

DECISION DAY with ANNALISA: *PUB, PUMP and PESTILENCE*

Annalisa has the ability to meet with characters, real or fictional, past or present, on a day they are taking an important decision. She helps them explore whether they are making the best decision. In this decision making session the character knows nothing about what happened subsequently and, while Annalisa does know, she consciously minimises the effect of that hindsight knowledge on what she says and does with them. Afterwards she brings her guest briefly into the present day to show and discuss what actually happened subsequently.

Set- up: 16 June 2008

Hello. It's Annalisa again. I'm in Broadwick Street, London, outside the John Snow pub. And you've guessed right... my guest today on Decision Day is none other than the John Snow after whom this pub is named. It's June 16 2008 today and so the 150th anniversary of Snow's death in 1858. I'm going to be talking to him on his Decision Day, 6 September 1854. Let's first give him the big surprise.

Hello Dr Snow.

And who may you be?

I'm Annalisa de Cision and we've brought you back briefly to the year 2008.

I'm dead long ago, therefore. I can't remember anything after early... 1858. How do you do this?

I'm afraid that's a closely-guarded secret. Yes, sadly you died suddenly on June 16 1858 at the age of only 45.

Of the cholera?

No, as far as we can establish you had a stroke.

Why am I here? Is that public house named after *me*? How ludicrous ... I was always a teetotaller and temperance campaigner. And where am I? This street looks just a little familiar, though all the buildings have changed... it's Broad Street, is it not?

Broad*wick* Street now, since it was merged with Wick Alley in 1936.

Am I still noteworthy 150 years after my death? Or is naming a public house after me some sort of joke?

Well, most of the ordinary people you can see in Broadwick Street won't have a clue about you. But yes, many people alive today have heard of you and you are definitely 'world famous' in some circles. Indeed you were voted the 'greatest doctor in history' in a medical magazine poll a few years ago. I wouldn't take that too seriously, however, because it's suspected there was a write-in campaign in your favour by members of the John Snow Society.

A Society named after me too? I'm totally amazed! I have to assume this is all because I developed new methods for administering chloroform. I had the honour of helping our Queen Victoria deliver both The Prince Leopold in 1853 and The Princess Beatrice in 1857.

For the Queen herself to receive an anaesthetic was indeed a major innovation and breakthrough, especially since the Church of England and most medical authorities were opposed to it.

I remember the furore. What happened to those children by the way?

No problems from the chloroform! Unfortunately Leopold inherited haemophilia from his mother and had a short and semi-invalid life, dying at the age of 30. Beatrice became her mother's lifelong companion and survived almost everyone in the family, dying at the age of 87. But, important as your work in anaesthesia undoubtedly was, that is not the reason you're with me today. You're here because we're interested in a decision you took on 6 September 1854.

September 1854? That would have been the time of the terrible cholera outbreak in this area. And the episode of the pump handle. Is that a reproduction of it I see in the distance?

It is indeed ... and shortly we will be sitting in your home nearby in Sackville St on the evening of 6 September 1854 talking about that pump handle. You won't know anything that happened after that point of time.

Not even for the subsequent 3 years I was alive?

No, that is what making a decision implies! And I will pretend I know nothing more than you during that session.

I won't find out what happened subsequently? That's a pity. I'd love to know...

After the Decision Day session we will come back briefly to 2008 again. You will then be able to give us your version of what happened in the remaining years of your life and I will be able to tell you some of the things that happened over the next 150 years, until now. Let's go.

6 September 1854

You look as if you have had a busy time. Tell me about it.

In the last two weeks there has been a terrible outbreak of the cholera in the Golden Square area nearby. This concerns me greatly not only because I'm a physician – though we can do nothing for the victims, who die within 24 hours - but also because I'm a medical scientist with a particular interest in cholera. Indeed I published my theory about its transmission 5 years ago in 1849 [1].

Is your theory now accepted?

