# The Contribution Of Human Resources For Health To The Quality Of Care In Indonesia

Staffing caps have not solved the inefficiencies within the civil-service system but might have constrained quality in the labor-intensive health sector.

**by Sarah L. Barber, Paul J. Gertler, and Pandu Harimurti**

**ABSTRACT:** Using a representative sample of public facilities surveyed in 1993 and 1997, we took advantage of exogenous changes imposed on the Indonesian health system to evaluate the contribution of physicians, nurses, and midwives to the quality of primary care. We found that quality depends on the availability, type, and number of health workers, which, in turn, is affected by public policies about deployment. We conclude that staff deployment could be refined by analyses of the skill-mix needed to provide quality care. Professional nurses in particular could play an important role in promoting quality. [*Health Affairs* 26, no. 3 (2007): w367–w379 (published online 27 March 2007; 10.1377/hlthaff.26.3.w367)]

THE POTENTIAL RETURNS TO INVESTING IN health care are high in low-income settings that are characterized by preventable or treatable health conditions. Global initiatives such as the United Nations (UN) Millennium Summit and its development goals emphasize "scaling up" existing cost-effective health interventions in low-income settings as a means of reducing poverty. However, these initiatives have been hampered by long-standing weaknesses in health systems and human resource management, which can impede performance and absorption capacity.[1]

This paper examines health staffing and quality in Indonesia—a diverse environment and population exceeding 225 million people. From the mid-1980s, the government expanded basic health infrastructure, and health workforce planning and deployment were focused on staffing the growing network of public facilities.

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To achieve the facility-based norms for primary-level facilities, the Ministry of Health (MoH) relied on a system of compulsory service as a prerequisite for civil-service employment. The time required for compulsory service varied by region, and physicians willing to accept postings in the most remote areas served fewer years.

Faced with declining public resources, the government of Indonesia enacted a zero-growth policy in 1992, which froze new hiring in the civil service. For the health sector, this policy eliminated the key incentive for deployment to remote regions: a shorter period of mandatory service before becoming a civil servant. Despite efforts to circumvent the freeze through contracting programs, the MoH reported declines in the number of physicians at primary-level facilities in remote areas between 1994 and 1998.[2]

We took advantage of this exogenous shock to the health system to evaluate the contribution of staffing to the quality of primary care. In this paper we first describe the institutional environment in Indonesia—including the government's hiring freeze, the MoH's contracting program designed to ameliorate its negative impact, and how both influenced the deployment of staff. We used a sample of public facilities surveyed in 1993 and 1997, to describe the changes in numbers of physicians, nurses, and midwives by region. We estimated the impact of the policy on changes in staffing independent of socioeconomic conditions, resource allocation criteria, population health status, and other factors. We then evaluated the effect of the presence of those providers on the quality of prenatal, child, and adult care. We conclude the paper with recommendations that are relevant to the current policy environment.

## The Setting

The diversity of Indonesia's environment and population poses enormous challenges to effective service delivery. Because health spending was viewed as integral to social welfare goals, the government tripled it in real terms between 1979 and 1983. An expansion of basic health infrastructure was under way, which initially focused on hospitals and then on primary-level facilities. The construction of the latter was based on uniform facility-per-population ratios. The result today is a nationwide network of more than 7,000 health centers and 21,000 subcenters that serve as the first point of contact in the public health system.

Human resource policies were focused on staffing this network of public facilities. Fixed staff-per-facility ratios were applied by facility type and geographic region.[3] The main geographic regions are Java-Bali and (more remote) Outer Java-Bali.[4] The challenge was in offering sufficient incentives to work in regional facilities. To achieve the targeted physician-per-facility ratios, the MoH relied on a system of five-year compulsory service at health centers as a prerequisite to obtaining a civil-service posting, practice license, and eligibility for specialty training. The service requirement was shortened to three years for work in remote regions of

Outer Java-Bali. This combination of incentives proved successful in increasing the availability of physicians at health centers. Between 1989 and 1993, the number of physicians per province increased on average by more than 8 percent annually.[5] Most of these physicians, however, moved to the capital or other urban areas for training or practice after their compulsory service.[6] Thus, sustaining an augmented physician-to-health-center ratio presented an ongoing challenge.

