Gedankenexperiment or just a flight of fancy?

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What’s faster than the speed of light? The speed of thought they say. Not in the strict sense of metres per second taken for an impulse to travel down a neuronal axon, but in metaphor. For in an instant, the human mind can transport itself from terra firma to the farthest reaches of the galaxy, zoom into the tiniest organelle in the tiniest prokaryote, or even just jump onto some entirely alternate plane of reality. Much faster than any old light ray ever could. ‘There are more things in heaven and earth, Horatio, than are dreamt of in your philosophy’.¹

True, Prince Hamlet, no doubt. But Horatio’s philosophy can still go a long way and it can get there pretty fast. You may at this point be asking what does this have to do with Medicine and the empirical sciences? ‘All sounds a bit wishy-washy, frankly . . .’ And this is where I become sacrilegious; for may haps, in our never-ending battle to unearth every medical scientific mystery the universe holds, in this brave new era of evidence-based medicine, with all its correctness and methodical beauty we have lost from our armoury a most formidable weapon; the thought experiment.

The most famous thought experiments, or Gedankenexperiments as the phrase popularized by Ernst Mach goes, are arguably those that developed into Einstein’s theory of Special Relativity and Newton’s theory of Gravity. Moments of genius in the history of Man. The latter theory was later proved by other empirical means of course, but their established use and the scientific celebrity they achieved made the use of these Gedankenexperiments invaluable tools in the physical sciences. However, the earliest recorded full account of a thought experiment comes to us from the writings of a physician rather than a physicist. A patriarch of modern medicine. One who originally described the contagious nature of tuberculosis and wrote on and propounded the Germ theory long before a miasmatic Europe finally caught ‘wind’ of it some eight centuries later. Ibn Sina or Avicenna as he is known in the West provides us the first full elucidation of a thought experiment with his ‘Flying Man’ description.² A tradition of scientific method then started by a medic.

Fast forward to today. In a modern world, is there any room for thought experiments to drive health policy? John Rawls’ work on distributive justice, which so intimately influences many of the principals of modern public health philosophy and practice, is itself based on a thought experiment. The Original Position thought experiment he describes in his book A Theory of Justice is used to justify and explain the system of distributive justice that so many health professionals now take as their ideal model for healthcare.³ Is there room then, on the basis of logical arguments and intuition alone, for decisions to be made that could potentially affect the health of large numbers of people? Or does every health proposal always have to come with the requisite bundle of randomized controlled trials and cost analyses in tow? Without exception? Surely, sound empirical evidence being a function of time, funding, necessity, popularity and the appropriately trained and motivated researcher is not always feasible. Does the entire process ever cause unnecessary delay or perhaps even stifle scientific development?

Time then, to examine a case in point. Thought experiments all follow a methodology that is a priori and so are conducted wholly in the mind without the use of observation or physical experiment. They have proved invaluable in the discovery of new knowledge and in developing concepts in a wide variety of fields from philosophy and metaphysics, to law, mathematics and the natural sciences. As such, they have been divided into many subcategories depending on the particular method employed and discipline for which they are being adapted.⁴ As philosophers sometimes disagree on the very nature of thought experiments and often conceptualize them differently, several taxonomies have evolved for classifying them.⁵

For our purposes, let us construct our thought experiment using reducendi ad absurdum, a model of apagogical logic where a proof by contradiction is made using an informal fallacy.⁶ Or

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simply put, where a logical case for not following a certain course is made by the ridiculous nature of the outcome.

The choice of an illustrative thought experiment stems from the personal experiences of the author\textsuperscript{7} as well as from a desire to address in some small way that seemingly intractable of public health issues; health inequalities and inequity both in delivery and access to health services. It often seems that despite the wonderful medical advances of the last century and the increasing life-expectancies witnessed in so many countries and peoples around the world, the problem of inequity and health inequalities within societies seems as entrenched as ever.

**Thought experiment: airline safety policy**

Basic premises:

(i) It is mandatory for every commercial airline to provide life-jackets under every passenger seat.