Definitely not! Despite my publication the vast majority of scientific opinion still holds that the cholera is air-borne - transmitted through the *air* in the bad smells associated with miasma. The miasmatisists reject - with varying degree of politeness and ridicule - my hypothesis that the cholera, whatever it is (and we don't really know), is primarily transmitted through *water* and in particular through drinking water. That's the reason I've been doing a large study in Southwark and Lambeth on the other side of the river Thames. I'm now confident I can demonstrate that the areas drawing their water supplies from sewage-contaminated parts of the Thames have a much higher death rate than those that draw them from elsewhere.

That would seem to an important finding to publish as soon as possible if you are right... or even *probably* right given people are dying in large numbers. Is the study nearly finished?

Yes, it is... but since I became very interested in this local outbreak I have suspended work on it for the last week in order to investigate what is happening here in Soho.

With a view to gathering further confirmation of your theory?

Of course... though I would never think of distorting the evidence if it was to the contrary.

What have you done up to now? Maybe gathered some water samples ... presumably not air samples!

Indeed. Since it was a very localised outbreak I quickly concluded that transmission would be through a specific water pump rather than via the general piped water supply. So on the 3rd I took samples from the various pumps in the area and have been observing them. After a couple of days they all showed some impurities, apart from the Broad Street sample. Then yesterday morning I obtained the latest figures from the General Register Office on the number of deaths in the area. The numbers were only available for the week ending September 2, but during that time there were 83 deaths in the Golden Square area. I then went down to the corner of Cambridge and Broad Street and studied the list of addresses of the dead. I could see that almost all were all in the immediately surrounding area.

What else have you done since then?

I have talked to many residents and businesses to check whether the cholera deaths occurred in households or businesses where water was taken from the Broad street pump... and vice versa, to confirm that where deaths hadn't occurred water was taken from elsewhere.

So what are you doing this evening?

As with each of the previous evenings I am considering whether I should go to the Board of Guardians of the Parish of St James and tell them that they should disable the Broad Street pump by removing the pump handle.

So each evening since the beginning of the outbreak one of your options has been to take that action the next day. What consideration was pushing you in that direction?

Naturally the belief that it would save lives, since every day's delay was costing lives - if I am right.

Your other option was not to act, an inaction which was potentially... *probably* given your belief... costing lives. Why then have you been waiting and how long are you prepared to wait?

I would like to convince the scientific community that I was right about the cholera being water-borne and that water supplies from a particular source was the origin of this particular outbreak.

But why wait? What is personally at stake here?

My scientific reputation and respect. Remember that in five years I haven't succeeded in proving my case in the eyes of the medical establishment. Even though I'm now more convinced than ever that I'm right about this local outbreak, Sadly I doubt if the evidence I've gathered in the last few days will make a jot of difference to their opinion.

That's interesting. Before you tell me whether you've made your decision for tonight I'd like to put your decision into the simple framework I use for all decisions, including ones like yours. I've heard you say that each evening, including this one, you have had two options: 'Recommend removal of pump handle immediately' and 'Wait for more evidence before acting'. Is that right?

It is.

And there are two considerations: Cholera Deaths (which you want to minimise) and Scientific Respect (which you want to maximise)

Agreed.

Let's go back a few days to the first day of the outbreak. You knew it was the cholera and you knew it was localized. Could you tell me how confident you were that the source of the problem would be one of the pumps in the area?

You are effectively asking me how confident I was in my theory and reasoning based on it.

Pretty much. Would you say you were 100% confident?

No. That would be too strong.

50%? This would mean you felt you were as likely to be wrong as to be right that a pump was the source of this outbreak?

Of course not. I was much more confident than that. Something like 70%... if you want a number.

Tonight we are a week into the outbreak and you have looked at the samples, you have collected and noted the addresses of those who died (at least up to 2 September), and you have visited the area and talked to some of the residents about

where they obtained their water. How confident are you *now* after doing this further research?

