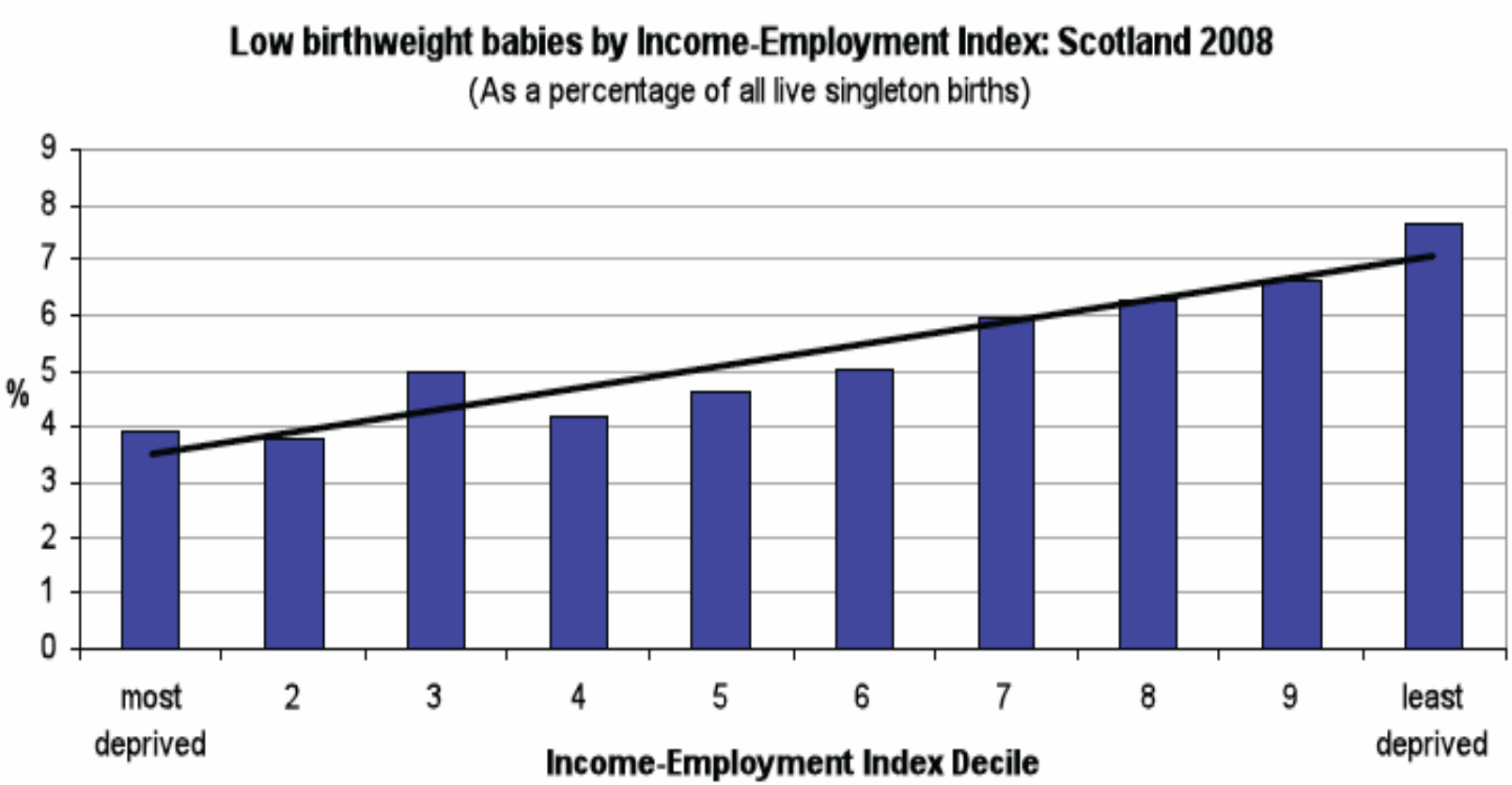
Dose-Response Curve of SIMR vs. HLE



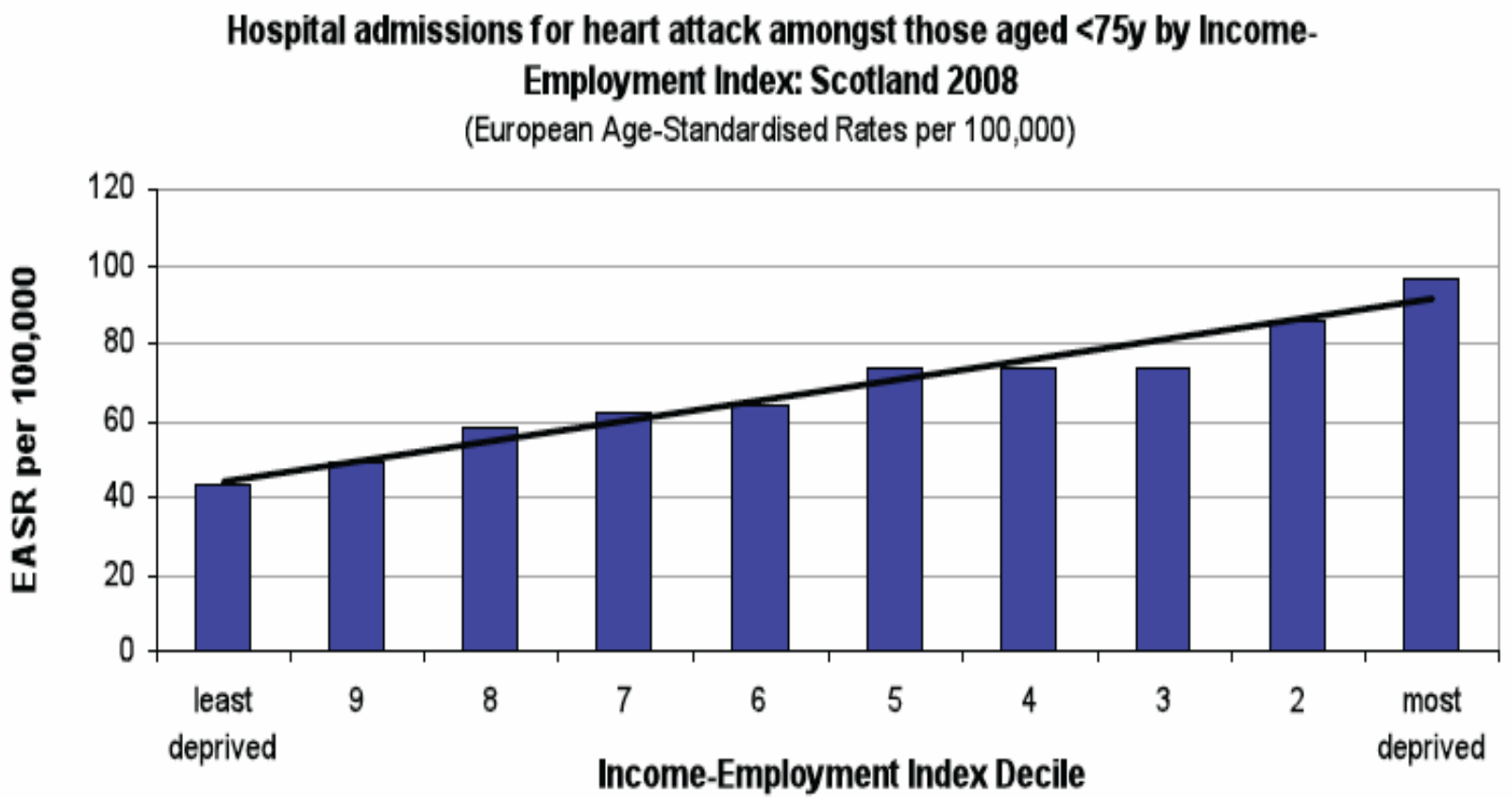
Dose-Response Curve of SIMR vs. WEMWBS



