Reviewer's report

Title: Benchmarking health system performance across districts in Zambia: a systematic analysis of levels and trends in key maternal and child health interventions from 1990 to 2010

Version: 1 Date: 19 January 2015

Reviewer: Ole Norheim

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The aim of this study was to use available data to produce a systematic benchmarking of levels and trends in the coverage of 17 MNCH interventions (12 priority interventions), with estimates of uncertainty, across Zambia’s 72 districts from 1990 to 2010.

The results show that overall composite coverage increased from 46% in 1990 to 73% in 2010. They also show that most of this gain was attributable to the scale up of malaria control interventions, pentavalent immunization, and exclusive breastfeeding. However, National estimates masked substantial variation across districts in the levels and trends of all indicators. Progress in routine services including polio immunization, antenatal care, and skilled birth attendance stagnated or declined and exhibited large disparities across districts, while coverage increased relatively equitably across districts for the new vertical programs. The authors also discuss lessons of great importance for systematic data collection for countries that want to move fairly and efficiently towards universal health coverage.

This is a clearly written study analyzing available data to maximum effect by innovative statistical methods including Gaussian Process Regression. The choice of methods is sound and the results convincing. The graphs very elegant. The study is so good that it could be a model for other countries seeking methods to perform subnational benchmarking. The results are not only relevant to health systems strengthening in Zambia, but should be of general interest to other countries and the readers of this journal.

Minor essential revision:
A new important result is introduced in the discussion: that performance was not highly correlated with average district socioeconomic status. This is an important finding, and is in contrast to other country experiences. I therefore suggest that this analysis should formally be introduced in the methods section, and the results shown in a figure or table in the results section.

Discretionary revisions

Page 1: First name of first author should be spelled out.
Page 4. Choice of 17 indicators. Since the authors basically use and report on 12
priority indicators (discussed also on page 7), perhaps that should be the chosen number? Why did the composite coverage indicator use only 10 of them?

Page 5: The choice of “underweight” as an indicator should be justified since many other studies use stunting as an indicator.

Page 6: The phrase “Except the Netmark surveys…” comes before the Netmark Surveys are explained.

Page 6: The assumption of 0.01% coverage for malaria interventions prior to 1997 cannot be correct, seems implausible, and should at least be justified.

Page 6: “The fixed effects of this model included the bases for a natural SPLINE, …” This concept needs an explanation (or is it a typo?).

Page 12: Discussion of lower ITN ownership and use in Lusaka. I don’t have the contextual knowledge here, but could it be the case that the denominator, need, is lower in Lusaka than elsewhere?

Page 14: Typo – STGs should be SDGs.

Page 14: Typo – Replace “the coverage several key” with “the coverage OF several key”

Page 18: References. There are perhaps too many references; some of them may be excluded without losses for the reader. Reference 10 could be supplemented with the recent WHO UHC report “Making fair choices on the path to universal health coverage” (2014) that makes exactly the same recommendation.

Supplementary figures: Perhaps one of the maps could be included in main manuscript. They provide easy to understand information.

**Quality of written English:** Acceptable

**Statistical review:** Yes, but I do not feel adequately qualified to assess the statistics.

**Declaration of competing interests:**

I declare that I have no competing interests