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Suicide watch

Despite a high death toll, public-health efforts to combat suicide lag far behind those focused on preventing accidents and diseases such as cancer. A US initiative aims to redress the balance.

Some 38,000 people killed themselves in the United States in 2010. That's more than were killed in traffic accidents (34,000) or by prostate cancer (29,000), and more than twice the number murdered (16,000). Shocking though that is, many other countries monitored by the Organisation for Economic Co-operation and Development have even higher suicide rates. So why do public-health authorities put less effort into preventing death from suicide than they do death from accidents or diseases such as prostate cancer?

One institution that has started to take the matter very seriously is the US army. Since 2008, the suicide rate among soldiers has exceeded that of the general population, and in the past few years the army has lost more soldiers to suicide than to combat. In 2009, the army launched a US$65-million, six-year project called Army STARRS to collect genomic, medical, psychological and lifestyle data from more than 100,000 soldiers to try to identify suicide risk factors and prevention measures, as well as biomarkers of resilience such as epigenetics or brain connectivity. In 2010, it co-launched the National Action Alliance for Suicide Prevention, a public–private partnership, which last week released a pioneering 172-page report on suicide and how it might be tackled.

The report, produced and published in partnership with the US National Institute of Mental Health in Bethesda, Maryland, outlines a strategy to reduce suicide rates in the general population by 20% over the next five years. It also makes shockingly clear how little is known about suicide. There is no standard way to define and so recognize what it means to be suicidal. Relevant statistics are not routinely collected, which makes it hard to know, for example, the effect of round-the-clock crisis teams, and good follow-up care for those who attempt suicide.

Cases of suicide linked to cyber-bullying in young people feature prominently in the media, but few studies have addressed how social media might increase suicide risk through bullying or contagion (prompting copycat suicides). In any case, people over the age of 65 kill themselves much more frequently than do young people.

Two things we do know. First, a high number of people with a psychiatric disorder such as schizophrenia, depression or substance abuse kill themselves — somewhere between 50% and 90% of all suicides are thought to be associated with mental illness. Second, stressful life events, particularly during childhood, greatly increase suicide risk. However, most people who are under stress or mentally ill do not kill themselves. And even as the use of psychiatric medications has soared in the past two decades, suicide rates in the United States and most other countries have remained stable. So what is going on? And what might help?

It will never be possible to eliminate suicide, but it should be possible to reduce rates in different risk groups by attacking the problem from many sides. Biological approaches could identify and help the vulnerable, and sociological interventions could reduce stress in societies.

More long-term studies such as Army STARRS are required to shed light on the biology. And clinical trials can identify therapies that target personality traits or feelings likely to lead to suicide — impulsivity and helplessness, perhaps. One large clinical trial that directly addressed suicide and psychiatric disease indicated that the antipsychotic drug clozapine could help to cut suicide rates in people with schizophrenia (L. Alphs *et al. Schizophr. Bull.* **30,** 577–586; 2004). And small trials have hinted that lithium may do the same for those with depression.

There are no good animal models for suicide risk at present, so biological investigations will have to rely on work with humans. But much can already be done to reduce suicide numbers, even in the absence of biomarkers. One powerful option, on which the report's strategy for reducing suicides by 20% strongly depends, would be to reduce people's access to means of suicide.

> ***"There is no standard way to define and so recognize what it means to be suicidal."***

Surprisingly, many people intent on suicide abandon their plan if their chosen means is not available. Firearms account for about half of US suicide deaths, and modelling work carried out for the new report shows that almost 10% of all suicides could be prevented by restricting access to guns. In 2010, 735 people in the United States killed themselves with carbon monoxide from car exhausts; the report suggests that 600 of those deaths might have been prevented if car manufactures were required to install a sensor inside the vehicle that turns off the engine when carbon monoxide builds up.

The report's 20% target will probably not be achieved in the desired five years, but it opens a useful debate that will help more people to understand that the action of committing suicide needs to be considered in the same way as a disorder — as something that can be addressed, not an unavoidable product of circumstance. ■

Number crunch

The correct use of statistics is not just good for science — it is essential.

In the fragmented media marketplace, it is a brave publisher that dismisses the professional competence of most of its readers. So sensitive subscribers might want to avoid page 150 of this week's *Nature*.

The criticism in question appears in a News Feature on the thorny issue of statistics. When it comes to statistical analysis of experimental data, the piece says, most scientists would look at a *P* value of 0.01 and "say that there was just a 1% chance" of the result being a false alarm. "But they would be wrong." In other words, most researchers do not understand the basis for a term many use every day. Worse, scientists misuse it. In doing so, they help to bury scientific truth beneath an avalanche of false findings that fail to survive replication.

As the News Feature explains, rather than being convenient shorthand for significance, the *P* value is a specific measure developed to test whether results touted as evidence for an effect are likely to be observed if the effect is not real. It says nothing about the likelihood of the effect in the first place. You knew that already, right? Of course: just as the roads are filled with bad drivers, yet no-one will admit to driving badly themselves, so bad statistics are a well-known problem in science, but one that usually undermines someone else's findings.

The first step towards solving a problem is to acknowledge it. In this spirit, *Nature* urges all scientists to read the News Feature and its summary of the problems of the *P* value, if only to refresh their memories.