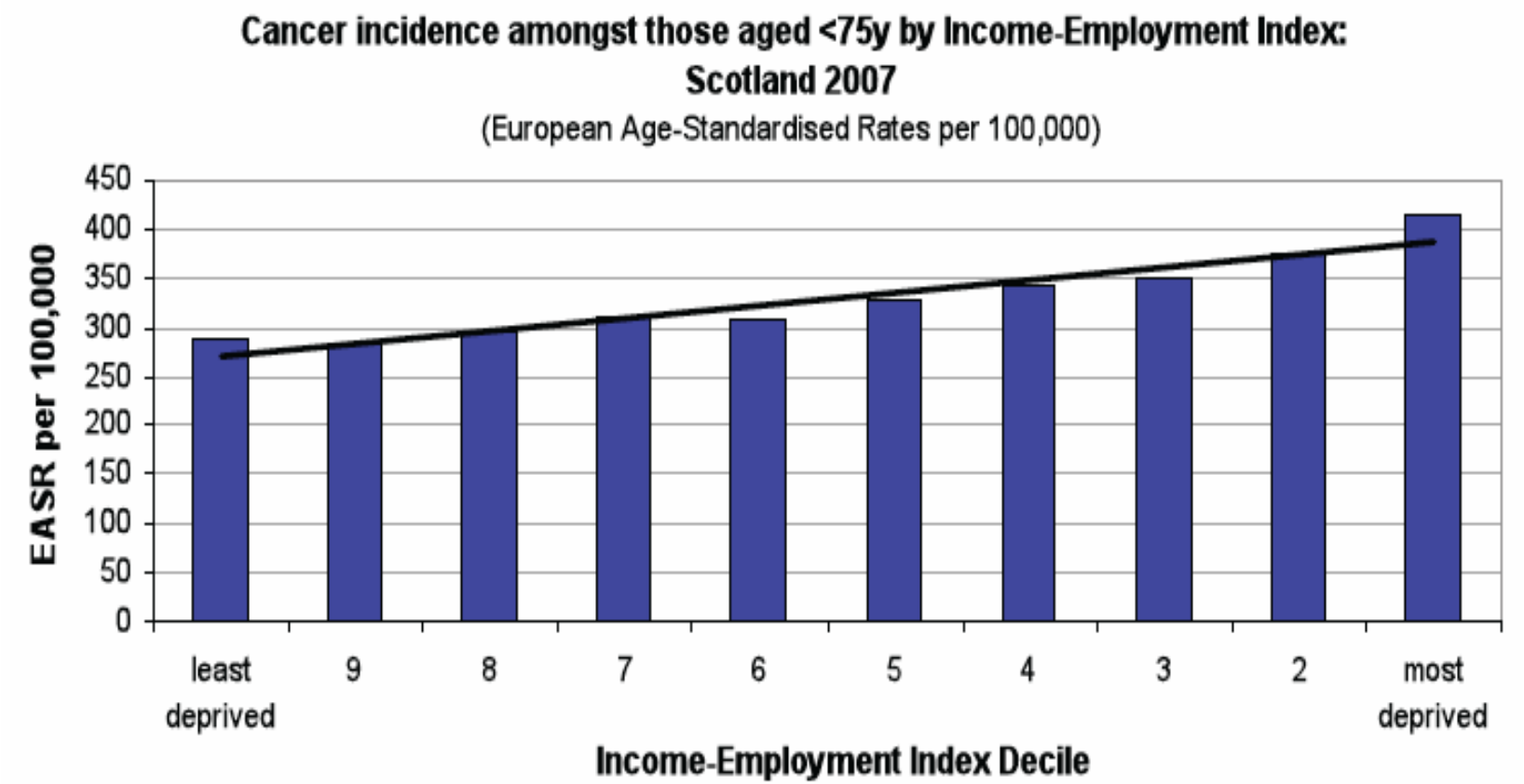
Dose-Response Curve of SIMR vs. LBW



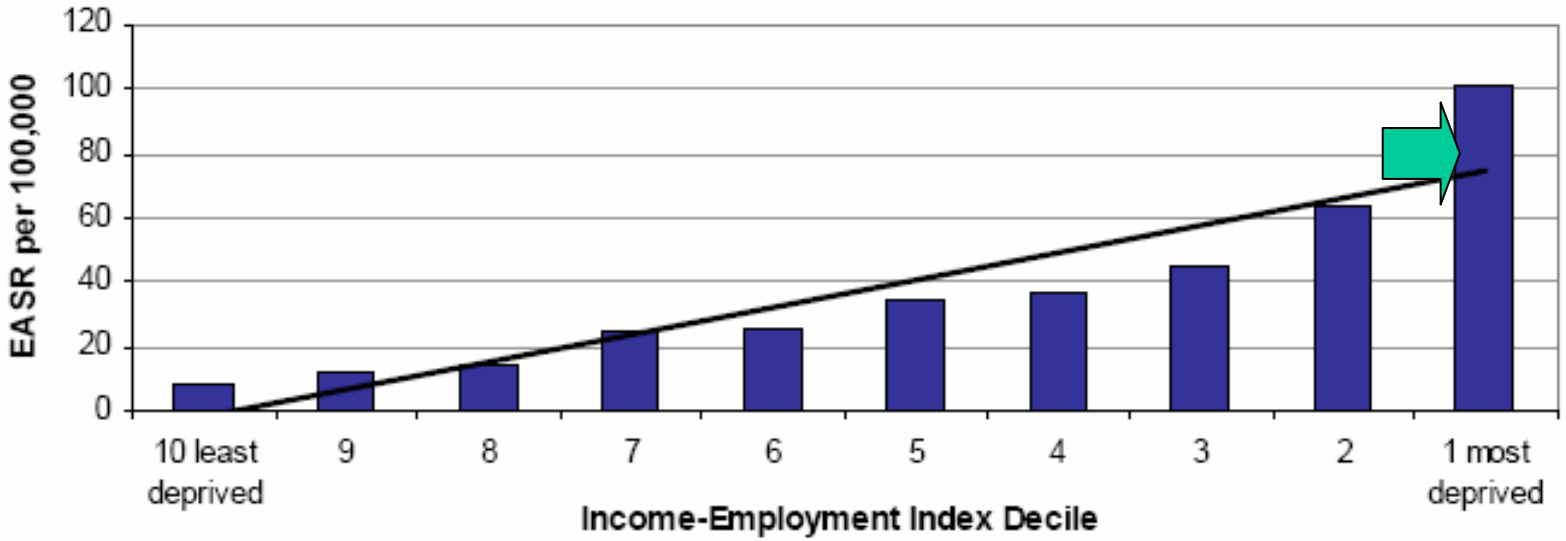
Dose-Response Curve of SIMR vs. ACS/AMI