During the late 1980s, Indonesia underwent great changes, amid international budget crises, declining oil prices, and increasing debt payments. Commitments to expanding the reach of the public health system were questioned in light of budget constraints. In 1992 the government enacted a zero-growth policy to stem the expansion of the civil service. For the health sector, this policy implied a major change in the incentives for deploying staff. Newly graduated physicians were no longer guaranteed a civil-service post, thus eliminating a key incentive for voluntary deployment to remote regions. The final civil-service cohorts recruited in 1991 completed their mandatory health center service in 1994 and 1996 in remote and nonremote regions, respectively.

Facing demands to staff a large network of primary-level facilities, the MoH developed contracting programs that circumvented the hiring restrictions and directly allocated physicians to health centers. Under the contracting program, new graduates were obligated to serve three years at a primary-level public facility before being eligible to obtain a practice license—similar to the previous hiring system. However, the MoH offered financial incentives to work in remote regions rather than shorter periods of compulsory service.[7] Despite these efforts, less than one-half and one-third of the MD health center staffing targets were filled in very remote and remote regions, respectively.[8]

## Study Data And Methods

■ **Data and sample.** The primary sources of data were the Indonesian Family Life Surveys (IFLS) fielded in communities and households in 1993 and 1997. The surveys collected information from more than 7,000 households in half of the twenty-six provinces representative of 83 percent of the Indonesian population.[9] The survey frame for health care providers was generated from household reports about knowledge of available outpatient providers. The selection of providers was based on a random probability sample, with the probability of selection proportionate to the frequency a given location was mentioned by households. Three to four public facilities were targeted for interview in each enumeration area; the response rate exceeded 99 percent in both years. These analyses focused on data from 992 public facilities in 1993 and 915 in 1997. The sampling for facilities was the same in both years. Rather than a panel of the same facilities, the data describe health care providers available in the same communities at two points in time.

■ **Measurement of quality.** We focused on assessments of technical quality for prenatal care and for child and adult curative care using clinical case scenarios. A

scenario was read aloud to one service provider per facility. He or she was then asked a series of questions about activities performed during history taking, physical, diagnostics, and follow-up. The interviewer was provided a list of procedures corresponding with clinical guidelines, and responses were evaluated against the guidelines. The scenarios used in the IFLS were pilot-tested before implementation, with direct observation to ensure clarity and minimal measurement error. The case scenario methodology has been validated in other settings.[10]

Responses were coded using international guidelines in consideration of available data. For prenatal care, nineteen criteria were identified that correspond with procedures for the management of routine pregnancies.[11] For the adult curative care scenario, an adult presented with cough and fever. The eleven criteria for this case corresponded with guidelines for the integrated management of adult illness in environments of high tuberculosis prevalence.[12] For the presentation of a child with diarrhea and vomiting, the twelve criteria were coded against guidelines for the integrated management of childhood illnesses.[13] The raw scores were expressed as the sum of the criteria spontaneously mentioned as a proportion of the total. The scores aimed to capture knowledge about evidence-based procedures for prenatal, adult curative, and child curative care. To examine quality relative to other providers, we standardized the scores with a mean of 0 and a standard deviation (SD) of 1, and variations in quality were expressed in SD units.

■ **Clinical settings, provider qualifications, and basic structural quality.** We used data from 1,907 public health centers and auxiliary health centers functioning as first-line facilities and providing outpatient care and preventive services. These analyses used reports about three main types of health professionals: nurses, midwives, and physicians. Nationally, 60 percent of nurses received vocational-level training after junior high school; most of the remaining has three-year postsecondary diplomas from nursing academies. Facility-based midwives have at least a three-year vocational level diploma in nurse-midwifery.[14] An estimated 81 percent of physicians are GPs with four years of baccalaureate training; the rest are hospital-based specialists.[15] In addition to staffing, other measures of public health structure in these analyses included the availability of a functioning microscope, inpatient beds, and electricity.

