University of Glasgow | College of Medical, Veterinary & Life Sciences

The Logic of the Larder and the Burden of Disease

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Key question

How much does a disease outbreak cost?

Introduction

- Are production animals better off alive?
- What impact does disease have on animal and human welfare?
- How can the impact be valued?
- How should I decision regarding prevention and treatment change based on how we value the impact of disease?

The Logic of the Larder

It is often said, as an excuse for the slaughter of animals, that it is better for them to live and to be butchered than not to live at all.

-Henry S.Salt (1914)

The Pig and the Philosopher

Philosopher: Blessed is the Pig, for the Philosopher is fond of bacon. Without butcher shops there would be no pigs at all therefore I have been a benefactor to this Pig, inasmuch as I ate a portion of his predecessor; and now I will be a benefactor to some yet unborn pig, by eating a portion of this one.

Logic of the Larder and Critical Level Utilitarianism

- Neutrality -the level of utility above which life is worth living
- To lose a life worth living that is above neutrality leads to welfare loss
- To lose a life not worth living that is below neutrality leads to a welfare gain
- Burden of disease can therefore be positive or negative depending on whether one accepts the logic of the larder
- Mere addition

The Repugnant Conclusion

For any possible population of at least ten billion people, all with a very high quality of life, there must be some much larger imaginable population whose existence, if other things are equal, would be better even though its members have lives that are barely worth living

The Repugnant Conclusion

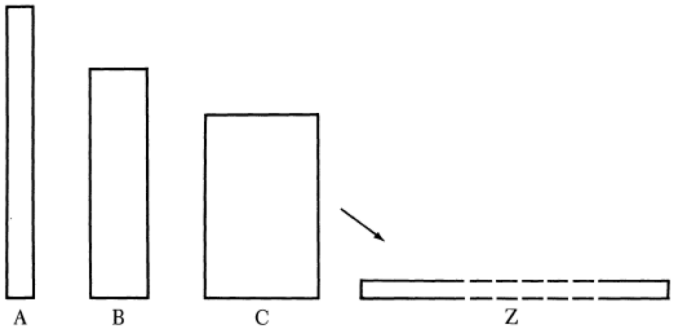


DIAGRAM 1

The Mere Addition (Subtraction) Paradox

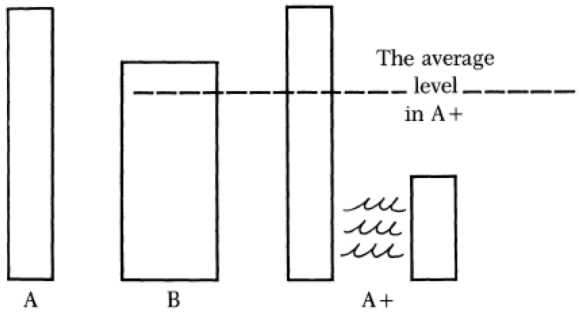


DIAGRAM 2

A>B,but A+ not worse than A and B>A+

Practical considerations

- Should calculations of the burden of disease for livestock incorporate both the economic loss to the farmer as well as the welfare loss/gain to the animal
- Does welfare increase with more animals or is welfare reduced with more animals?
- Kaldor-Hicks criteria a situation x is preferred if in situation x any loser could theoretically be compensated by any winner
- Human analysis of disease burden based on value of statistical life and QALY,DALY, type analyses.
- Animal studies purely consider productive value of the animal and ignore welfare aspects
- Assumptions often arbitrary and legislation on compensation payments to farmers is not

accounted for

Total Utilitarianism

$$W^{h,a}(x) = \sum_{i=1}^{N_h} U_i^h(x) + \sum_{i=1}^{N_a} U_i^a(x)$$

This works as long as the poulation is fixed. For a variable population paradoxes arise $\rightarrow$ **repugnant conclusion**

Average Utilitarianism

$$W^{h,a}(x) = \frac{1}{N_h}\sum_{i=1}^{N_h} U_i^h(x) + \frac{1}{N_a}\sum_{i=1}^{N_a} U_i^a(x)$$