Dose-Response: SIMR vs. (All) Cancer Incidence



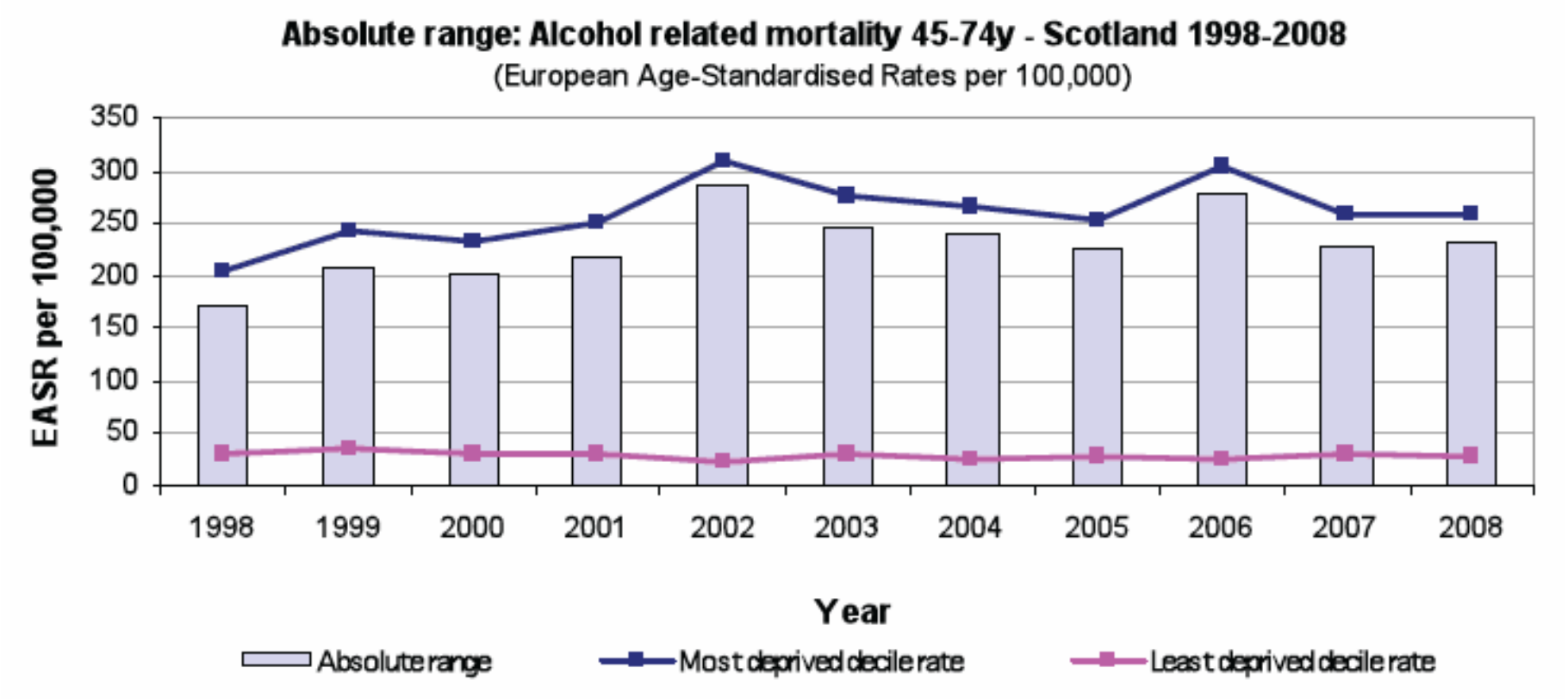
Alcohol-related mortality amongst those aged 45-74y by Income-Employment Index: Scotland 2006 (European Age-Standardised Rates per 100,000)



➢Unlike most Scottish inequalities, the SES *gradient* is non-linear: the burden is concentrated among the very poor, suggestive of "reverse causation" –i.e. chronicity ➡ low SES – but, in any case, should RIIs be used to summarize it?