■ **Health infrastructure and socioeconomic factors at district, community, and household levels.** We included a series of control variables about health infrastructure and socioeconomics from the IFLS and other data sets. The number of health facilities and population were from the Village Potential Statistics Survey in 1993 and 1996 (Potensi Desa, or PODES). Fielded by the Indonesian Central Statistical Bureau to gather information about infrastructure for national planning, the PODES collects data from all villages in Indonesia (approximately 65,000). District wealth is measured as district gross domestic product (GDP), as estimated by the Central Statistical Bureau, deflated across regions, and expressed as 1993 Indonesian rupiah values. At the community level, the IFLS surveys collected a broad range of

data from community leaders about local infrastructure in 1993 and 1997. From this information, we developed a community infrastructure index measuring the proportion of communities with a formal market, public telephone, post office, predominantly piped drinking water, and waste and garbage disposal systems.

Household-level control variables from the IFLS included wealth, health status, and age and education. Wealth was measured as per capita household monthly spending on food and nonfood items. Maternal education and age data were collected from women who experienced a pregnancy between 1990 and 1997. Data on education and age for all adults were collected from the household roster for approximately 10,000 men and women age eighteen and older each round. The analyses also included height-for-age among children ages 36–60 months at the time of the survey. Height-for-age is expressed in SD units, or z-scores, derived by subtracting each child's height from the National Center for Health Statistics (NCHS) median reference standard and dividing by the standard deviation of the reference distribution for a given age and sex.[16]

■ **The analyses.** We first assessed the change in human resources by region. The dependent variables were the availability of a physician, expressed as a dichotomous variable, and the numbers of physicians, nurses, and midwives, expressed as logarithms. We examined public health centers separately, given that the staffing criteria were different by facility type. To identify the change in human resources independent of other factors, these regressions included three main sets of controls: the government's criteria for allocating health staff, factors that affect the sorting of health workers, and past health status.

The MoH allocated health staff based on fixed facility and population criteria by geographic region, and these standards remained unchanged throughout the 1990s.[17] To capture these criteria, district-level data were used about the number of facilities and population, in addition to facility-level data about inpatient beds. To control for the allocation of human resources based on health needs, the analyses included lagged health status as measured by height-for-age z-scores for children ages 36–60 months at each survey round. To capture the sorting of health workers to wealthier locations, regressions included monthly household spending and the community infrastructure index. Spending and height-for-age data from the household surveys were expressed as community means. Lastly, we included a dummy variable for the second survey wave (1997–1998) to control for social and political changes in Indonesia that affected all communities. All of the models included community fixed effects, which swept out of the regressions other characteristics that were the same for all facilities in a given community. Community fixed effects control for the allocation of human resources based on other stable characteristics, such as the quality of regional training centers and staffing standards by geographic regions. If health workers consistently migrate to urban areas or the national capital, fixed effects also control for this type of migration bias. For each dependent variable, we reported the results from interaction terms that esti-

mated the change in human resources for urban and rural regions of Outer Java-Bali and rural Java-Bali in 1997 as compared with the omitted variable of urban Java-Bali. Preliminary analyses found no significant change in staffing over time in urban Java-Bali.

The second set of analyses predicted the effect of human resources on quality of care. These analyses combined health centers and auxiliary health centers, given that the subcenters relied on health centers for technical support, management of activities, and referrals. Exploratory analyses confirmed significant effects on quality for subcenters with access to physicians. The dependent variables in these regressions were the quality scores for prenatal care and child and adult curative care in SD units and as raw scores. The key explanatory variables were each staffing type expressed categorically: 0, 1, and 2 or more physicians; for nurses and midwives, the categorical variable cut-offs were 0, 1, 2, and 3 or more staff. These regressions controlled for household and community factors, including district GDP, household spending, community infrastructure, age, education, facility structural quality, and a dummy variable for the survey round. In predicting adult curative care, we replaced maternal age and education with average age and education for adult men and women in the community. Education and age from the household data were expressed as community means.