Example

A simple example illustrates the application of critical-level utilitarianism to practical ethical questions involving animals. At the University of British Columbia, mice are used to produce monoclonal antibodies: they are given tumours in their stomachs which grow the antibodies. One mouse can live through a maximum of three 'rounds' of antibody growth and removal. It seems reasonable to suggest that these mice are below neutrality, but are no worse off in the second and third rounds than in the first. The ethical question is: should the suffering of individual mice be limited by shortening their lives to a single round? This move is an improvement for each mouse because it is below neutrality, but, if antibody production is to be the same, three times as many mice must be used. -source: Blackorby and Donaldson, 1989

Welfare Analysis

- utilities for mice living 3 rounds $(-2, -1, -1)$
- critical level is positive, e.g. 1

Total Utilitarianism

Utility	Round 1	Round 2	Round 3	Welfare
10 mice live three rounds	-2	-1	-1	$10 \times (-4) = -40$
30 mice live one period	-2			$30 \times (-2) = -60$

Average Utilitarianism

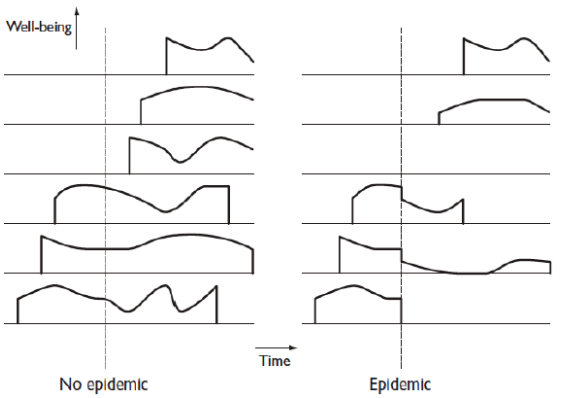
Utility	Round 1	Round 2	Round 3	Welfare
10 mice live three rounds	-2	-1	-1	$\frac{10}{10} \times (-4) = -4$
30 mice live one period	-2			$\frac{30}{30} \times (-2) = -2$

Critical Level Utilitarianism

Utility	Round 1	Round 2	Round 3	Welfare
10 mice live three rounds	-2	-1	-1	$10 \times (-4 - 1) = -50$
30 mice live one period	-2			$30 \times (-2 - 1) = -90$

The Burden of Disease

Figure 1 Well-being with and without an epidemic



The Burden of Disease

- One person is killed at the time of the epidemic.
- One person is disabled by the epidemic, but her life is not shortened.
- One person's life is shortened by the epidemic, but she does not die immediately.
- One person who would have been born is not born as a result of the epidemic (perhaps because one of her parents is killed).
- One person born later, who would have been born healthy, is born disabled (perhaps because of genetic damage to one of her parents).

Temkin's second standard view (SV2)

There are two illnesses I_1 and I_k and a number n_1 less than 10 such that, for any number n_k, curing n_1 people of I_1 is better than curing n_k people of I_k.

It is better to cure less people of more severe diseases than more people of less severe diseases.

Temkin's first standard view (pairwise comparison of diseases) (SV1)

For every illness I_j and every number n_j, there is an illness I_{j+1} and a number n_{j+1} such that I_{j+1} is less severe than I_j and curing n_{j+1} people of I_{j+1} is better than curing n_j people of I_j.

Temkin's SV1*

For every pair of illnesses I_1 and I_k and every number n_1 less than 10, there is a sequence of illnesses $I_1 \ldots I_k$ and a sequence of numbers $n_1, \ldots n_k$ such that for every I_j in the sequence, curing n_{j+1} people of I_{j+1} is better than curing n_j people of I_j .

Diseases can be ranked in order of priority (triage principle).

Measuring Health Outcomes: QALY's and DALY's

Quality adjusted life year's

QALY= I $\times$ Q Q is the quality of life weight (utility)

Quality adjusted life expectancy

$$QALE = \sum_{t=a}^{a+L} QALY_t$$

L is the residual life expectancy.