Oh, now I'm even more confident ... I'm 90% sure that the source is not just any pump, but the Broad Street pump.

Could I switch to your scientific reputation then? When the outbreak occurred how confident were you that recommending the immediate disabling of any of the pumps in the area would have damaged your reputation in the eyes of the scientific community.

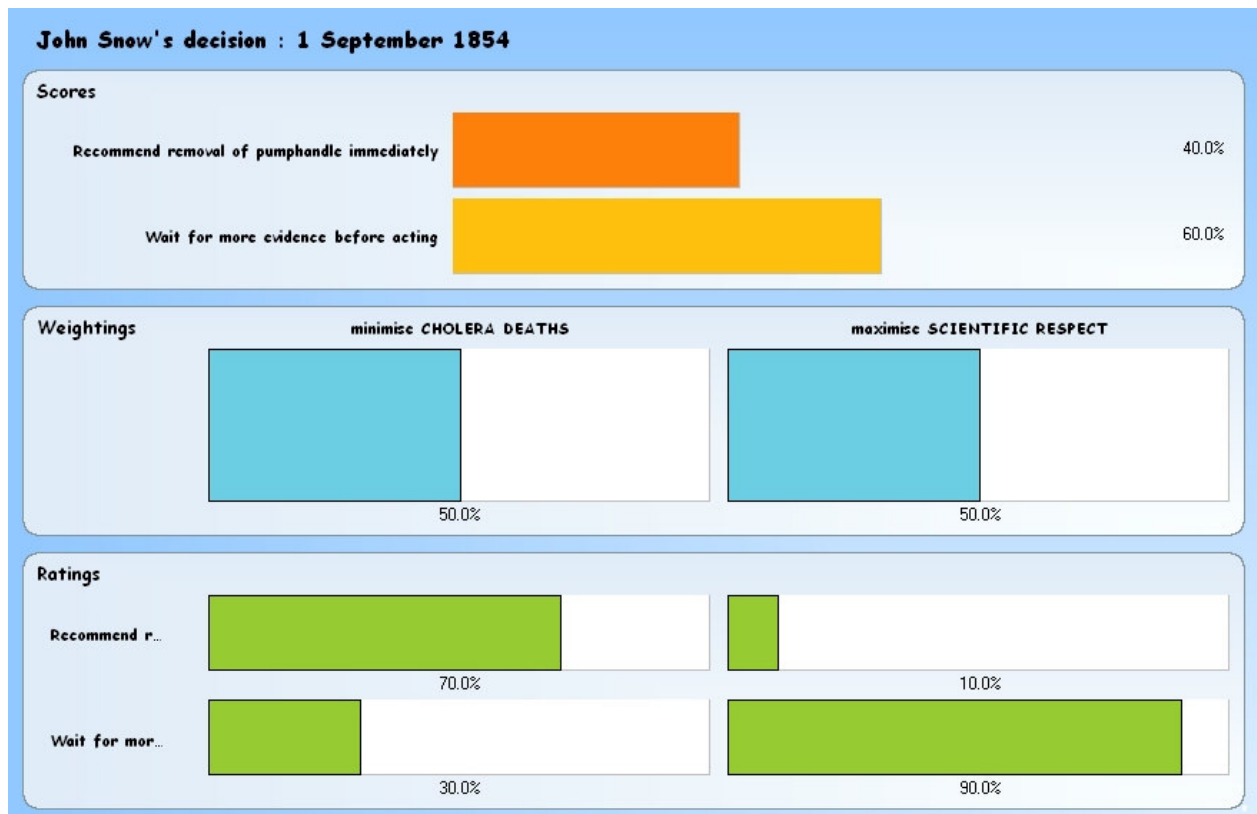
Further damaged you could have said. Very sure... I would have been ridiculed...

80% confident?

Nearer a 100... but say 90%.