Community-based health care is less reliant on technology and equipment than is hospital-based care. Nonetheless, we included measures of basic facility structural quality—availability of inpatient beds, electricity, and a functioning microscope—in addition to the type of facility. Similar to the other regressions, we included community fixed effects to control for stable and time-variant factors that were the same for communities. Hausman and F-tests indicated that the fixed-effects models were efficient and appropriate. To obtain estimates for the underlying population, descriptive statistics applied sampling weights to adjust for oversampling in urban areas and provinces outside of Java; all analyses adjusted for the cluster survey design.

## Study Results

Exhibit 1 describes the sample by region and year. Panel A reports the quality scores. Declines of 14.1 percent, 9.7 percent, and 9.2 percent occurred in the proportion of public health workers mentioning the criteria for prenatal, child curative care, and adult curative care, on average. In SD units, this implies a decline of 0.41, 0.32, and 0.23 for prenatal, child, and adult care, respectively. Quality declines were steeper in Outer Java-Bali: For example, a decline of 24.5 percent occurred in the proportion of health workers mentioning criteria for prenatal care.

Panel B reports changes in staffing. At health centers, significant increases in the number of physicians occurred in Java-Bali, but the number of nurses and midwives declined. For Outer Java-Bali, the opposite occurred. At the auxiliary health center level, declines occurred in the number of midwives in Java-Bali. For com-

## EXHIBIT 1
## Health Facility And Socioeconomic Characteristics By Region, Indonesia, 1993 And 1997

| | Java-Bali | | Outer Java-Bali | | All observations | |
|---|---|---|---|---|---|---|
| **Characteristic** | **1993** | **1997** | **1993** | **1997** | **1993** | **1997** |
| **Panel A: facility quality** | | | | | | |
| Prenatal care | | | | | | |
| Quality score (raw %) | 54.97 | 48.65*** | 49.30 | 37.29*** | 53.58 | 46.04*** |
| Quality score (SD) | 0.34 | 0.00*** | 0.03 | −0.62*** | 0.26 | −0.15*** |
| Facilities that offer care | 94.93% | 95.29% | 89.06% | 91.94% | 93.42% | 95.26% |
| Child curative care | | | | | | |
| Quality score (raw %) | 65.96 | 61.24*** | 64.70 | 52.82*** | 65.63 | 59.26*** |
| Quality score (SD) | 0.17 | −0.06*** | 0.11 | −0.49*** | 0.16 | −0.16*** |
| Facilities that offer care | 98.01% | 98.59% | 97.34% | 97.03% | 97.84% | 98.22% |
| Adult curative care | | | | | | |
| Quality score (raw %) | 54.63 | 52.15 | 52.82 | 42.56*** | 54.17 | 49.17*** |
| Quality score (SD) | 0.12 | 0.00 | 0.03 | −0.44*** | 0.10 | −0.13*** |
| Facilities that offer care | 98.88% | 53.93%*** | 98.93% | 77.65%*** | 98.89% | 59.58%*** |
| **Panel B: facility staffing** | | | | | | |
| Health centers | | | | | | |
| No MD available | 3.35% | 2.96% | 8.22% | 11.77% | 4.48% | 4.92% |
| Number of MDs | 1.39 | 1.54*** | 1.24 | 1.06*** | 1.36 | 1.43* |
| Number of nurses | 4.75 | 4.42** | 5.51 | 5.84 | 4.92 | 4.74 |
| Number of midwives | 3.30 | 2.79*** | 2.72 | 3.21*** | 3.17 | 2.88** |
| Auxiliary health centers | | | | | | |
| Number of nurses | 1.03 | 0.95 | 1.10 | 1.15 | 1.05 | 1.00 |
| Number of midwives | 0.76 | 0.63** | 0.60 | 0.60 | 0.71 | 0.62* |
| **Panel C: facility structural quality and socioeconomics** | | | | | | |
| Electricity available | 84.01% | 93.71%*** | 66.48% | 87.48%*** | 79.51% | 92.23%*** |
| Microscope available | 50.96% | 50.94% | 38.13% | 50.22%*** | 47.67% | 50.77%* |
| Household expenditures (Ln rupiah per capita) | 10.70 | 10.88*** | 10.63 | 10.71* | 10.68 | 10.84*** |
| Community infrastructure index | 36.72 | 41.99*** | 25.92 | 32.94*** | 33.94 | 39.83*** |
| Total number of public facilities | 612 | 606 | 380 | 309 | 992 | 915 |