The second step is more difficult, because it involves finding a solution. Too many researchers have an incomplete or outdated sense of what is necessary in statistics; this is a broader problem than misuse of the *P* value. Among the most common fundamental mistakes in research papers submitted to *Nature*, for instance, is the failure to understand the statistical difference between technical replications and independent experiments.

Statistics can be a difficult discipline to master, particularly because there has been a historical failure to properly teach the design of experiments and the statistics that are relevant to basic research. Attitudes are also part of the problem. Too often, statistics is seen as a service to call on where necessary — and usually too late — when, in fact, statisticians should be involved in the early stages of experiment design, as well as in teaching. Department heads, lab chiefs and senior scientists need to upgrade a good working knowledge of statistics from the 'desirable' column in job specifications to 'essential'. But that, in turn, requires universities and funders to recognize the importance of statistics and provide for it. *Nature* is trying to do its bit and to acknowledge its own shortcomings. Better use of statistics is a central plank of a reproducibility initiative that aims to boost the reliability of the research that we publish (see *Nature* **496,** 398; 2013). We are actively recruiting statisticians to help to evaluate some papers in parallel with standard peer review — and can always do with more help. (It has been hard to find people with the right expertise, so do please get in touch.) Our sister journal *Nature Methods* has published a series of well-received columns, Points of Significance, on statistics and how to use them.

"Too many researchers have an incomplete or outdated sense of what is necessary."

Some researchers already do better than others. In the big-data era, statistics has changed from a way to assess science to a way of doing science — and some fields have embraced this. From genomics to astronomy, important discoveries emerge from a mass of information only when they are viewed through the correct statistical prism. Collaboration between astronomers and statisticians has spawned the discipline of astrostatistics. (This union is particularly apposite, because it mirrors the nineteenth-century development of statistical techniques such as least squares regression to solve problems in celestial mechanics.)

Among themselves, statisticians sometimes view their contribution to research in terms of a paraphrase of chemical giant BASF's classic advertising tag line: "We don't make the products. We make them better." In doing so, they sell themselves short. Good statistics can no longer be seen as something that makes science better — it is a fundamental requirement, and one that can only grow in importance as funding cuts bite and competition for resources intensifies.

Most scientists use statistics. Most scientists think they do it pretty well. Are most scientists mistaken about that? In the News Feature, *Nature* says so. Go on, prove us wrong. ■

Lone wolves

A declining island wolf population underlines the influence that humans have on nature.

Ecologists have studied the wolves and moose on Isle Royale, a remote island in Lake Superior, for more than 50 years. As we report on page 140, after decades of isolation and inbreeding, the wolf population may be on the verge of dying out.

The US National Park Service, which manages the island, is moving slowly in deciding how to proceed. It has three options: total non-intervention; reintroduction of wolves only after the current population has hit zero; or pre-emptive genetic rescue by bringing in wolves from the mainland to diversify the gene pool. Arguments for non-intervention tend to rely on the perceived need to let nature take its course. This is nonsense. The whole system is highly artificial: wolves and moose have been on the island for less than 100 years, and human activity has been key to the wolves' decline. A previous wolf-population crash in the 1980s was caused by a disease transmitted by a domestic dog. Anthropogenic climate change is almost certainly reducing how often ice bridges form to the mainland, which makes it hard for new wolves to come to the island. Some even think that humans put moose on Isle Royale in the first place.

Arguments are more convincing for reintroducing wolves only if the current population dies out: waiting and watching may yield some useful insights into how highly inbred populations function. But the ecologists who run the island's predator–prey observation study warn that, as the wolves die out, the moose will gorge unchecked on their key food plant, balsam fir, preventing the plant from regenerating. The researchers think that by the time the old wolf population has died out and a new one is established, the ecosystem may have become dominated by pine or spruce, without enough firs to support a moose population that can in turn feed a viable wolf population. If the wolves die out, they could become nearly impossible to reintroduce.

And that might be fine, except that tourists and locals love the wolves of Isle Royale, and the National Park Service was founded with an obligation to protect "the enjoyment of future generations". Furthermore, the predator–prey study — the world's longest — would have to end. That would be a shame: it would be difficult to find another place where none of the predators, herbivores or trees are routinely exploited by humans.

The study's lead ecologists are in favour of genetic rescue. This fairly cheap intervention would allow the project to continue, and would stabilize an ecosystem with which many people feel a deep connection. Some researchers have suggested that any data on reintroduced wolves would have to be treated with caution. Certainly, the influence of the reintroduction would be acknowledged and studied. But the introduced population would not be any more artificial than the population that survived disease, or that which could suffer the effects of climate change.

Isle Royale data help ecology to approach one of its grandest questions. As study leader John Vucetich puts it: "Are ecosystems like other physical systems, governed by law-like patterns and processes, or are they more like human history, where we see one contingency after the next?" The early years of the study seemed to support predictions that in a closed system, predator and prey populations would follow law-like mirror-image cycles, driven by predation pressure. But the data never fitted the theoretical curves that well. And since then, factors from disease to fir abundance, weather, moose ticks and wolf inbreeding have taken turns as the key driver in shaping the populations.

The driver that will shape the future of Isle Royale is now the decision on whether to stage a rescue. Thus of the story of all Earth's systems is writ small on a wooded isle in a frozen lake: the course of human history is no longer merely analogous to the course of ecology. Ecology depends on human history. ■

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