

Epidemiological thinking in public discourse

You do not fully understand an idea until you are able to explain it to the common person—something to that effect was proposed by, I think, the geographer and anarchist Peter Kropotkin. In this spirit, I continue to try my hand at using epidemiological thinking to clarify issues that arise in the media or public discourse. In addition to the deeper or perhaps revised understanding, epidemiologists could build from such exercises a basis for a more public role as epidemiologists and from that might emerge eventually greater support for epidemiology and public health. My latest contribution, on unemployment, follows. It turned out there is not much epidemiological thinking here except to notice the parallels with the contrast between public health efforts to shift the population distribution and the more clinical emphasis on treating high-risk individuals. Earlier contributions—on urban riots, voter restrictions, the Tucson massacre, and mammogram guidelines—follow.

Unemployment

August 19, 2011, <http://wp.me/pPWGi-qs>

Ever spoken to someone who hustled and found a job in times of high unemployment and now claims that “anyone can get a job if they try hard enough”? There is usually more to this claim than their own employment; they probably know people who have not tried hard (which includes not accepting a wage cut) and who have not found a job. But does the go-getter claim make sense? A first look would say no: If there are a fixed number of jobs and this number is less than the working population, then for each go-getter getting a job another unemployed person misses out on one. But perhaps the claim is really that go-getters help create *jobs that would not have been there*. How would that play out?

Let us suppose there is a working population of N people, a base level of employment rate of e , and a fraction f of the population who are go-getters, that is who, when unemployed, can generate jobs for themselves that would not have existed otherwise. (For simplicity, assume the go-getters still fall prey to job loss at the same rate as other workers.) The algebra translates to: for each percentage point increase in the go-getter fraction, the total employment (i.e., base level plus additions from the go-getters) increases by $1-e$ percentage points. For high base unemployment, say 10%, the effect on total employment is to increase it .1 percentage points for each percentage point increase in the go-getter fraction. Now if everyone were a go-getter, total employment would always be 100%, but for realistic, smaller fractions of go-getting, the take-home message would not be to blame the non-go-getters but to focus on public policies to increase base-level employment.

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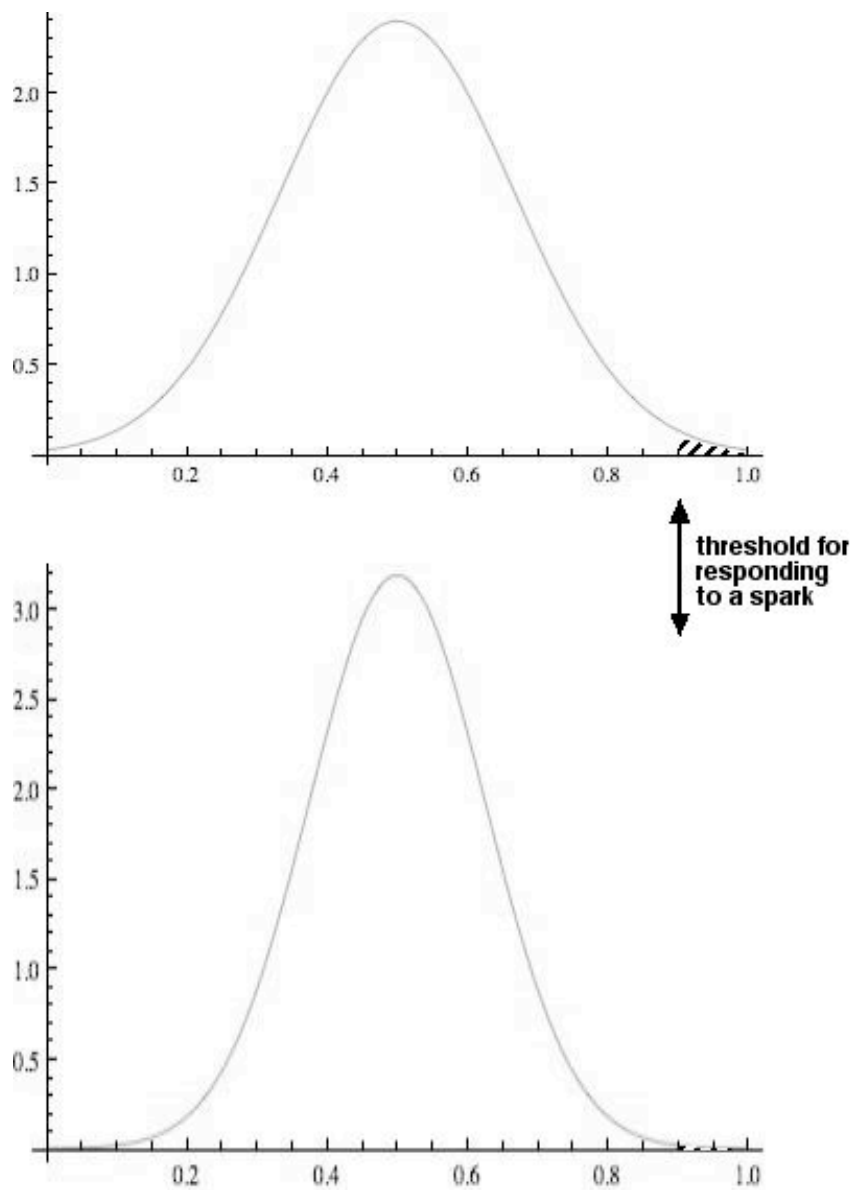
Riots and population thinking