**SOURCE:** Indonesian Family Life Surveys, Village Potential Surveys (Sensus Potensi Desa).

**NOTES:** Outer Java-Bali is defined as provinces in Sumatra, Kalimantan, and the Eastern Islands. The community infrastructure index was measured as the proportion of communities with a formal market, public telephone, post office, predominantly piped drinking water, sewage waste disposal system, and garbage disposal system. Figures were adjusted for sampling design. A version of this exhibit showing 95 percent confidence intervals is available online at http://content.healthaffairs.org/cgi/content/full/hlthaff.26.3.w367/DC2. SD is standard deviation units. Ln is logarithm.

*$p \leq 0.10$ **$p \leq 0.05$ ***$p \leq 0.01$

parison, facility structural quality and socioeconomic characteristics demonstrated some improvements over the study period (panel C).

Exhibit 2 illustrates the changes between 1993 and 1997 in quality and human resources by major region. Rural Outer Java-Bali reported the steepest declines in quality as well as significant declines in the number of physicians per facility. Significant increases in physician numbers occurred in rural Java-Bali, where there was no change in curative care quality.

Although changes in staffing are evident, it is unclear to what extent such

**EXHIBIT 2**
**Changes In Quality For Public Prenatal, Child, And Adult Care, And Changes in Staffing Levels For Public Facilities, By Region, Indonesia, 1993–1997**

| | Change in health care quality (SD) | | | Change in staffing (%) | | |
|---|---|---|---|---|---|---|
| **Region** | **Prenatal** | **Child** | **Adult** | **MDs** | **Midwives** | **Nurses** |
| Rural Java-Bali | −0.13*** | −0.17 | 0.03 | 14.21** | −29.37*** | −0.49 |
| Urban Java-Bali | −0.52*** | −0.31*** | −0.26*** | 6.50 | −3.56 | −7.77 |
| Urban Outer Java-Bali | −0.67*** | −0.57*** | −0.46*** | −2.01 | 20.05*** | 3.73 |
| Rural Outer Java-Bali | −0.64*** | −0.61*** | −0.48*** | −26.16*** | 19.10 | 17.71 |

**SOURCE:** Indonesian Family Life Surveys.
**NOTES:** Change in quality is expressed in standard deviation (SD) units. MD staffing levels were measured for health centers. Significance denotes change from 1993 to 1997. For a graphical depiction of these data, see http://content.healthaffairs.org/cgi/content/full/hlthaff.26.3.w367/DC2.
$^{**}p \leq 0.05$ $^{***}p \leq 0.01$

changes are a result of the modifications to the civil-service policies. Exhibit 3 reports the results from regressions that aim to isolate the change in staffing by major region, independent of government allocation criteria; district, household, and community socioeconomics; and health status. For rural Outer Java-Bali, representing the most remote regions, Exhibit 3 reports an 11 percent increase in facilities lacking MDs, and a 21.5 percent decline in the number of physicians per health center (columns 1 and 2). The number of nurses increased 12 percent in rural regions of both Java-Bali and Outer Java-Bali (column 3). In contrast, the number of midwives declined in rural Java-Bali and increased in urban Outer Java-Bali. Among the control variables (not shown), the government's allocation criteria

