Social Science & Medicine 89 (2013) 25–31

Contents lists available at SciVerse ScienceDirect

Social Science & Medicine

journal homepage: www.elsevier.com/locate/socscimed

Horizontal equity and efficiency at primary health care facilities in rural Afghanistan: A seemingly unrelated regression approach

Benjamin Johns [a,*], Laura Steinhardt [a], Damian G. Walker [a], David H. Peters [a], David Bishai [b]

[a] Johns Hopkins Bloomberg School of Public Health, Department of International Health, Health Systems Program, USA
[b] Johns Hopkins Bloomberg School of Public Health, Department of Population, Family and Reproductive Health, USA

ARTICLE INFO

Article history:
Available online 24 April 2013

Keywords:
Afghanistan
Equity
Efficiency
Seemingly unrelated regression
Primary health care

ABSTRACT

Producing services efficiently and equitably are important goals for health systems. Many countries pursue horizontal equity – providing people with the same illnesses equal access to health services – by locating facilities in remote areas. Staff are often paid incentives to work at such facilities. However, there is little evidence on how many fewer people are treated at remote facilities than facilities in more densely settled areas. This research explores if there is an association between the efficiency of health centers in Afghanistan and the remoteness of their location.

Survey teams collected data on facility level inputs and outputs at a stratified random sample of 579 health centers in 2005. Quality of care was measured by observing staff interact with patients and determining if staff completed a set of normative patient care tasks. We used seemingly unrelated regression to determine if facilities in remote areas have fewer outpatient visits than other rural facilities. In this analysis, one equation compares the number of outpatient visits to facility inputs, while another compares quality of care to determinants of quality.

The results indicate remote facilities have about 13% fewer outpatient visits than non-remote facilities, holding inputs constant. Our analysis suggests that facilities in remote areas are realizing horizontal equity since their clients are receiving comparable quality of care to those at non-remote facilities. However, we find the average labor cost for a visit at a remote facility is $1.44, but only $0.97 at other rural facilities, indicating that a visit in a remote facility would have to be 'worth' 1.49 times a visit at a rural facility for there to be no equity – efficiency trade-off. In determining where to build or staff health centers, this loss of efficiency may be offset by progress toward a social policy objective of providing services to disadvantaged rural populations.

Introduction

Universal coverage of primary health care is increasingly seen as a means of achieving the Millennium Development Goals (MDGs) (Gilson, Doherty, Loewenson, Francis, & the Knowledge Network, 2007; Gwatkin & Ergo, 2011; UNICEF, 2010; World Health Organization, 2008). Targeting some populations, including poorer groups living in remote areas and in greater need of health services, is often viewed as necessary to achieve universal coverage (Gilson et al., 2007; Gwatkin, Wagstaff, & Yazbeck, 2005; Victora, Fenn, Bryce, & Kirkwood, 2005; Victora et al., 2003; Zurn et al., 2005, 2011). Targeting remote groups represents a form of horizontal equity – providing equal access to health services to those with equal need for them.

The importance of maximizing health is axiomatic in cost-effectiveness analysis and utilitarian views of justice (Mishan, 1972). On the other hand, some argue that some benefit can be forgone for increased equity (Benatar, 2003; Culyer, 2006), especially for publicly funded health programs (Chalkidou, Culyer, Naidoo, & Littlejohns, 2008). Surveys show that policy-makers and health providers state they are willing to trade some efficiency for equity (Kapiriri & Norheim, 2004; Lindholm & Rosen, 1998; Lindholm, Rosen, & Emmelin, 1996, 1998; Ottersen, Mbilinyi, Maestad, & Norheim, 2008; Ubel, DeKay, Baron, & Asch, 1996).

Cost projections (Over, 1986) and geographic-based modeling (Johns & Baltussen, 2004) suggest that facilities in remote areas may be less efficient due to diseconomies of scale, and empirical research shows that health centers with lower utilization can have

* Corresponding author. Johns Hopkins University Bloomberg School of Public Health, Department of International Health, 615 N. Wolfe Street, Baltimore, MD 21205, USA. Tel.: +1 410 955 3928.
E-mail address: bjohns@jhsph.edu (B. Johns).

0277-9536/$ – see front matter © 2013 Elsevier Ltd. All rights reserved.
http://dx.doi.org/10.1016/j.socscimed.2013.04.012

higher average cost per patient (Berman, Brotowasisto, Nadjib, Sakai & Gani, 1989) than busier health centers. Some health systems provide primary health care facilities in remote areas (Barnighausen & Bloom, 2009b; Chomitz, Setiadi, Azwar, Ismail, & Widiyarti, 1998), and a pool of literature has looked at providing staff incentives to recruit and retain workers in these areas (Awofeso, 2010; Barnighausen & Bloom, 2009a; Rao, Rao, Kumar, Chatterjee, & Sundararaman, 2011). However, there is little evidence quantifying a relationship between efficiency and the pursuit of horizontal equity objectives. This may be especially true for countries with health centers in remote areas while other areas of the country do not have access to services, which is likely in post-conflict settings or in countries with limited human resources for health.