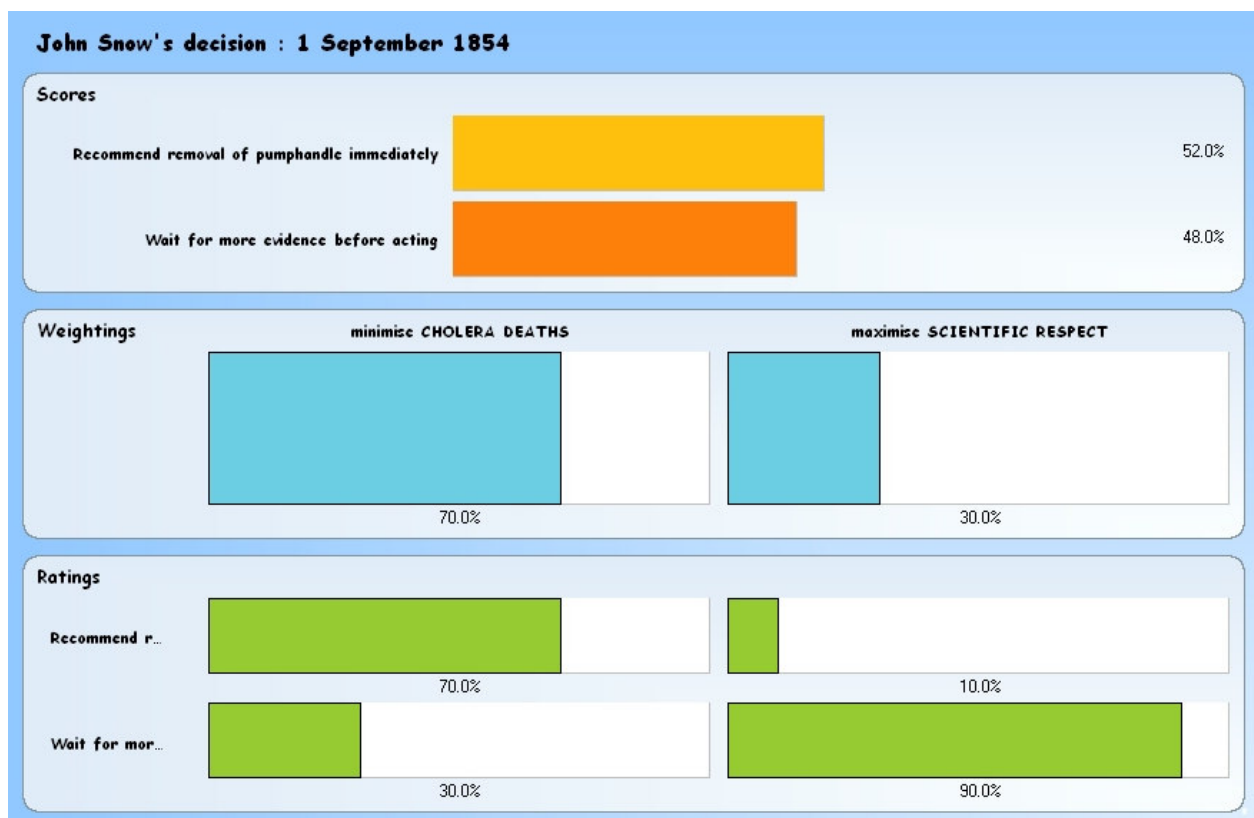
And now, a week later? If tomorrow you were to recommend immediate action in relation to the Broad Street pump would it do further damage?

Nothing has really changed in respect of scientific community opinion.

