

**BODY POLITIC** Nigel Hawkes

# Solving the mystery of health inequality

The emerging science of epigenetics could hold the key

The persistence of wide inequalities in health, even in a system with two generations of universal free access to care behind it, is a great unsolved mystery of medicine. Might new discoveries in genetics provide some answers, at last? Wearing my hopeful hat, I think they might.

Unequal provision of healthcare used to be blamed for the gap between rich and poor people's life chances, and it remains a favourite trope of Labour health secretaries to point out that, with every station on the London Underground heading east, life expectancy falls by a year. But hasn't more than 65 years of the NHS laid that explanation to rest? I do not pretend that everybody yet has equal access to care, but the inequalities that remain are far too small to explain the huge gaps in life expectancy.

Nor does blaming poor people for their own misfortunes meet the case. Poor diet, smoking, and other risky behaviour can account for some but not all of the differences. In the end we are reduced to arguments that are little more than arm waving or to citing explanations such as "the Glasgow effect," a potent force that is believed to account for the especially poor prospects of Glaswegians, a medical version of the dark matter that puzzles cosmologists. It's common to hear the claim that what matters is having control of your life, which, while possibly true, is not a biological explanation as commonly understood.

## The divide between rich and poor

The real difference is in wealth. Rich people do lots better than poor people, a strong argument for a more equal distribution of wealth. But although there's an abundance of evidence attesting to this truth, it isn't a biological explanation either. What is it about wealth that enables its possessors to claim a few more years of life, given that the conventional explanations don't seem to provide an adequate answer?

It's tempting, to those who aren't afraid of giving offence, to suggest differences in genetic fitness. In a fluid society, people with the highest intelligence rise to the top, tend to mate with others of equal intelligence, and to have bright children. If the genes for IQ are a mark of general fitness, then it's possible that both wealth and longevity march in step.

But this explanation is unpalatable, because we recoil from causes that have no remedy, preferring, like Thomas Gray, to believe that the graves of the poor contain some mute inglorious Milton who but for the accident of birth could have written *Paradise Lost*. Besides, studies of migrant populations show that shared genetic heritage has less effect on inequalities than do contemporary environments.

The emerging science of epigenetics could hold the key. Though the public still widely believes that the genes you are born with are fixed and immutable, the idea is at least a decade out of date. While the genes may not alter, their function may be changed by a range of factors that regulate how they operate. Some genes may be silenced, others activated. Such changes, once made, can be inherited, indicating that the genome can retain a biological memory of the experiences of past generations. Importantly, these experiences may have been quite transitory—far too brief to have had any effect on the genome through natural selection. Yet they affect life chances and may be inherited.

As an example, recent experiments have shown how male fruit flies that were fed on a sugar rich diet were able to pass on to their offspring a propensity to obesity.<sup>1</sup> This transmission was traced to changes in gene expression that resulted in down-regulation of two proteins, one of them called Su(var); and a further investigation showed that the depletion of Su(var) proteins is also seen in obese mice and humans. Most strikingly, in identical twin pairs one of



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whom was obese and the other not, depletion of Su(var) was found only in the obese twin.

In this case, a transmissible trait was introduced by diet, but plenty of other epigenetic pathways have been identified. One is stress arising from social position, such as job seniority, or shift work; another (studied in rats) is mothering style, with less nurturing mothers producing longlasting changes to the epigenetic profiles of their offspring that resulted in greater proneness to anxiety. Yet another is pollution: experiments in mice have shown changes in sperm caused by 10 or more weeks' exposure to air pollution that were not reversed when the pollution was removed. Transmission of such changes to future generations also looks possible, though there remains some dispute over their persistence.

There thus seems a real possibility that epigenetics can help explain why differences in life prospects exist and why they persist so obstinately. They could be the long sought biological mechanism that makes sense of the data on poverty and longevity, because poor people are more likely to experience the environmental insults that trigger the changes, passing them on to their children, who are then unfairly blamed for being the authors of their own misfortunes.

The public health implications, if this proves true, are many. There is also the possibility of intervening with drugs to correct epigenetic changes. But the discoveries cut both ways: if obesogenic diets are producing changes that are transmissible, it is no longer possible to regard each new generation as a clean slate more amenable to dietary advice than its parents were. Epigenetics may illuminate the Glasgow effect but doesn't make it any easier to eliminate.

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**NO HOLDS BARRED** Margaret McCartney

## Time to give patients informed choice

Time is short: 10 minutes. Come in, take a seat, introduce yourself. Remove a jacket. Say what's wrong. Talk freely. I ask questions to exclude or include a diagnosis. We may need a translator, who may or may not have been organised. On average, we discuss two or three problems.