It is often assumed that there is a trade-off between efficiency and equity—targeting poorer or more remote populations costs more money per person and is therefore less efficient (Culyer, 2006). Poor people and people in remote areas may require more expensive outreach, or require more staff time and other resources. Higher service needs for poor populations have been found in developed countries even after controlling for diagnostic codes and co-morbidities (Laudicella, Olsen, & Street, 2010).

Technical efficiency is defined by using the minimum quantity of inputs needed to produce a given level of output. Technical inefficiency can be further separated into two categories. Inefficiencies of scale result from not operating at the lowest average cost, whereas inefficiencies of production indicate that the resources present at a given scale are not used optimally – production has departed from the optimal average cost curve. Inefficiency of production is the primary focus of this paper.

After the fall of the Taliban, the Afghan Ministry of Public Health prioritized delivering an "effective and efficient" package of basic health services (Ministry of Health, 2003). A major goal was to increase access to health care by providing a basic package of services for people with low economic status, particularly in rural areas, and for women and children (Peters et al., 2007). The basic package covers antenatal, maternal, postnatal, child health, nutrition, tuberculosis, basic mental health, and first aid services at basic health centers. Basic health centers, by staffing norms, should have a nurse and midwife on staff, while comprehensive health centers are supposed to be able to handle deliveries with minor complications and have a doctor on staff. Reports indicate that in 2004 districts with a facility offering the basic package of health services covered about 77% of the population, while in 2006, about 18% of the population did not have 'access' to basic health services, although uptake of services and the quality of the services available were highly variable (Hansen et al. 2008; Sabri, Siddiqi, Ahmed, Kakar, & Perrot, 2007). About 77% of the population lives in rural areas; WHO estimates that there were 2.1 physicians and 5 nurses or midwives per 10,000 people (WHO, 2012).

A policy was established to provide monetary incentives to staff working in remote areas to encourage the provision of health services in disadvantaged areas (Salary Policy Working Group, 2003). Thus, in a system with goals of both efficiency and equity, assessing the potential trade-off between these two objectives can help show the extent that they affect each other. The purpose of this analysis is to determine if there is a lower level of production efficiency in health centers located in remote areas of Afghanistan, and, if so, to quantify the amount of efficiency forgone. Whereas more health gains may be produced in underserved populations, in this analysis the available data limits us to using the number of patients seen as a proxy measure for health care service production as opposed to estimating actual health production. This metric should reflect equity in receipt of services, while not addressing the impact of those services on health.

Methods

Theoretical considerations and model specification

The data from Afghanistan do not include the total costs of facility operation since a limited set of inputs are measured; for example, total drug usage is not measured. Thus, we model a health center as a unit that converts inputs of staff time, medical supplies, and capital into two outputs: medical visits and technical quality. Output-oriented models like this typically include the quantities of inputs – staff and beds are most common – as independent variables and the type of facility (level or type of health center or hospital) as independent variables. Other factors that are commonly considered include the quality of care, case-mix of patients, and environmental factors such as location, price indices, etc. (Jacobs, Smith, & Street, 2006). Quality can be measured either as an outcome, such as successful treatment, or as a process, such as if diagnosis and treatments match some pre-defined standard (Hansen et al., 2008; Jacobs et al., 2006). We test whether modeling the joint production of quality and visits as a simultaneous process is applicable compared to modeling them separately by assessing the correlation of the residuals in the separate equations.

Assuming that quality of care is exogenous from the number of visits is problematic. Higher quality may draw more clients to a facility, while staff serving a high volume of patients may not have time or resources to provide high quality care. Including quality in a simple ordinary least squares (OLS) regression may thus introduce bias in the regression estimates of the values of the coefficients and their standard errors. Thus, we use seemingly unrelated regression (SUR) to specify two equations: one predicting quality linked to another estimating the number of visits. SUR models assume that the error terms in the separate equations are correlated with a bivariate normal distribution with same variance across equations (Jacobs et al., 2006). This allows the estimation to account for correlation in the unobserved variables affecting both equations. SUR will improve the efficiency of estimation if there are different independent variables in the separate equations (and the independent variables in the separate equations are not highly correlated) and if there is a correlation in the ordinary least squares OLS error terms. We also explore using quality as a predictor of the number of visits.

The equations below give the final form of the SUR estimation equation:

$$\begin{aligned} Y &= \alpha + \beta L + \xi X + \lambda R + \varepsilon_1 \\ Q &= \tau + \beta' L + \xi X + \mu Z + \lambda' R + \varepsilon_2 \\ E(\varepsilon_1 \varepsilon_2') &= \sigma_{1,2} \end{aligned} \qquad \text{(Equation 1)}$$

Where:

Y = the number of visits to a health facility;
L = the amount of labor inputs at a facility by type of labor;
X = a vector of other inputs;
R = an indicator variable if a facility is located in a remote area;
Q = the measured process quality at a facility;
Z = a vector of variables unique to predicting quality;
λ and λ' represent the parameters of interest for this analysis; and,
ε_i are the error terms, with σ the covariance between error terms.

In addition, dummy variables for province of a facility are employed, since facilities within a province often have similar management structures. We used Stata 12.0 for this analysis (StataCorp LP, 2011).