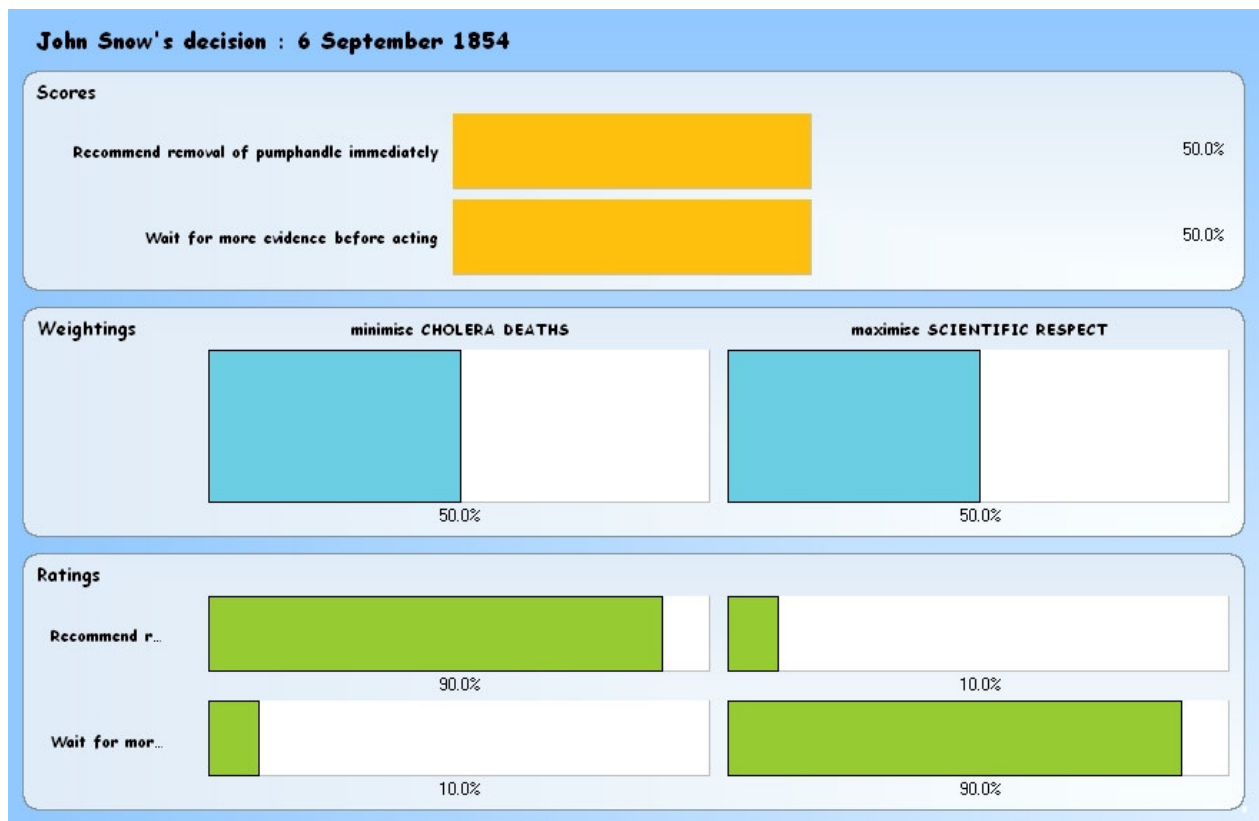


So we can leave it at 90%. Ok I want to show you how I have captured all this in my decision aid. On September 1st the green bars in the bottom pane reflect what I hear you saying... they show immediate action has a 70% chance of minimising Cholera Deaths but only a 10% chance of maximising your Scientific Respect. Waiting has a 90% chance of maximising your Scientific Respect, but only a 30% chance of minimising cholera deaths. (Figure 1)