Then an examination, which may require undressing, a chaperone, screens pulled around. We discuss findings, uncertainties, a proposed course of (in)action, and decisions (perhaps deferred). My computer prompts me to review drugs, ask about smoking, and switch drugs to cheaper ones. A few words may reveal why the patient is here at all. We may discuss follow-up and whether I can leave voicemail messages. Then re-dressing, leaving, typing up the notes, and writing reminders for later (for referrals, finding information, and so on).

Into this mix goes the judgment from the Supreme Court essentially that patients, not doctors, should decide what risks to take and that doctors should ensure that patients have

balanced information on treatments.<sup>1</sup> At this I cheer. For almost 15 years a theme of my writing has been the need for unbiased information so that citizens can make informed choices about interventions, particularly screening.

Emphasis on the need for choice—rather than submission—has been a long time coming. However, screening invitations are generally sent by post, with printed or web based information. We still lack standardised, face to face discussions to ensure understanding and answer any questions. This exemplifies the problem: even the most planned healthcare does informed choice badly.

Giving patients better information requires a systematic overhaul. It's simply not possible in a 10 minute consultation to outline every hazard and every treatment option. Remember: not everyone is literate, able to access the internet, or in a position to seek information. Patient information leaflets can be patchy, and information sheets inside drug packets



**Not everyone is literate, able to access the internet, or in a position to seek information on his or her own health**

are largely there to protect the manufacturer, not to help patients make informed choices. Citizens and professionals can struggle to make sense of risk: we need help to do it well.

We should provide universal access to coherent information for people with all levels of literacy on the problems we deal with daily, to outline choices, uncertainties, hazards, and the benefits of interventions. This needs to be tested for effectiveness (and harms). And we must find more time to help patients make choices. This does not just mean help from pharmacists and nurses: we need to get rid of every politically driven, wasteful thing doctors do that takes away time from patients.

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**BLOG** Athene Donald

## Learning lessons from Tim Hunt

Many years after his Nobel prize winning discoveries in cell cycle regulation, Tim Hunt made some inappropriate and indefensible comments. It seems like the whole world wants to discuss those comments. Or rather, it's as if everyone wants to demonise the man and forget the totality of his life.

Scientists are supposed to like evidence. We are not supposed to cherry pick data to fit a model that ties in with our beliefs, and I fear that some of the more extreme extrapolations that have been made—based on one datapoint comprising some off the cuff remarks, however offensive people found them—do not stand up to scrutiny. If any good is to come out of this whole sorry episode, I hope it will be that people scrutinise their own behaviour in the light of the issues regarding the ongoing barriers, explicit and implicit, that women in medicine and science face. I believe that Hunt has been



**We should use this episode as a trigger for much wider action across the sector to ensure that future generations of talented women get the support and recognition they deserve**

scapegoated to exorcise a sense of guilt that all is not well for women in science—and, of course, that won't really move us forward.

We should use this episode as a trigger for much wider action across the sector to ensure that future generations of talented women get the support and recognition they deserve. No more appointment and promotion panels that don't receive training to deal with unconscious bias; no more presumptions that part timers can't be serious about their research; no more dumping of unvalued (in terms of career progression and promotion) tasks onto women because "they'd be so good at it"; no more lazy stereotyping, including by the

media; no more looking the other way when whispers of harassment or aggression surface. Will all this happen because one man and great scientist has been publicly humiliated? I fear not.

In medicine, in universities, and in most other professions we still too often rely on appointing people "like us" while at the same time paying lip service to the value of diversity. Minorities suffer because they are different and may not appear to fit in with the dominant norm. To rectify such problems we need not to vilify one man but to scrutinise behaviour across the board. We need to recognise the implicit hurdles that women face daily and to embrace wholeheartedly

the idea that each of us has a responsibility to call out bad behaviour. Stories of harassment often bubble beneath the surface, as well as stories of aggressive behaviour directed towards people lower down the pecking order. As long as people think that this is acceptable behaviour we will not have equality.

We remain stuck in a mindset of normative behaviour that is outdated. Far too many questionable practices are allowed to continue. At the very least, we should use the sacrifice of a great scientist to finally embrace change. This means putting into place the well documented actions that can improve the working world for women and men alike, not briefly shouting and then forgetting about the wider problems.