Source: Scottish Government Health Analytical Services (2008) Long-term monitoring of health inequalities

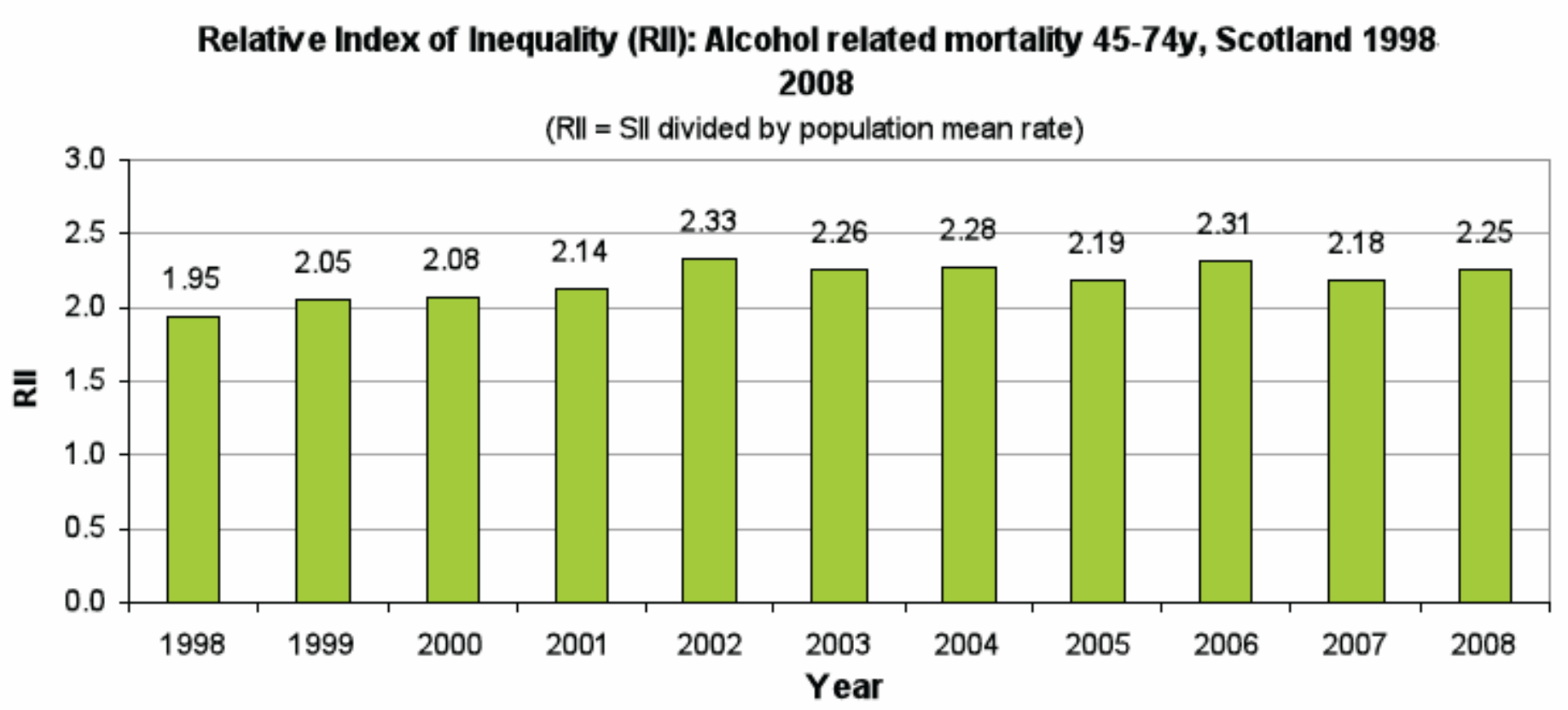
Absolute range: Alcohol-related mortality 45-74y – Scotland 1998-2008 (European Age-Standardised Rates per 100,000)



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

RIIs Over Time: Alcohol Mortality (1998-2008)



Research Questions for Rob, Frank, et al.

- Is there a robust but easy way to check for the linearity assumption that should be met by SES/health-risk data, before utilizing RII as a summary measure (and to quantify any bias in HI quantification, created by its use under that assumption)?

- How different would Scottish HIs look if the SES variables were available for individuals, rather than post-code-assigned ecologically? [Would reduced misclassification of SES lead to much higher estimates of inequality?]

How to Reach Us …..

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