Estimating indices of health system readiness: an example from rural northern Ghana

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Abstract

Background There is growing recognition that stronger health systems are necessary to accelerate progress towards the Millennium Development Goals (MDGs). However, a departure from disease-specific programmes and interventions requires the development of a new empirical framework for programme evaluation that focuses on indicators of health system strengthening. Service provision assessment (SPA) surveys provide a wealth of data about health system resources, but they often include too many indicators to provide useful insight into general systems strength or service readiness. To improve the usefulness of such data, we have applied multidimensional statistical data reduction techniques to SPA data with the aim of developing robust measures of health system capabilities.

Methods Data for the construction of indices were derived from the 2010 Ghana Emergency Obstetric and Newborn Care (EmONC) survey published by the Ghanaian Ministry of Health. This survey included a saturated sample of 147 health facilities in the Upper East Region. The instrument assessed facility readiness and performance using 3872 service and outcome indicators of: infrastructure; human resources; availability of drugs, equipment, and supplies; and knowledge of essential procedures. Of those indicators, 872 were identified as corresponding to one of the six WHO health system building blocks. Dimensionality reduction was done using principal component analysis. Where appropriate, we reorganised binary indicators into ordinal categorical variables, as is commonly done in the socioeconomic status literature. We also assessed the external validity of the new index.

Findings Results from the principal component analysis of the 872 health systems indicators suggest that a single component (PCI) explains more than 30% of the common variance among the health facilities surveyed. An index composed of the factor loadings from PCI showed marked variation between facilities (SD 13·077) with easily identifiable clusters of facility type (hospital, health centre, clinic, community compound). The distribution of PCI also suggested concentration of resources among a few high-level facilities (Gini 0·508). Compared with EmONC signal functions, the index scores were better predictors of the number of deliveries ($R^2$ 0·61 vs $R^2$ 0·31) and the number of low birthweight babies (0·68 vs 0·26) as well as maternal deaths (0·81 vs 0·34) and neonatal deaths (0·79 vs 0·36).

Interpretation Our findings suggest that an index of health system readiness that captures a large portion of facility variance can be constructed from SPA data using principal component analysis. In practice, such an index could be used to monitor progress towards stronger health systems. However, further research is needed to determine how an increase in index score which is input-focused, affects population health. Particular attention must also be paid to the performance determinants that maximise the efficient use of health system inputs.

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Declaration of interests
We declare no competing interests.