August 18, 2011, <http://wp.me/PWGi>

Suppose you wanted to prevent future urban riots or, at least, reduce their likelihood. You would want to reduce the frequency of the potential spark as well as reduce the proportion of people

who are ready to respond to the spark (or join with others who have responded to the spark). Let us consider the second challenge first.

There will always be a range of responsiveness to a spark, where responsiveness derives from some as yet undetermined combination of individual proclivity to criminality and frustration or anger at social conditions. Suppose you assume that there is some threshold of responsiveness below which people do not riot. Suppose also for the moment that responsiveness is not 100% individual proclivity to 0% social conditions. That means you could imagine reducing the causes of frustration and anger. To do so would be equivalent to shifting the distribution of responsiveness from the top curve to the bottom. (The horizontal axis depicts responsiveness on a scale from 0 to 1; the vertical axis depicts the proportion of the population having this responsiveness on an arbitrary scale.)



In the top plot 1 person in 146 is above the threshold (the cross-hatched lines on the right hand tail); in the bottom, 1 person in 1526. If the spark is not experienced by everyone, but by say 100,000 people, then this is a reduction from 685 people to 66.

Of course, the numbers are made up, for purposes of illustration only, but the point illustrated is that shifting the population is an alternative to framing the issue in terms of controlling the individuals who are highly responsive to a spark. (Control may be policing, curtailing civil liberties, preventative detention, control over social media in times of tension or unrest, and so on.) Under that alternative, paying attention to the frustration/anger side of responsiveness corresponds to an interest in reducing future violence even if politicians and the media polemically equate understanding the causes of responsiveness with absolving individuals of responsibility that thus condoning violence. Indeed, an emphasis on control is likely to have the counter-productive result of increasing the frequency of sparks given that there are inevitably mistakes made by some of those who are given the power to control more heavily. The most obvious mistake is when an individual is treated according to the group that they are (or presumed to be a) member of, where the range of responsiveness for that group is disproportionately to the high responsive side.

What would it mean to pay attention to the frustration/anger side of responsiveness? (This question is a precursor to the question of what would it mean to shift the distribution of responsiveness.) Answering that requires serious social science, but it should be possible if there is variation among regions in how deeply budget cuts have affected services, racial profiling, job loss, and so on.

What would it mean to pay attention to the individual proclivity side of responsiveness? (This question is a precursor to the question of what would it mean to control the individuals who are highly responsive to a spark, especially if you want to do that without increasing the sparks.) Answering that requires serious social science, but it might be possible if there is variation in incidence of riots among regions with equally deep budget cuts, racial profiling, job loss, and so on. Once you have some answers, however, it is difficult to convert that knowledge into individually focussed control. In practice, individuals are treated according to the group that they are (or presumed to be a) member of, where the range of responsiveness for that group is disproportionately to the high responsive side.

Tooth decay and epidemiological thinking in a time of urban riots

August 13, 2011, <http://wp.me/pPWGi-qa>

A: It's sweet teeth, pure and simple. Tooth decay is a problem among youth who give in to temptation to have sweets in their mouth. To look elsewhere for explanations is to condone their lack of self-control and responsibility for their own self-destructive actions.

B: I agree that no-one should defend letting one's sweet tooth dictate behavior. But, if we want to reduce tooth decay we need to look at the conditions in places where tooth decay is high, conditions such as low numbers of dentists, low income, advertisements for sweets that show healthy people with smiles and shiny teeth, and so on. If we address these conditions, we can reduce tooth decay even if the proportion of people with sweet teeth stays unchanged.

A: So, let us be clear: You do not condemn sweet teeth?

C: Let me step in here. I am quite prepared to state that I do not condemn sweet teeth. In poor places where there's little pleasure and plenty of media portrayals of well-off people enjoying sweets, why shouldn't these youth also have sweets and be helped if they get tooth decay? In fact, let me ask you a question: Are you condoning unequal access to dental health, jobs flowing overseas, and seductive advertizing aimed at the poor?

A: Anyone who condones sweet teeth is someone whose questions I do not have to answer.

