Reviewer's report

Title: How are Population-based Funding Formulae for healthcare composed? A comparative analysis of seven models

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Reviewer: Nicholas Barron Mays

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Major revisions

This is a generally clearly written, clearly organised piece describing the similarities and differences between seven population-based resource allocation formulae. Despite the title and the second sentence of the Abstract, the paper is descriptive rather than analytical and/or evaluative of the different formulae. For example, there is no analysis in the paper of the effects of the different formulae or of the extent to which they fulfil the goals set for them in each system. The authors state that there is a gap in the literature in terms of an account of the contents of different countries' funding formulae and argue that this is a substantial shortcoming. However, it is not apparent from the paper what the value of filling this gap is likely to be and why it should be seen as a ‘substantial’ shortcoming. This is particularly pertinent given that the authors emphasise the fact that much of the difference between formulae is likely to be attributable to the different requirements of different systems and their contexts. If this is so, then it is even more uncertain what the benefits of comparative description are likely to be. Beyond showing that formulae generally include the same population features, but differ in how these are operationalised because their goals differ and the availability of necessary data varies, it is not clear what else is learned. The authors claim that the paper provides new insights into the unique nature of the formulae used in different jurisdictions and the influences generating these differences, but these insights are not very directly articulated. The paper ends with a call for further comparative research on this topic, but again the case for this is not entirely convincing. For example, while it is very much the case that within each country there is much analysis and debate about whether the funding formula accurately provides for the cost of providing services to each population (usually from those who perceive that they are being disadvantaged in some way), it is unclear what use comparative research would be given the uniqueness of each country/system context.

The Abstract holds out the promise that the paper will consider the ‘dynamics’ of formula construction which suggests that it will include accounts either of how formulae have changed over time within countries (e.g. perhaps in relation to availability of new data or new health system goals such as those relating to reducing health inequalities) or how the overall approach to formula construction across countries has changed over time (e.g. perhaps in response to availability of new analytical techniques or cross-country learning). However, there is little or
There is no clear justification for comparing the seven chosen formulae. They are described somewhat contradictorily as on the one hand a ‘convenience sample’ and then a little later as justified in terms of being ‘more diverse’ than those in previous studies with no sense of what the value of greater diversity might be. A convenience sample is based on availability and does not imply specific selection criteria whereas ‘greater diversity’ implies some underlying sampling goal. However, it is not stated which criteria of ‘diversity’ were used. Further, there is no discussion of the implications of comparing a formula designed to allocate funds within a single city of 1.5 million (Stockholm) with the formula designed to allocate funds to over a hundred local purchasing/planning organisations in England with a total population of over 50 million people.

The Discussion summarises the influences on formula content in terms of data availability, policy goals, public preferences and changes in population characteristics. It does not mention one important reason that formulae differ, namely, that the empirical relationships between variables differ in different systems/countries (e.g. the socio-economic gradient or pattern of hospital use may not be the same in different systems). As formulae have become increasingly ‘empirical’ since the 1970s with fewer explicitly normative elements (Mays, 1994), it seems likely that empirical differences are increasingly important in explaining what goes into different formulae.

There seems to be an unresolved tension underlying the aim of the paper between arguing that each system has a distinctive formula because each is faces a unique set of circumstances and trying to identify whether some approaches are in some sense ‘better’ than others (e.g. in predicting actual costs). This is most obvious between the top/middle and bottom of page 16. For example, a system may deliberately set out to design a formula that does not predict the demands and resultant costs facing different plans (populations) precisely because it wishes to focus funders and planners on meeting ‘need’ defined in terms of ability to improve health rather than ability to meet ‘demand’ (on the grounds that ‘demand’ tends to reflect the health system of the past rather than the future and reflects the pattern of supply that may be weakly related to population need geographically). Giving such a formula a low score in relation to cost prediction would make little sense.

Minor revisions

If all the systems and formulae discussed relate to publicly financed care, perhaps this should be made more explicit in the title and/or Abstract of the paper.

It is not clear in the paper whether words like ‘need’ and ‘demand’ are being used deliberately or not in some parts of the paper. For instance, page 5, para 2 opens: ‘Pressure to maintain equitable funding which is responsive to the demand placed on different health plans has triggered each system to develop population based funding models. Needs based models were implemented as
early as the 1970s ....’ It is not clear from this passage whether need and demand are being equated and whether or not ‘equitable’ is seen as meaning ‘fair in relation to need’ or ‘fair in relation to demand’ or something else. The same ambiguity recurs on page 6 para 2.

It is argued on page 6, para 2 that disease status is a ‘direct’ measure of need and demographic indicators are ‘indirect’ measures of need. Normally, both would be considered ‘indirect’ or ‘proxy’ measures, since ‘need for health care’ is notoriously difficult to conceptualise and measure.

It is argued that ‘socio-economic circumstance as a predictor of health need is most striking in New Zealand’ (page 7, para 2), but it is not clear what this judgement is based on since other countries have formulae with a wide range of socio-economic indicators. England is described in these terms immediately before this comment on New Zealand.

On a number of occasions, indicators are described as being ‘customised’ for inclusion in formulae (e.g. page 7, para 2) or ‘tailored’ (page 10, para 3), but the meaning of ‘customised’ in this context is not defined.

Geography is described as ‘mediating’ both an individual’s health status and their access to health services. Why is the term ‘mediating’ used rather than a more straightforward word such as ‘influencing’ or ‘shaping’?

The discussion of how the impact of geography on need, demand, use and cost is accommodated in formulae needs more careful unpacking. For example, on page 9, para 2, we learn that in NSW remoteness is included in the formula on the grounds that demand for hospital care is greater in remote and rural areas. In the next paragraph, it is argued that England approaches the issue of geography very differently. This difference needs more careful explanation. Firstly, the idea that the demand for hospital care might be greater in remote areas is unusual in that in most countries the observation is the opposite – demand decays with distance from facilities such that measured demand and/or utilisation (not necessarily ‘need’) is generally found to be lower in more remote populations far from facilities. Secondly, this is the case empirically in England, and is why the English formula tries to remove the impact of proximity to supply on the use rates used to weight the ‘need’ variables in its formula. Thus it is incorrect to imply as the final sentence of the paragraph does that England ‘imposes a normative reference point for supply’. Rather, the opposite is the case.

Ontario’s individually based formula is contrasted with the other countries’ approaches. It may be of interest to note that England has developed an allocation formula at the individual level known as the Person-Based Resource Allocation (PBRA) formula.

Line 4 of page 11 mentions ‘intensity’ but it is not clear of what.

Page 12, line 3 – it is not clear what ‘proportional specialisation’ means

Page 12, para 3 – I think that the MFF in England is more accurately described
as a response to the higher cost of attracting and retaining the non-clinical workforce; i.e. a weighting to compensate for the stronger external labour market competition in certain parts of the country, especially London and the South-East.

**Level of interest:** An article of limited interest

**Quality of written English:** Acceptable

**Statistical review:** No, the manuscript does not need to be seen by a statistician.

**Declaration of competing interests:**

I have no conflicts of interest in reviewing this paper.