**EXHIBIT 3**
**Changes In Staffing Levels For Public Facilities, After Adjusting For Government Allocation Criteria, Socioeconomic Changes, And Health Status, By Region, Indonesia, 1993–1997**

| | Change in staffing (%) | | | |
|---|---|---|---|---|
| **Region and year** | **No MD available** | **Number of MDs** | **Number of nurses** | **Number of midwives** |
| Region | | | | |
| Rural Java-Bali | −3.80 | 5.23 | 11.75** | −8.65* |
| Urban Outer Java-Bali | −2.39 | −6.95 | 7.89 | 10.69* |
| Rural Outer Java-Bali | 11.23*** | −21.52*** | 11.61* | 5.33 |
| Year | | | | |
| 1997 | 2.54 | −0.74 | −0.87 | −3.10 |

**SOURCE:** Indonesian Family Life Surveys, Village Potential Surveys (Sensus Potensi Desa)
**NOTES:** Changes in region and year were generated from regressions controlling for the number of health centers and auxiliary health centers, inpatient services, population, household expenditures, community infrastructure, lagged height-for-age z-scores, and community fixed effects. The omitted comparison group for region is urban Java-Bali. Regressions for MDs include health centers.
$^{*}p \leq 0.10$ $^{**}p \leq 0.05$ $^{***}p \leq 0.01$

predicted changes in the number of physicians, nurses, and midwives; however, lagged health status was not significant.

Exhibit 4 describes the change in quality as a result of the type and level of staffing, independent of socioeconomic, facility, and community factors. For prenatal care, large quality gains resulted from increasing the number of physicians to one (0.24 SD or 4.5 percentage points) and to two or more (0.34 SD or 6.3 percentage points) compared with none. Having three or more nurses led to large increases in quality (0.28 SD), as did having two or more midwives (0.25 SD) compared with none. The results for child care are similar to those for prenatal care. Large gains in quality resulted from increasing the number of physicians from zero to one (0.19 SD) and to two or more (0.24 SD, $p < 0.10$). However, increasing the number of nurses to three or more led to large quality gains (0.30 SD) compared with none. Midwives did not contribute to either child or adult curative care quality.

Moving from zero to one physician contributed to increases in adult care quality (0.20 SD, $p < 0.10$), although increasing the number of physicians beyond one did not lead to additional quality gains. However, increasing the number of nurses from one to two and to three or more increased quality in adult curative care (0.32 SD and 0.34 SD, respectively).

**EXHIBIT 4**
**Contribution Of Additional Staffing In Increasing Quality Of Prenatal Care And Child And Adult Curative Care, Public Facilities, Indonesia, 1993–1997**

| | Prenatal care | | Child curative care | | Adult curative care | |
|---|---|---|---|---|---|---|
| **Facility staffing** | **SD** | **Percentage points** | **SD** | **Percentage points** | **SD** | **Percentage points** |
| MDs | | | | | | |
| None (omitted) | | | | | | |
| One | 0.24** | 4.49** | 0.19* | 3.85* | 0.20* | 4.32* |
| Two or more | 0.34*** | 6.29*** | 0.24* | 4.81* | 0.21 | 4.46 |
| Nurses | | | | | | |
| None (omitted) | | | | | | |
| One | 0.10 | 1.76 | 0.07 | 1.39 | 0.19* | 4.01* |
| Two | 0.16 | 2.96 | 0.24* | 4.78* | 0.32** | 6.85** |
| Three or more | 0.28** | 5.08** | 0.30** | 5.94** | 0.34** | 7.40** |
| Midwives | | | | | | |
| None (omitted) | | | | | | |
| One | 0.16* | 2.92* | −0.01 | −0.23 | 0.09 | 1.87 |
| Two | 0.25** | 4.63** | −0.01 | −0.28 | 0.11 | 2.46 |
| Three or more | 0.21* | 3.85* | −0.06 | −1.23 | 0.10 | 2.10 |
| 1997 | −0.17 | −3.13 | −0.23 | −4.52 | 0.38* | 8.29* |

**SOURCES:** Indonesian Family Life Surveys, and Indonesian Central Statistical Bureau.

**NOTES:** All six models include community fixed effects. In addition to the human resource variables in the exhibit, all models controlled for district gross domestic product (GDP), household spending , average age and education in the community, facility-specific factors, and dummy variables for facility type and year of survey. Age and education for women who delivered during 1990–1997 were included in the models estimating prenatal and child care quality, and age and education for adult males and females were included in the models estimating adult care quality. Facility-specific factors included the availability of inpatient beds, electricity, and a microscope. SD is standard deviation units.