B: Hold on. I am simply interested in improving public health, which, in this case, means reducing tooth decay. If subsidized dental care helped in the past, let's not rule out restoring that. Ditto for compulsory dental health education in schools (though do we have evidence that education aimed at individual behavior worked?). And so on.

Voter registration laws can devalue a vote on average

May 2, 2011, <http://wp.me/plgwfa-ln>

The right to vote is among the most treasured privileges for Americans. From time to time, it would seem reasonable that the Texas Legislature close loopholes that invite election fraud, which devalues a legal vote. Matt Mackowiak, 27 Jan. 2001

Statements like this are the standard justification given for new legislation that requires higher standards of identification before a person can vote. We could interpret what is not said (e.g., the treasured privilege or right—which is it?—is not so treasured that everyone should be issued a national ID card and be automatically eligible to vote), but let us focus on the phrase “devalues a legal vote.”

Actually, it is possible to devalue a vote more through restrictive voter ID laws. Some algebra (described below) shows, if I am not mistaken, that the value of a vote decreases on average if

the proportion of falsely rejected votes $>$ (originally fraudulent fraction * accepted fraction after the law is implemented) / (originally legit fraction * rejected fraction after the law is implemented)

For example, if 10 votes of a 1000 would have been fraudulent and the new law leads to 20 votes not being cast, of which 10 would not have been fraudulent, then the vote is devalued because $.5 > (.01 * .98) / (.99 * .02)$.

The way this result comes about is that under the restrictive laws, for the people who get to cast their vote legitimately, the value of their vote goes up, but for those who do not get to cast a vote that would have been legitimate, their vote value goes to 0.

Moreover, if the value of a vote is measured in terms of whether the candidate who would have had the most legitimate votes is elected, then the situation can be even more skewed. However, to show that requires detail about a specific election.

Even if we put aside the obvious political motivation in disenfranchising likely voters for one's opponent, there's still a conceptual question about why the standard justification given for new legislation seems plausible, even unimpeachable, to most listeners—No-one wants to be on the side of allowing fraudulent votes, right? But why don't people automatically say: "Yes, but how many legitimate votes will not happen using your laws. After all, the right to vote is treasured by American citizens." (At least, by the fraction who register and then vote...)

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Algebra

If N = no. of voters before law is implemented; fN = no. of fraudulent voters before law is implemented; $(1-p)N$ = no. of accepted votes after law is implemented; and ipN = no. of votes not accepted or not cast after law is implemented, then

True value of a vote is 1 for eligible voters $N(1-f)$ and 0 for ineligible voters fN .

Value before law is implemented is $(1-f)$ for eligible and ineligible voters.

Value after law is implemented is 1 for $(1-p)N$ (which may still include some ineligible voters) and 0 for pN , which includes ipN eligible voters. The average of this is $(1-p)N / [(1-p)N + ipN] = (1-p) / [(1-p)+ip]$. Compare this quantity with $(1-f)$ and you find that it's less if

$$i > [f(1-p)] / [(1-f)p]$$

To use the language of medical screening, this is a matter of how many true positives there are—that is, how many fraudulent votes (or attempts to vote) are detected and rejected by a given ID requirement—compared to false positives (rejected votes from eligible citizens), true negatives (accepted votes from eligible citizens), and false negatives (accepted votes from non-eligible citizens).

Interpreting the Tucson massacre and the relevance of epidemiological thinking

14 January 2011, <http://wp.me/pPWGi-gn>

In advising on the most effective measures to be taken to improve the health of a population, epidemiologists may focus on different determinants of the disease than a doctor would when faced with sick or high-risk individuals. This contrast is evident in interpretations of Jared Loughner's shooting rampage in Tucson—do we focus on Loughner as a deranged individual and consider how we can catch such people before they hurt others or, thinking like a social epidemiologist, do we push for changes in the social conditions that exacerbate damage when deranged individuals arise (e.g., by restricting availability of automatic weapons)?

Geoffrey Rose is well known in social epidemiology for promoting the population health focus (Rose 1985), but this is not universally accepted by healthcare practitioners and policy makers. Road accidents and alcohol consumption may be a good illustration of Rose's argument. Most of us know of times when we've been able to get home safely after we've drunk too much "risk factor," but we also know that a substantial fraction of people in accidents have high alcohol levels. We also sense that some people are more susceptible to having their judgement and reaction times impaired by alcohol so we could imagine doing further epidemiological and biological research to develop multivariable risk factor formulas. Would a more refined

knowledge of riskiness help us prioritize our risk-prevention efforts, or would that pale into insignificance relative to drink-don't-drive efforts? Rose would push for the latter. In the same spirit, he observed that investigating genes that might confer some resistance to lung cancer among smokers—we all know of someone who smoked heavily but lived into their 80s—wouldn't be a high priority in a society that has eliminated smoking.

