Multi-dimensional Problems in Health Settings: A Review of Approaches to Decision Making

Victor J. Del Rio Vilas*[1], Gilberto Montibeller[2], L. Alberto Franco[3] and Willy Aspinall[4]

[1]PAHO, Rio de Janeiro, Brazil; [2]London School of Economics, London, United Kingdom; [3]University of Hull, Hull, United Kingdom; [4]University of Bristol, Bristol, United Kingdom

Introduction

There appears to be a growing number of prioritization exercises, for example of diseases, in health related settings (1). The decision process around these exercises involves comparing competing alternatives, i.e. diseases, and irreducible objectives. In addition to the multi-dimensional nature of the problem, the lack of reliable data, group dynamics associated to the involvement of experts, and the multiplicity of stakeholders, among other contextual factors, add complexity to the decision process. Here we review trends in such prioritization exercises and applications in different settings and for different events of interest, for example the management of emerging risks. Based on our findings, we discuss a conceptual framework based on multi-attribute utility theory presented to the World Organization for Animal Health (OIE) for the modification of its qualitative assessment of veterinary services performance into a quantifiable decision support system.

Methods

We searched PubMed for articles containing the key words 'multi-criteria', 'multi-attribute', 'multi-objective', 'prioritization', 'decision making' and their variations (e.g. without hyphenation) for the period 1990 to 2011 for human and veterinary medicine. We focused on prioritization methodologies and their sound application.

Results

A large number of prioritization efforts in health settings aim to produce a rank order of diseases to help allocation of scarce surveillance and disease control budgets. A number of applications target the prioritization of competing health interventions against specific diseases. Fewer target different events, for example emerging threats. Common mistakes found in multi-attribute prioritization approaches reported in the social sciences (2) appear also in public and animal health settings. In particular, the application of linear additive models to non-preferentially independent evaluation criteria, the poor design of attributes to assess the decision alternatives, the failure to define suitable criteria scales, and mistakes in defining trade-off weights were prevalent. In addition, most decision support tools tend to be overly complex. This not only compromises their acceptability and long-term sustainability but also increases the likelihood of methodological mistakes in their design and regular application. For example, the failure to properly identify and separate 'ends' objectives, such as the improvement of a country's health, from 'means' objectives, i.e. required resources, in the definition of the fundamental drivers in any decision process.

Conclusions

Our findings, and experience in the practical application of formal prioritization methodologies (3), informed our advice to the OIE for the quantification of its tools for the assessment of veterinary services performance. The current framework used by the OIE produces a purely qualitative output with ordinal scales. The suggested quantitative extension allows additional outputs not available in their current form, for example, the aggregation of assessment scores at any level within the framework to produce a country's overall score. It also permits the assessment of marginal performance improvements for every criterion and the consideration of trade-offs among the different criteria. The final output of our extension is the identification of the best portfolio of actions that will maximize the overall capability of national veterinary services given available resources. Quantification of the existing tool will deliver obvious benefits such as enhanced accountability and transparency in the decision making process, and will allow the historical analysis of a country's veterinary services performance. The approach suggested to the OIE is adaptable to similar decision problems, such as monitoring the implementation of the International Health Regulations in a given country.

Keywords

Prioritisation; Multi-attribute utility theory; Decision support

References

1. Krause G., 2008. Prioritisation of infectious diseases in public health – call for comments. Euro Surveillance 13, 40.
2. Keeney R.L. (2002). Common Mistakes in Making Value Trade-Offs. Operations Research, 50, 6, 935–945.
3. Del Rio Vilas V.J., Voller F., Montibeller G., Franco A., Sribhashyam S., Watson E., Hartley M., Gibbens J. An integrated process and management tools for ranking multiple emerging threats to animal health. Preventive Veterinary Medicine (in press).

*Victor J. Del Rio Vilas
E-mail: vdelriovilas@yahoo.co.uk