*$p \leq 0.10$ **$p \leq 0.05$ ***$p \leq 0.01$

## Discussion

■ **Limitations.** To measure quality, we used case scenarios, which have been used in other settings to predict knowledge and clinical decision making and control for illness severity.[18] The scenarios were scored against standard practice guidelines, although some important criteria were missing because of data limitations. Prenatal care has been used as a tracer service, which implies that the assessment could be capturing overall service quality.[19] The results for adult care should be interpreted carefully because there was a significant reduction in its availability between 1993 and 1997, which can be explained in part by changes in staffing.

We have described national trends in staffing in Indonesia during the 1990s. The data used in this study did not include very remote areas; we also employed reports about staffing on roster rather than working hours.[20] Government estimates of the decline in health center physicians are higher than the results reported here, which suggests that our results might be conservative. We explored separately whether private providers compensated for the declines in public quality. We concluded that this is unlikely, given that public quality accounts for a large part of the variation in private quality. In this study, health center nurses contributed to the provision of high-quality curative care, a finding that contrasts with previous reports associating private nurses with large quality deficiencies.[21] Higher quality for health center nurses might result from opportunities for professional development, which are unavailable to nurses in private practice. The scenarios used in this study were more appropriate for evaluation of individuals and basic primary services; however, future research is examining complementarities and substitutions among staff.

■ **Findings and discussion.** We found that quality depends on the availability, type, and number of health workers, which, in turn, is affected by public policies. Changes in staffing occurred by region between 1993 and 1997 for primary facilities, independent of socioeconomic factors and government allocation policies. The changes corresponded with having the last cohort of physicians complete their mandatory health center service after 1993 and 1995 in remote and nonremote regions, respectively, and with the shift in incentives for working in remote areas.

Personnel expenses account for some 60 percent of the public health budget in Indonesia.[22] However, the system for deploying health workers—based on eliminating gaps in fixed facility and population ratios—has not changed since the late 1980s.[23] Recent efforts have focused on the community-based *desa siaga* or village preparedness program, which aims to place at least one health paraprofessional in each village. Yet the policy emphasis remains on filling quantitative targets, rather than on quality or health outcomes.[24]

The relatively recent decentralization policies offer an opportunity to move away from uniform quantitative targets and systematically test alternative means of staffing primary facilities. We found, for example, that increasing the number of nurses resulted in larger quality gains for curative care compared with increasing

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the number of physicians or midwives. By expanding on these types of analyses, alternative methods of staffing could be identified to achieve quality and coverage goals for specific programs of care, given regional health problems and priorities.

Deployment of physicians to health centers has remained the prevalent health policy focus. Indeed, we found that the presence of a physician was an important determinant of quality. In particular, moving from no physicians to one appeared to provide an important capacity as measured by significantly increased quality, separate from the presence and number of other staff. At health centers, physicians provide care directly as well as supervising and managing activities. This role is a manifestation of physicians' status and a higher level of professionalism for physician training compared with that of nurses and midwives. However, it has long been recognized that the incentive packages were insufficient to fill the physician staffing gaps in remote regions.

Taking a long-term approach, expanding the managerial roles and responsibilities of nurses, midwives, and other professionals in the primary-level public system is promising. Efforts are under way to strengthen the National Midwifery and Nursing Professional Associations for self-regulation, certification, and establishing codes of ethics. Professional nurses in particular could play an important role in promoting quality in Outer Java-Bali, given the difficulty of posting physicians to these areas.

Working in remote Indonesia is characterized by few basic amenities, poor transportation and communication, twenty-four-hour on-call responsibilities, and limited educational facilities for children. Previous studies have tried to identify appropriate incentives for deployment to remote regions.[25] However, the incentive packages need to be revised in light of changes in the policy environment. Indeed, given growing opportunities in the private hospital market, the incentive of civil-service employment is not as attractive as before.[26] Systematically testing alternative incentives for deployment could build on earlier experiences while also considering responsibility, workload, and performance.