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# Nepal was better prepared than Haiti

**Paul S Auerbach** responded to recent disasters in both countries and reflects on why Nepal saw so many fewer deaths

**O**n 12 January 2010, a magnitude 7 earthquake struck Haiti 25 km from the capital, Port-au-Prince. Between 160 000 and 200 000 people are estimated to have died and more than 300 000 were injured.

Five years later, on 25 April 2015 a 7.8 magnitude earthquake struck Nepal, its epicentre 77 km from Kathmandu. This was followed on 12 May by a 7.3 magnitude earthquake equidistant from Kathmandu but on the opposite side. So far 8604 people are reported to have died and 16 808 have been injured.<sup>1</sup>

In both countries, buildings collapsed and enormous numbers of people were displaced and relocated to improvised shelters. The risk of communicable diarrhoeal disease loomed because of crowding and rain. Restricted airport capacity delayed relief workers and supplies.

The many differences between the two countries help explain why Haiti was far more vulnerable than Nepal to a similar sized earthquake. Both countries are poor, but Haiti is significantly poorer than Nepal. Haiti is considered politically a fragile, if not failed, state. It was more densely populated in the immediate region of the earthquake. The overall result was that Nepal was better prepared than Haiti to respond to such a major disaster. Nepal's comparatively low death toll shows how much preparedness, both by governments and the international community, can make a difference.

## Haiti had less medical infrastructure

Haiti had a very weak medical system infrastructure and shortages of staff and equipment even for routine care, let alone for mass treatment of patients with trauma. Large parts of the university hospital in Port-au-Prince collapsed structurally and functionally. Haiti had almost no effective emergency medical services system or network of community healthcare workers, and crushed neighbourhoods had had no preparation for dealing with an earthquake. Civil disobedience and marginally effective law enforcement ensued. Global responders effectively had to create a healthcare system rather than support one.

By contrast, Nepal's robust healthcare system remained largely intact. Most of the many hospital and clinic buildings remained usable. They were staffed by highly qualified doctors and nurses, rose to the occasion, and functioned well. For example, Patan Hospital had been retrofitted to withstand an earthquake and the orthopaedic surgeons had

**Haiti (above was far more vulnerable than Nepal to a similar sized earthquake)**



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working operating theatres.<sup>2</sup> The recently created Nepal Ambulance Service, whose staff Stanford Emergency Medicine International helped to train,<sup>3</sup> worked overtime to transport injured patients while operating its dispatch centre from inside a tent.<sup>4</sup> The business community, including the Federation of Nepalese Chambers of Commerce and Industry, organised volunteers who provided essential non-medical services. The military and local law enforcement helped transport patients and maintained law and order in public areas, which were rapidly occupied by displaced people.

## Kathmandu was ready

I arrived as an emergency medical provider for International Medical Corps within a few days of the earthquake in Haiti and the first earthquake in Nepal. The first days of the response in Haiti were chaotic and there were tensions between the Haitian government and international organisations. The first days of the response in Nepal saw more prompt structured collaboration internally and coordination between national and international response organisations. Many Nepalese organisations had expected an earthquake and had prepared to some degree with drills.

We can learn lessons from what transpires in Nepal and from preceding earthquakes.<sup>5</sup> To minimise loss of life and property, and maximise early recovery, preparedness is essential. Geophysicists can predict where and when earthquakes might occur.<sup>6</sup> We must design for the possibility of earthquakes. The earthquakes in Nepal again highlight the perils of non earthquake-proof construction and isolation. Communities need to enforce building codes and construction standards, with incen-

tives, funding, and the mandate to improve. The initial medical focus is on people seriously injured by falling debris and collapsing buildings. Poor living conditions following an earthquake mean that conditions such as diarrhoea, respiratory infections, and skin infections should be anticipated.<sup>7</sup>

All citizens should be taught personal protective behaviours, such as "drop, cover, and hold on," and these should be practised in drills.<sup>8,9</sup> National and international relief teams may take days to arrive, so communities need to identify local emergency response teams in expectation of a disaster, and the general population should be taught safe sheltering, water disinfection, and basic medical first aid.

Every municipality should try to have, or know where to obtain quickly, heavy lifting equipment to clear rubble to allow movement through affected areas. Shelter, food, and water are essential for displaced people and responders. Sanitation and hygiene need to be priorities. Injuries and medical problems caused by earthquakes are predictable, and medical professionals need thorough and validated training. Emergency response systems should be created and prepared. Supply chain management, communication, and transportation needs can be anticipated. Interoperability of communication systems, particularly when multiple languages are spoken, should not be assumed without preparation. Events as large as the Nepal earthquake will almost always need a global response. Regional teams that can be rapidly mobilised could be set up.

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