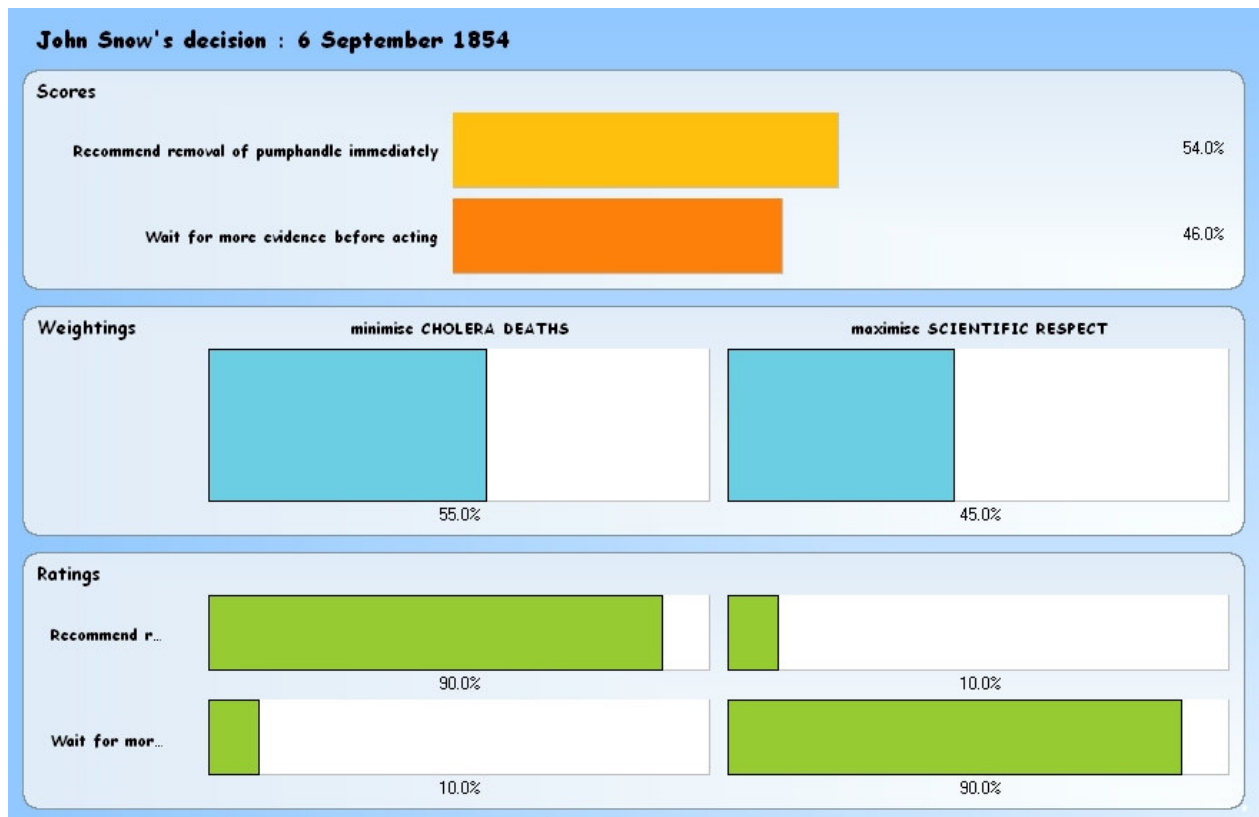
This means that if you were equally concerned with minimising Cholera Deaths and maximising your Scientific Respect – an equality indicated by the blue bars in the middle pane being equal in length - then waiting was optimal. (This is indicated by it having the longer bar in the Score pane at the top.) Given your beliefs you would have had to give twice as much weight to minimising Cholera Deaths in order to make acting immediately the best thing to do. You can see that giving 70% weight to that consideration and 30% to your reputation as a scientist does produce that change. (Figure 2)



Now let's come up to date... to this evening. You have just told me about how you have revised your beliefs... your confidence... over the last few days. Your 70% for minimising Cholera Deaths has become 90% but the position in respect of your Scientific Respect is unchanged. With equal weights the situation becomes (Figure 3) a dead heat... It's a toss-up! Are you going to toss a coin?



No, I am not! I get the idea and I can see that if I give even 51% weight to minimising Cholera Deaths it will win. Give it 55%, please. Yes, I'm right.



