Geoffrey Rose Revisited: Population – Level Strategies in Prevention Reduce Health Inequalities Best… (but sometimes no one’s listening)

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OUTLINE:

I. What is the “Prevention Paradox” of Geoffrey Rose, and its consequences for the impact on health inequalities of population-level interventions, as opposed to individualized high-risk strategies, to prevent chronic disease?

II. Under what conditions are population-level prevention strategies for chronic disease particularly likely to be especially effective at reducing health inequalities by SES?

III. What “less scientific” (e.g. cultural) factors also drive policy preferences in this field, despite the aim to reduce health inequalities?
I. Sick Individuals & Sick Populations: Geoffrey Rose (with apologies to epidemiologists in the audience!)

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 brings higher CHD risk.

The Bell-Curve Shift in Industrial Populations

In Western industrialized populations, the entire bell-curve of risk-factor levels is shifted due to “lifestyle” factors, so even “low levels” within the population confer CHD risk. Thus a large number of people at small risk give rise to more cases of disease than the small number who are at high risk – this is the PREVENTION PARADOX.

ON THE OTHER HAND, GENES AND ENVIRONMENTS INTERACT IN COMPLEX WAYS:

Familial Hypercholesterolaemia
Over Two Centuries

In the 19th century, mortality seemed lower than in the general population. It rose after 1915, reached a maximum during the 1950s, and decreased thereafter, just like CHD mortality in the general population (note: all data censored after statin treatments began).

Such large variation in mortality, over time across generations of family members likely to have one defective gene (with powerful effects), indicates that even this rare Mendelian disorder – a genetic analog of usual CHD -- has strong interactions with the environmental factors, that are the “underlying causes of incidence” for the CHD pandemic over the last century.

Population and High Risk Designs for Intervening on Chronic Disease Risks

Population Approach
SHIFT the whole risk factor distribution in the target population

High-Risk Approach
IDENTIFY (by screening) individuals at high-risk for individualized management

Source: Rose G. The Strategy of Preventive Medicine
Oxford Press, 1992
The shifting distributions of BMI of five population groups of men and women aged 20-59 years derived from 52 surveys in 32 countries.


Adapted from Shiriki Kumanyika slide show
The Importance of Population Distributions of Exposure

Source: The World Health Report: 2002. Reducing Risks, Promoting Healthy Life. Chapter 2, Figure 2.3
The Importance of Population Distributions of Exposure

Source: The World Health Report: 2002. Reducing Risks, Promoting Healthy Life. Chapter 2, Figure 2.3
Rose: “Seek the Causes of Incidence Not Just the Causes 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. This constitutes “primordial” – truly upstream – prevention. It prevents not only current birth-cohorts’ cases, but also cases arising in the future.

Some Consequences of Rose’s Prevention Paradox for Reducing Health Inequalities by SES

Table 1  Prevention by the ‘high-risk strategy’: advantages

1. Intervention appropriate to individual
2. Subject motivation *
3. Physician motivation *
4. Cost-effective use of resources
5. Benefit: risk ratio favourable
Table 2  Prevention by the ‘high-risk strategy’: disadvantages

1. Difficulties and costs of screening
2. Palliative and temporary—not radical
3. Limited potential for (a) individual
   (b) population
4. Behaviourally inappropriate *

**Table 5** Prevention by the ‘population strategy’: advantages

1. Radical

2. Large potential for population

3. Behaviourally appropriate *
**Table 6** Prevention by the ‘population strategy’: disadvantages

1. Small benefit to individual (‘Prevention Paradox’)  
2. Poor motivation of subject *  
3. Poor motivation of physician *  
4. Benefit: risk ratio worrisome
II. Under what conditions are population-level prevention strategies for chronic disease particularly likely to be more effective for reducing health inequalities by socioeconomic status (SES)?
EXAMPLE #1: ARE SCOTLAND’S CHD RATES/INEQUALITIES COMING DOWN FAST ENOUGH?

Ischaemic heart disease mortality age standardised rates among men aged 15-74 years
Scotland in context of Northern Europe
Source: WHOSIS (May 2002)

Q: COULD ANYTHING TRULY ACCELERATE THIS DECLINE?

OK – BUT how are Scottish inequalities in CHD doing, in recent years?


POINT: RATES ARE STILL COMING DOWN, BUT THE SES GAP IS STILL VERY WIDE IN FACT, THE RELATIVE INDEX OF INEQUALITY HAS ACTUALLY INCREASED! (FROM 1.11 IN 1997 TO 1.51 IN 2008) BECAUSE PROPORTIONATELY, GAP IS STALLED: WHY?
Smoking declines, from largely individual-level interventions (until recently), appear to be “stalled,” in terms of SES disparities reduction—e.g., UK smoking rates by SES over the last 50 yrs:

Some Scottish CHPs show local smoking rates > 50%—i.e., more than five-fold above the best areas’ rates

**Figure 3: Cigarette smoking among women aged 16 and over by socio-economic group 1958-2000, Britain**

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

Source: http://www.esrcsocietytoday.ac.uk/ESRCInfoCentre
Scots’ vs. EU RIs for Smoking/Obesity (Popham & Boyle 2010)
(commissioned by SCPHRP: see www.scphrp.ac.uk)

SES “x” = EDUCATION

**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

**A** Current Smoking

SCOTLAND = 4.31 (MALES); 4.33 (FEMALES)

**B** Obesity

SCOTLAND = 1.46 (MALES); 1.58 (FEMALES)
EXAMPLE # 2: Blood Pressure Control in the UK -- overall impact of decades of individual-level Interventions rather ineffective, and probably inequitable

Preamble: What do we know about the relative contribution of risk factors/prevention, versus case fatality/clinical care effectiveness, to the recent decline of CHD mortality?

