REALITY CHECK **Ray Moynihan**

Science of overdiagnosis with a good dose of humility

The Preventing Overdiagnosis international scientific conference gets under way next month

The Preventing Overdiagnosis conference (www.preventingoverdiagnosis.net) is close to capacity and may have to close registrations even before it opens its doors in a couple of weeks. It's pleasing that so many people will gather within the grounds of Dartmouth College's picturesque campus in New England to share the science of this problem and its potential solutions.

The meeting is hosted by the Dartmouth Institute for Health Policy and Clinical Practice, in partnership with the *BMJ*, the influential US consumer organisation Consumer Reports, and Bond University in Australia. It will feature more than 90 presentations, with participants from almost 20 nations. The twin aims are to share what we know about overdiagnosis and how we might best respond to it. And as we sit down to try to work out how to wind back the harms of too much medicine safely and fairly, if there's an overarching theme, let it be humility . . . for there are no simple quick fixes and no panaceas.

As interest in this field grows, it's worth restating that there are myriad benefits of a medical diagnosis. An appropriate diagnosis can open the door to effective management and well targeted treatment that can extend life and ameliorate suffering. Disease definitions and standardised diagnostic criteria enable reliable evaluation of treatments and a common language among researchers. Giving a label to bewildering or debilitating symptoms can help bring understanding and a great sense of relief to people. A diagnosis from a doctor can be a way for society to say that it cares enough about that suffering to label and treat it; medicalisation can pave the way to de-stigmatisation, recognition, and resources.

However, almost weekly in the world's top medical journals there's fresh evidence or debate about overdiagnosis and overtreatment. In recent months we've seen concern about the overtreatment of mild hypertension in *JAMA Internal Medicine*[1] and recommendations in *JAMA* for combating the overdiagnosis of cancer,[2] covered last week in Douglas Kamerow's *BMJ* column.[3] The *BMJ*'s new Analysis series on overdiagnosis (part of its Too Much Medicine campaign (bmj.com/too-much-medicine)) kicked off recently with an article on the overdiagnosis of pulmonary embolism[4] and followed with a piece on the controversy around "chronic kidney disease,"[5] where the boundaries of the "disease" have been set so wide that some experts have observed that "like a fishing trawler it catches many more innocent subjects than it should."[6] In *PLOS Medicine* last week I and a team of researchers published a study looking at a range of common conditions in which we observed that definitions were often broadened or diagnostic thresholds lowered by panels of experts with financial ties to drug companies that stood to gain from such expansion.[7] We didn't identify any causal link—but our findings augment the debate on the nature of overdiagnosis and reinforce questions about whether the current processes of disease definition need reform.

The Preventing Overdiagnosis conference will feature workshops on the philosophical underpinnings of how we define disease and how we define "normal." Others will look at how to reduce overdiagnosis in emergency medicine and general practice. Concurrent scientific sessions cover a wide array of topics, with many presentations focusing on the potential harms of screening and how to communicate them. Breast and prostate cancer are the subjects of several presentations, but a number of other conditions are covered, such as attention-deficit/hyperactivity disorder, osteoporosis, depression, asthma, and thyroid cancer. There are also sessions on how healthcare managers are responding to overdiagnosis inside hospitals and health systems and presentations on the role of financial incentives such as fees for services—part of the exploration of the many drivers of medical excess. Strategic planning sessions will close the conference, looking forward to further research, education, effective communication about overdiagnosis with professionals and the public, and policy reform, cognisant of the many activities already under way in this burgeoning field.[8]

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TOO MUCH MEDICINE

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While much ground will be covered in Dartmouth, other parts of the field warrant more digging. The coming tsunami of routine genetic testing for disease predisposition clearly carries huge risks of overdiagnosis. Making links between the problem of too much medicine and the way excess more generally is driving unhealthy climate change is another potentially fruitful area for debate and investigation.

Confronting truisms that "more is better," that "newer is best," and that early detection is always desirable is a complex challenge, and discussions on these issues will doubtless continue in conferences, seminars, workshops, and media across the globe.

In some ways this growing concern about medical excess feels like something new, but surely it is part of a long discussion about how to minimise any harm caused when doctors try to heal. Let's hope that we can keep that conversation going with a large dose of humility, a sprinkling of hope, and even, at times, a dash of humour.

Ray Moynihan is a journalist and senior research fellow, Bond University, Australia
RayMoynihan@bond.edu.au

Competing interests: I am one of the organisers of the Preventing Overdiagnosis conference and a member of the conference's scientific committee.

Those who wish to can follow conference events on Twitter (#PODC2013). The *BMJ* plans to publish a special theme issue in early 2014, aiming to capture the best from the conference floor and beyond.

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THE ART OF RISK COMMUNICATION **Gerd Gigerenzer**

Helping clinicians communicate HIV test results

Natural frequencies should become part of the training of every medical student and HIV counsellor

In April 2013 the US Preventive Services Task Force recommended that clinicians screen for HIV infection in people aged 15-65 years, revising its earlier position to screen only people at increased risk and pregnant women.[1] The proposal elicited discussion about the benefits and harms of antiretroviral treatment, the ethics of testing without people's explicit consent, and much else, but it neglected one crucial issue: risk literacy among clinicians.