Might I suggest that 45% seems a high weight to Scientific Respect?

You have to remember that I am the son of a poor farm labourer from the North of England. I couldn't make my way in medicine the conventional way by offering private services to the rich, so I advanced myself by becoming as expert as possible in the science of medicine and being a leader in new developments. That was why I leapt at the chance offered by anaesthesia... and this strategy paid off.

Even to the point of entering royal cycles with your anaesthesia techniques. So what are you saying?

I'm saying that my career and income was built on my reputation as a scientist, albeit one who had views which differed from the majority – perhaps that was the Yorkshireman in me coming out. This means I have to think carefully about taking actions which would damage it.

I understand.

But thank you for summing up my problem so clearly.

You're happy?

In one way, because that was the decision I had already arrived at in my own head. I will meet the Guardians tomorrow and make the recommendation to disable the Broad Street pump.

There's a 'But...'?

But I can see that with a lower weight to Scientific Respect I might have acted a day or two... or three... or four... earlier and saved some lives, since it is now clear that the outbreak is slowing and many people have fled the area. Your aid is a two-edged sword in that respect because it makes one's value conflicts so transparent.

16 June 2008

OK John we're back in 2008 and I can now answer some of the questions that you must have in your mind. And you may be able to tell me something about the period between 6 September 1854 and your death in 1858.

Well they did disable the pump, even though it appeared they didn't believe my theory. It was removed on a trial basis and it went back soon after the outbreak was

over, which it was almost by that date anyway. I published my Report on the outbreak [2] and the second edition of my book on the transmission of cholera [3] in 1855 but basically neither produced any greater acceptance of my theory. Very disappointing.

It's interesting that one of the recent criticisms of your work - within a generally positive assessment - is that you didn't wait long enough. You could have eliminated some errors that have been found... even using the statistical techniques of your time [4].

But surely that applies only to the writings I published in 1855. If I have interpreted you correctly the decision about what to do in the middle of an outbreak is a very different question from the decision as to when to publish as a scientist. In deciding whether to present to a scientific meeting or publish in a journal I would expect to give very great weight... almost 100%... to Scientific Respect. But as a physician I could never do that. I wouldn't have given any of my suffering early patients anaesthesia if I had had to wait to prove it by scientific standards.

I agree with you completely. The standards for decision making must be based on what is best for the patient - or population - in terms of the consequences of being right and wrong. The standards of science are – correctly – very different.

I don't like that blunt way of putting it, but I fear my distaste arises from the fact that most of us prefer to deny or minimise the clash that exists between them. I'd have to admit that was very much what I was doing that week in 1854.

Now to the big question as far as much of your current fame is concerned. Would you mind confirming what you *didn't* say on 6 September 1854? When you were making your decision did you draw any sort of map of the Golden Square area with cholera deaths plotted on it?

I did not. I did draw a map of the area a few weeks later when I was working on the second edition of my book on cholera and my report on the outbreak. I first presented a version of that map at a talk to the Epidemiology Society in early December 1854. But this map had several hundreds of deaths on it, not just the 83 I knew about on 6 September. Why is this so important?

It's very important because the thing you are now most famous for is simply not true. You did not draw the map and conclude, from looking at the pattern of death dots on it, that the Broad St pump was the source of the Golden Square outbreak. But that's the myth that is widely prevalent [5, 6].

I suppose you could say I was thinking *geographically* when I was standing at the corner of Broad Street and thinking of the houses where the deaths had occurred... and again when I was going around asking which households obtained their water from which pump. But I only drew the map some weeks later, with the pumps marked and all the deaths up to September 30 (as I recall). And I marked boundaries indicating the minimum walking distance to each pump... I was proud of that idea. Of course by October I had seen Mr Edmund Cooper's map of this sort, which was designed to test the hypothesis that sewers, via miasma, were to blame for the outbreak. I could see a map would be a useful way to illustrate and reinforce my argument. By the way, you should note that Cooper's map highlighted *households* that had suffered a death, whereas mine emphasised the number of *individual deaths* in each household.