Is it better to preserve the life of newborn (high QALY) or a potential mother (low QALY)?

QALY's treat lives as separable.

DALY

Disability adjusted life years

- *DALY=Years of life lived (YLL)+ Years of life with disability (YLD).*
- *YLL=Number of deaths (N) $\times$ Life expectancy at death (L).*
- *YLD=No. of Incident cases $\times$ Disability weight $\times$ average duration of disability.*

Burden of Mortality

$$BM = \sum_{a=0}^{A} N_a L_a$$

where N_a is the number of deaths at a particular age and L_a is the life expectancy at death of a particular age group.

Cost effectiveness

How cost effective is a treatment (prevention)?

Cost per health outcome,e.g. year of life saved. Choose option that is lowest cost. Cost-Benefit-Kaldor-Hicks principle.

Alternative analysis frameworks

- Welfare economics and variable poulation social choice theory

- Prerence logic
- Deontic logic
- Prohairetic deontic logic (union of preference logic and deontic logic)
- Stit theory

Deontic logic

- Deontological approaches to ethics are an alternative to utilitarian approaches.
- Branch of modal logic in which modal operators (possibility, necessity) are replaced
- it is obligatory that (OB)
- it is permissible that (PE)
- it is impermissible that (IM)
- it is omissible that (OM)
- it is optional that (OP)

Stit theory

- Related to philosophical game theory but not the same
- Stit =see to it that
- Allows incorporation of values and choices
- Allows incorporation of strategic decisons

Prohairetic deontic logic

- combines logic of preference orderings with deontic (modal) operators

- allows reasoning over possible worlds (e.g. varying population)
- combines deontological and utilitarian considerations?

Conclusion

Answering the question of how to measure the burden of disease requires first reasoning about the interplay of actions and the ethical consequences of actions under different disease states. Two broad approaches can traditionally be identified one based on utilitarian pinciples (Bentham, Mill, Blackorby, Donaldson) and one based on deontological principles (Spinoza, Mally, etc.). It is not clear why these two approaches should be alternatives. Prohairetic logic and stit theory provide a possible means of reasoning about actions and disease states that combines aspects of deontological and utilitarian thinking.

References

Blackorby, C. and Donaldson, D. (1992) Pigs and Guinea Pigs: A Note on the Ethics of Animal Exploitation, *The Economic Journal*, Vol. 102, No. 415 (Nov., 1992), pp. 1345-1369.

Broome, J. Measuring the burden of disease, in: *Summary Measures of Population Health: Concepts, Ethics, Measurement and Applications*, edited by Christopher J.L. Murray, Joshua A. Salomon, Colin D. Mathers and Alan D. Lopez, World Health Organization, 2002, pp. 91–113, 135–7, and 727–9.

Matheny, G. and K.M.A.Chan Human diets and animal welfare: The illogic of the larder, *Journal of Agricultural and Environmental Ethics* (2005) 18: 579–594 DOI 10.1007/s10806-005-1805-x

Murray, Christopher J.L. and Lopez, Alan D. (2013) Measuring the Global Burden of Disease, *N Engl J Med* 2013;369:448-57. DOI: 10.1056/NEJMra1201534

Murray, C., Salomon, J.A. and Mathers, C. (2000) A critical examination of summary measures of population health, *Bulletin of the World Health Organization*, 78 (8).

Rabinowicz, W. *Broome and the intuition of neutrality* (http://lup.lub.lu.se/luur/download?func=downloadFile&recordOId=1458722&fileOId=1459024)

Singer, P. *Practical Ethics*. Cambridge, 1979.

Visak, T. Killing Happy Animals: Exploration in Utilitarian Ethics *Quaestiones Infinitae* *PUBLICATIONS OF THE DEPARTMENT OF PHILOSOPHY UTRECHT UNIVERSITY VOLUME LVI*, 2011.