When my colleagues and I tested 20 professional HIV counsellors, 10 wrongly asserted that false positive test results never occurred, and eight confused the test's sensitivity (the proportion of people with HIV who actually test positive for it) with its positive predictive value (the proportion of people who test positive who actually have HIV).[2] Does innumeracy among clinicians matter? No systematic studies of effects on patients exist—just anecdotal reports of people with false positive test results engaging in unprotected sex with other HIV positive people, believing that it wouldn't matter, and of people who committed suicide or who endured harmful effects of unnecessary antiretroviral treatment.[3]

A US woman, newly married and pregnant, was told by her doctor to undergo HIV screening and tested positive on western blotting. The doctors told her that the false positive rate was five in 100 000, gave her handouts about living with HIV, and sent her off to tell her family the news. After a bad evening, she considered her low risk lifestyle and went with her husband to a different clinic for a pinprick test; both partners have tested negative ever since.[4]

How can we help clinicians understand the risk of false positives? Consider a low prevalence group in which the frequency of (undiagnosed) HIV infection is about one in 10 000, as in female US blood donors.[5] If the test has a sensitivity of 99.95% and a specificity of 99.99%, what is the positive predictive value? To calculate this, medical students are taught to insert the prevalence, the sensitivity, and the false positive rate into Bayes's rule (see version on bmj.com). In our case this gives a positive predictive value of about 50%.

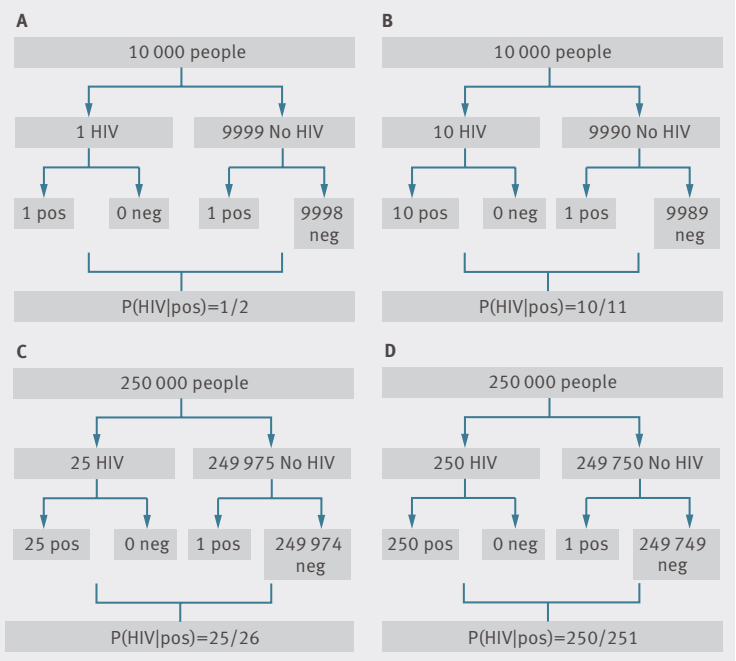
But the formula is not intuitive, which explains why even those who like to point out others' "probability blindness" are sometimes confused themselves, as exemplified by an MIT researcher who wrote that the sensitivity of the HIV test was 87% and that the false positive rate was "the complement of 87%, or 13%."[6]

A method that can improve insight is called natural frequencies.[7-9] These can be represented as a tree (figure). The top of the tree specifies a number of people, say 10 000. In the centre of the tree these are split into one person who is expected to be infected (representing the prevalence) and those who are not. At the bottom these are split again into those who are expected to test positive or negative. Now it is easier to see (panel A of figure) that among those who test positive one is infected with HIV and one is not. Thus the positive predictive value is 50%.

Prevalence, false positive rates, and sensitivity can vary widely in HIV testing, depending on the risk group and the test used. Panels B, C, and D show what happens with a different prevalence of HIV or false alarm rate. Even if the prevalence isn't exactly known, natural frequencies can help us acquire a feeling for their order of magnitude.

"Prevalence, false positive rates, and sensitivity can vary widely in HIV testing, depending on the risk group and the test used"

In panel A the prevalence of HIV is one case in 10 000 people screened, and the false alarm rate is one in 10 000. The tree shows that a total of two positive test results is expected: one true positive and one false positive result (thus the positive predictive value is 50%). Panel B shows the same tree for a prevalence of one in 1000 people, resulting in a positive predictive value of 10/11 or 91%. Panels C and D show the same analysis for a false alarm rate of one in 250 000



Gerd Gigerenzer is director, Harding Centre for Risk Literacy and Centre for Adaptive Behaviour and Cognition, Max Planck Institute, Berlin gigerenzer@mpib-berlin.mpg.de

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