Explain why that was important.

Well, if the cholera was air-borne, as most of my opponents argued, then it wouldn't matter how many people in the household died from it. One death in a household would be as significant as several. But if it was water-borne only those who drank it, and everyone who drank it, would be affected, so the numbers of victims per household did matter. But let's forget such detail. This is my chance to find out what happened. I'm sure that 150 years on you know what the cholera is, you know how it's transmitted - obviously I hope the answer is through water - and you have eliminated it.

You'll be pleased to hear that 'miasma' and the miasmatisists have long since disappeared as microbial 'germ' theory - in its infancy in your time - took over. It has enabled us to understand why and how outbreaks of diseases like cholera happen. There are still many environmental concerns... air pollution, water pollution ... but these are mainly associated with chronic diseases (cancer, heart disease and so on) and the major infectious diseases are fairly well understood. But that is not saying they are well controlled, let alone eliminated. So while cholera is almost unknown in England it is still a major threat in many parts of the world where water supplies are inadequate or contaminated. So yes, you were eventually proved right!

And is that why I am still quite well known in 2008? Much as I'm flattered, I still don't really understand that... and the existence of a Society in my name.

That there are different and competing theories of why you are famous will not surprise you! The dominant one, reflected in the existence of the Society, is that by the action that we have been talking about, which led to the removal of the Broad Street pump handle, you symbolise the beginnings of interventionist public health

based on epidemiological studies –including the ‘shoe-leather epidemiology’ of which you are now regarded as the founder.

‘Founder of shoe-leather epidemiology’. I like it! All that walking around London was worth it for that alone...

At the other extreme there are those who, while they don’t want to deny your important contributions, feel that your iconic status is fundamentally the result of the need of professions for heroes. And it is much easier to set up a convincing hero when one has visual events or objects– the removal of a pump handle, the use of a map – to carry the heroic story. These sceptics emphasise that the removal of the pump handle had almost no effect on the number of deaths and that the map was not part of the reasoning which lead to your conclusion and action.

Well, I suppose they have a point. I’ll settle for being a flawed hero.

The final thing to mention is that your fame is quite a recent thing. For example, the frieze around the London School of Hygiene and Tropical Medicine building, built in 1928, contains the names of 23 leading figure in the history of Hygiene and Tropical Medicine. It does not include the name of John Snow. But it does include Max von Pettenkofer.

What? Most of us thought he was quite mad.

Posterity largely agrees, so I’m trying to find out how he managed to get included... and why you weren’t. But I’m afraid that’s all we have time for John. I’ll use a metaphor that should appeal to you and put you back to sleep.

Wind-up

That’s all from Decision Day this week. Earlier in the series you were very enthusiastic about my meeting with Humpty Dumpty and hearing about his decision to sit on the wall. So next week we are revisiting another fabulous character... Hans Christian Andersen’s Little Mermaid. Should she have bet on the Prince? Bye for now.

Follow-up

If you would like to explore this decision further using the Annalisa software you should download and install the free version of it from <http://www.annalisa.org.uk> and the download and run the Snow topic files from <http://www.cafeannalisa.org.uk>

References

1. Snow, J., *On the mode of communication of cholera*. 1st ed. 1849, London: John Churchill.
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4. Koch, T. and K. Denike, *Rethinking John Snow's South London study: a Bayesian evaluation and recalculation*. *Social Science and Medicine*, 2006. **63**: p. 271-283.
5. Brody, H., et al., *Map-making and myth-making in Broad Street: the London cholera epidemic, 1854*. *The Lancet*, 2000. **356**(1 July).
6. McLeod, K.S., *Our sense of Snow: the myth of John Snow in medical geography*. *Social Science and Medicine*, 2000. **50**: p. 923-935.

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