The best studies, many of them by Simon Capewell et al, suggest that about half of the decline has been due to improved prevention (both clinical, and due to secular trends in “culture”) and half due to improved CHD treatment, after clinical presentation. But…
IN THE CASE OF BLOOD PRESSURE, IT MAY BE DIFFERENT!

High risk interventions compared with mass population interventions: impact on an idealised population distribution or bell curve for systolic blood pressure

FINDINGS: NO EVIDENCE OF ANY “DENTING” OF THE DISTRIBUTION: IT SEEMS THAT ALL THE NHS’ PAST EFFORTS TO DX AND RX HBP HAD LITTLE POPULATION IMPACT!

Why might the clinical care system (even if “free”, as in the UK) have failed to make much impact on CVD mortality/disparities, via its HBP $D_X \& R_X$ efforts?

“The RULE OF (notional) HALVES” (at each “link in the effectiveness chain”):

- Of all HBP cases in population (historically at least):
  - $\approx 1/2$ were seen frequently enough by GP to possibly have early $D_X$;
  - $\approx 1/2$ were actually diagnosed when seen in that BP was properly measured and interpreted (three visits needed!);
  - $\approx 1/2$ were properly treated (as per guidelines);
  - $\approx 1/2$ were compliant with treatment in the long run (decades)

Only $\approx 1/16$ of target population effectively $R_X$’d (AND the “slippage” is strongly associated with low SES: where the probabilities of the various “effectiveness chain-link failures” are correlated – probably an inherent feature of clinical care systems?)
EXAMPLE #3: ARE SES DISPARITIES IN DENTAL CARIES REDUCED IN COMMUNITIES WITH FLOURIDATED WATER SUPPLIES?

In press, Canadian J Public Health, 2012, by Lindsay McLaren PhD, J.C. Herbert Emery PhD 1,2 (Department of Community Health Sciences and Department of Economics, respectively, University of Calgary, Calgary, Alberta, CANADA)
Characteristics of policies more likely to be effective in reducing health inequalities*

- Structural changes in the environment (e.g. urban/product design for traffic/child safety)
- Legislative & regulatory controls (e.g. drink driving, seat belts, smoking bans, food fortification)
- Fiscal policies (tobacco & alcohol taxes and minimum pricing)
- Income support/other policies to reduce underlying SES inequalities

*MACINTYRE, SALLY. MRC SPHSU OCCASIONAL PAPER #17, GLASGOW OCT. 2007
CHARACTERISTICS OF POLICIES MORE LIKELY TO BE EFFECTIVE IN REDUCING HEALTH INEQUALITIES*

 Reducing price barriers to proven preventive goods & services (healthy foods & products, disability assistive devices)
 Improving accessibility/acceptability of proven preventive services (e.g. Cancer screening, immunization)
 Prioritizing disadvantaged groups in sensitive ways (e.g. In local services)
 “Proportional universalism”: more education/support for higher-risk families
 Starting (get them while they’re) young: utilize human developmental plasticity

*MACINTYRE, SALLY. MRC SPHSU OCCASIONAL PAPER #17, GLASGOW OCT. 2007
III. Why do policy-makers often favour individualized medical preventive services, while “upstream” policies lie unused?

- “Moral judgmental–ism”: belief that people who still smoke/have elevated cholesterol levels/hypertension/obesity have those problems due to “bad behaviour” – or “character defects.”

- Individualized medical care solutions, based on screening, similarly tend to focus on individual behaviour – i.e. compliance with long-term risk-factor treatments based on hygiene (lifestyle changes), and drugs.

- The real truth is complex and hard to explain: 1) for many high-risk individuals’, genetics and “lifestyle” exposures jointly determine risk factor levels; 2) early-life poverty makes life an uneven playing field.

- The public’s appetite for “curve-shifting,” upstream preventive interventions is accordingly reduced, by the view that the many should not have to either forgo pleasure – or, in the case of unhealthy food/beverage taxes and alcohol minimum-pricing policies, “pay” – to make up for the indiscretions of the “morally weak” or “genetically unlucky” few.
iili. Why do policy-makers often favour cardiovascular risk factor screening, while upstream policies lie unused?

> Politicians’ and special interest-groups’ concerns re curve-shifting interventions at the population level, such as increased tobacco taxes, minimum pricing for alcohol is that they represent “nanny-state-ism,”

> In this climate, “nudging” -- subtle environmental signalling to consumers, -- is seen as a seductive, “non-state-interventionist” alternative to regulation and taxation/subsidization.

> Many researchers believe nudging cannot do the job: e.g. in long-term psychological habituation (e.g. salty, sugary or high-fat food and drink) or frank addiction (e.g. tobacco and alcohol) – stronger measures needed.

> Public health is often naïve about these political realities, and fails to ask whether their proposed interventions are really “Pareto improvements” – such that no one would be worse off with them.

> Public health often fails to make the case that reduction in health inequalities requires upstream, population-level interventions
Final Thoughts…

- Evidence is fine, but deeply held beliefs and moral judgements matter a great deal...

- Understanding the ‘culturally framed’ beliefs that often drive policies – especially around “lifestyle” risk factors – is critical to effective policy advocacy

- Those backing public health policies aiming to “shift the curve” often have not adequately convinced the public of those policies’ “(re)distributive justice”

- Policies intended to reduce inequalities require the same thoughtful public health analysis
How to Reach Us ..... 

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