(ii) Medical equipment/kits and training is self-regulated by the airlines (the notable exception being the mandatory automated defibrillator (AED) provision on all flights to and within the USA).\textsuperscript{8}

(iii) The primary argument against mandatory guidelines and enforced provision of equipment is the perceived small proportion of total medical emergencies on airlines compared to the total number of flights and passengers. The extra cost of such provisions and training is thus felt not to warrant their mandatory, regulated use by various civil aviation authorities. This, of course, is the argument put forward most often by airline authorities and is somewhat at odds with medical opinion.\textsuperscript{9}

Let us challenge this status quo then, by posing a series of questions with no use of empirical methods or statistics.

What proportion of total flights that fly every year will crash?
Of these flights, how many will crash in a body of water?
Of the proportion that crashes in a body of water, how many will have survivors that live through the initial impact of the crash?
Of those survivors, what proportion will be in a condition to make use of the life-jacket under their seats?
Of those that do use the life-jacket, what proportion will actually have had their survival improved specifically because of their use of said life-jacket?
How are these proportions affected if we only examine flights that are entirely overland?

A short appendage to our thought experiment is added here in the form of a most unscientific anecdote: Vesna Vulovic, famously survived a free fall after her airplane blew up over-land in 1972 at 33 000 feet. She did this by crashing onto a snowy mountain and finally settling on a frozen pond of water still strapped into her seat. Even she didn’t use her life-jacket!

Had civil aviation and the safety laws it currently operates under first been developed in an era of evidence-based practice, could a justification for the provision of life-jackets under every airline seat including all flights that are overland been made?

Would a cost benefit analysis even with the most generous monetary valuation of a human life justify putting life-jackets under every seat on every airline (not that monetary valuation of a human life has ever been a particularly scientific or evidence based concept)?

Instead, could a successful argument be made using a cost benefit analysis, for the removal of life-jackets from the seats of passengers?

Could this possibly be followed up with a cost-effectiveness analysis comparing life-jackets and defibrillators and/or medical equipment in terms of morbidity and mortality?

Conclusion?

Get rid of all the life-jackets. A clearly ridiculous outcome?

Or perhaps, first class passengers might make do with a scoop less of caviar on their crackers and instead settle for a backup adrenaline vial, just to offset costs of course.

Here ends our thought experiment.

Not evidence based enough? Not enough to justify a policy change? No doubt countless puritans and upholders of all things prim and proper will be hastily arranging plans for in-flight audits, designing before-and-after studies and busily completing that cost benefit analysis (though with the current instability of currency markets, choosing the wrong currency for the analysis may well make results invalid by the time the analysis goes to press). All in the hope that, that bastion of science, the civil aviation authority be convinced by good intentions and beneficent recommendations. With the provision of medical equipment and services on flights being almost wholly self-regulated by the airlines themselves, it is not surprising that some airlines provide good medical kits and AEDs while others do not. Nor, is it surprising that travel routes more likely to have passengers with a recourse to legal action against an airline for poor medical services are better provided for than those without. Thus, as in almost every other sphere of health services worldwide, it is those that are poorest and the least empowered that end up with the worst health-related service.

Could we not just be sensible and make upgraded medical kits based on expert medical consensus\textsuperscript{10}
mandatory on all airlines and all sectors all over the world? AEDs and their maintenance are admittedly expensive but so are many of an aeroplane’s standard safety features and could at least be made mandatory for all long-haul flights in the first instance. All these passengers are treated equitably and their lives equally valued whether they’re flying to the richest capitals of Europe or whether they’re flying to the poorest cities of Africa. And what’s more, let’s just keep the life-jackets. They’re a big part of our comfort zone. We’re all so used to that routine of being shown how to put them on by the cabin crew every time we take off. They give us that peace of mind in those nervous couple of minutes just before take-off. And because at some point, on some random journey, we all sit in our seats and imagine ourselves, just for that split second, floating in a cramped, bright yellow dinghy. There we are, bobbing along in that dinghy with a bunch of complete strangers, and only our trusty life-jackets for company. I dunno, it’s just a thought.

References