In the Loughner case, one Rosean approach would be to restrict availability of automatic weapons. Another would be to promote reduction in rhetoric of individuals having to arm themselves against the tyrannies of the government. Another would be to improve mental health funding so that help would be given to more distressed individuals (even if we had no way to determine if their distress was leading them towards violence). Of course, any given Rosean measure might not be straightforward to institute (e.g., vaccination of girls for HPV is resisted by some on the grounds that it is a promiscuity-promoting measure). Moreover, it may turn out that the Rosean measure does not have the expected effect (e.g., abstinence-only sex education has been shown in some studies not to reduce rates of STDs) and has to be rethought.

Interestingly, right-wing commentators, wishing to resist any points being scored for gun control and anti-vitriol have not simply focussed on Loughner as a deranged individual who, as an individual, is responsible for his own actions. Some have joined in discussion of the idea that mental health services needed to be better. Are they Rosean? There has been ambiguity about whether the improvement is to improve the mental health care for society as a whole or just to detect and “treat” the high-risk individuals.

Reference

Rose, G. (1985). “Sick individuals and sick populations.” *International Journal of Epidemiology* 14: 32-38 [Reprinted in *IJE* 30: 427-432 (2001)]

Changes in mammogram guidelines: Responding to the personal-story response

14 October 2010, <http://wp.me/pPWGi-3s>

Personal stories of the kind, “I would not be alive if a routine screening mammogram had not detected my breast cancer,” dominate the letters to the editor after any news of research or policy proposals that favor less use of such mammograms. What kinds of responses can be made on public health and ethical grounds to such letters?

First consider a recent, well-known case:

In 2009, the USPSTF (United States Preventive Services Task Force) updated its advice for screening mammograms. Screening mammograms, or routine mammograms, are X-rays given to apparently healthy women with no symptoms or evidence of breast cancer in the hope of detecting the disease in an early, easily treatable stage... The previous advice was for all women over the age of 40 to receive a mammogram every one to two years... The Task Force recommended against routine mammography to screen asymptomatic women aged 40 to 49 years for breast cancer. Patients in this age group should be educated about the risks and benefits of screening, and the decision whether to screen or not should be based on the individual situation and preferences. The old advice was based on “weak” evidence for this age group. The new advice is based on improved scientific evidence about the benefits and harms associated with mammography and is consistent with recommendations by the World Health Organization and other major

medical bodies. Their recommendation against routine, suspicion-less mammograms for younger women does not change the advice for screening women at above-average risk for developing breast cancer or for testing women who have a suspicious lump or any other symptoms that might be related to breast cancer. (Source: wikipedia)

Otis W. Brawley, chief medical officer for the American Cancer Society (ACS), responded for ACS. His commentary included a sentence widely quoted since: “With its new recommendations, the USPSTF is essentially telling women that mammography at age 40 to 49 saves lives; just not enough of them.” Brawley hints at a benefit/cost issue in the USPSTF recommendations—the benefits of the lives saved is outweighed by the costs (of screening, follow-up investigation of false positives, unnecessary treatment of slow-growing cancers, etc.)—but his words also seem to imply, accusingly, that the USPSTF is prepared to let a number of unscreened 40-49 year old women die of breast cancer—like the writers of the letters to the editor but now multiplied by the thousands.

Neither Brawley nor any letter writer, to my knowledge, has followed the logic of their rejection of the USPSTF proposal. If just one life saved by screening mammograms of 40-49 year old women justifies such mammograms being routine, how can they justify not having routine mammograms of 30-39 year olds? After all, there are women in that age group who get breast cancer and go on to die from it. In not advocating such screening is the ACS saying “mammography at age [30 to 39] saves lives; just not enough of them”? Similarly for 20-29 year old women[i]. And 10-19 year olds. And for 0-9 year olds. (Yes, breast cancer sometimes occurs in young girls.)

If this logic were pointed out to the letter-writers, they might agree that such screening for all ages should take place. Some of them might go on to get involved in a campaign to that end. Trying to convince insurance companies and government policy-makers to provide the necessary funds would, I predict, expose limits to the support to be gained from those who had been their allies in maintaining the practice of routine screening for 40-49 year olds. Insurance companies and government policy-makers would, I suspect, end up invoking benefit/cost arguments when faced with extension of such screening to other age groups—Healthcare funds are not unlimited and so they need some basis for choices about their allocation.

Yet, allocation of health care funds according to benefit/cost calculations cannot be expected to satisfy the person with the story about screening saving their own life. The post <http://wp.me/pPWGi-3L> considers a different angle to approach the incommensurability of the individual experience and the net social benefit.

[i] Indeed, a local newspaper that highlighted Brawley’s quote also featured a story about a recent high-school graduate recovering from breast cancer discovered (by self-examination, not by mammogram) when she was 23.