Reviewer’s report

Title: Informing decision-making for universal access to quality tuberculosis diagnosis in India: an economic-epidemiological model

Version: 0 Date: 15 May 2019

Reviewer: James G. Kahn

Reviewer's report:

Superb paper -- compelling conceptualization of the policy issue, builds on strong prior epidemiologic and costing work, clear exposition, generally very appropriate sensitivity analyses, strong and actionable findings. A fine example of how to use cost & effectiveness modeling in tandem to inform important health programming.

There is one area which needs fuller explanation and a sensitivity analysis. The findings are driven in large part by the volume of testing -- with fewer tests, cost per test rises substantially, both centrally and in decentralized facilities. This makes intuitive sense, insofar as some costs are fixed -- e.g., annual external quality assurance is mentioned, and presumably equipment purchase costs similarly need to be amortized. However, I found myself under-informed on how this is done, despite searching for terms like capital, amortization, and depreciation, in both the main text and supplement.

I did find this passage: "Xpert per-test cost for both centralized and decentralized Xpert include costs associated with unused equipment capacity based on the expected daily sample processing capacity of the key laboratory equipment or human resource availability (e.g. we assumed one GX4 unit has a daily maximum capacity to process 16 tests in an 8-hour operating day). Any number of tests performed less than 16 in a given day would result in incorporation of costs associated with unused GX4 modules. For example, if a laboratory performed 10 Xpert tests, a total of 6 individual GX4 slots were unused that day. Thus, six per-slot costs would be incurred as additional cost to this day as costs associated with unused capacity. This process was repeated for the decentralized Xpert with relevant estimated pricing3 and needed capacity to meet a 90% same-day testing requirement (Table S2)."
However, I find this description inadequate. What is a "per-slot cost"? I'm guessing that it's the fixed component of costs, and assumes that not using slots has no impact on annual capital costs (see below on this issue). There are two citations, one old (2011) and one submitted, but unclear if they address this specific issue. I think it's essential that this driver of the analysis be more fully characterized, and explored in sensitivity analyses.

By fully characterized, I mean that the math is shown and 1-2 illustrative examples provided. The similarities / links / differences with amortization of capital costs should be explained, and the reasons for using this approach noted.

By exploring in sensitivity analyses, I mean altering key assumptions that affect the association of # of tests and cost per test. E.g., if useful life of the equipment influences these costs effects of low testing volume (which I can't tell), show longer or shorter life. Also show if there is an effect of lower testing volume on equipment longevity (i.e., fewer tests reduce wear and tear / extend equipment life, and thus lower annual capital amount and is so doing partially offset the cost rise from low test volume). Ultimately, are there any plausible differences in the portrayal of the test # / cost relationship that change the paper's conclusions?

Ordinarily, I wouldn't care so much about the effect of testing volume on testing cost, but for this paper it largely drives the results.
Are the methods appropriate and well described?
If not, please specify what is required in your comments to the authors.
Yes

Does the work include the necessary controls?
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Are the conclusions drawn adequately supported by the data shown?
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