INDONESIA HAS THE SECOND-LOWEST RATIO of physicians to population in the Asia Pacific region, with one physician responsible for approximately 6,000 people, on average. This ratio represents one-quarter of the physician density in neighboring Malaysia and is some thirty times lower than the U.S. physician-to-population ratio.[27] Staffing caps have not solved the inefficiencies within the civil-service system but might have imposed constraints on quality in health as a labor-intensive sector.[28]

Health workforce issues are grounded in long-standing policies about central

planning and deployment, budget limitations, and ceilings on workforce numbers in Indonesia—similar to some other less-developed settings. The deployment of staff could be refined by analyses of the skill-mix needed to provide high-quality care. Particularly given the difficulty of posting physicians to remote regions, expanding the roles and responsibilities of professional nurses is promising. More empirical analyses are needed to identify solutions that can contribute to global goals of reducing poverty through higher investments in health.

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## NOTES

1. Joint Learning Initiative, *Human Resources for Health: Overcoming the Crisis* (Cambridge, Mass.: Harvard University, Global Equity Initiative, 2004); and World Health Organization, International Labor Office, International Council of Nurses, Public Services International, *Public Service Reforms and Their Impact on Health Sector Personnel* (Geneva: WHO, 2001).
2. Ministry of Health, Republic of Indonesia, *Indonesian Health Profile* (Jakarta: MoH, 2001).
3. MoH, *Health Center Manual* (Jakarta: MoH, 1997/1998, 1991/1992, and 1989/1990).
4. Java-Bali is composed of provinces in Java and Bali islands; Outer Java-Bali can be divided into Sumatra and Kalimantan and the Eastern Islands.
5. MoH, *Indonesian Health Profile*, 2001.
6. World Bank, *Indonesia's Health Workforce: Issues and Options* (Washington: World Bank, 1994).
7. The contracting program was later expanded to include dentists and village midwives.
8. Figures based on MoH contracting data. After 2002, compulsory service was required only for obtaining a practice license, and assignments could be fulfilled in public, private, or religious facilities. In 2004 it was estimated that the contracting program absorbed some 80 percent of newly graduated physicians.
9. The Indonesian Family Life Survey has been extensively documented elsewhere; see, among others, E. Frankenberg and D. Thomas, *The Indonesian Family Life Survey (ILFS): Study Design and Results from Waves 1 and 2* (Santa Monica, Calif.: RAND, 2000).
10. J. Veloski et al., "Clinical Vignette–Based Surveys: A Tool for Assessing Physician Practice Variation," *American Journal of Medical Quality* 20, no. 3 (2005): 151–157.
11. Prenatal risk assessment was omitted from the analyses, primarily because the risk scoring system is related to the accessibility of emergency obstetric services and qualified providers and, therefore, could be endogenous to the analyses. Prenatal care criteria are in J. Villar and P. Bergsjo, "Scientific Basis for the Content of Routine Antenatal Care, I. Philosophy, Recent Studies, and Power to Eliminate or Alleviate Adverse Maternal Outcomes," *Acta Obstetricia et Gynecologica Scandinavica* 76, no. 1 (1997): 1–14; and P. Bergsjo and J. Villar, "Scientific Basis for the Content of Routine Antenatal Care, II. Power to Eliminate or Alleviate Adverse Newborn Outcomes; Some Special Conditions and Examinations," *Acta Obstetricia et Gynecologica Scandinavica* 76, no. 1 (1997): 15–25.
12. Tuberculosis prevalence was estimated at 786 per 100,000 in 1998, in Ministry of Planning, Republic of Indonesia, *Indonesia Progress Report on the MDGs* (Jakarta: Ministry of Planning, 2005); and World Health Organization, *Acute Care: Integrated Management of Adolescent and Adult Illness; Interim Guidelines for First Level Facility Health Workers at Health Center or District Outpatient Clinic*, Pub. no. WHO/CDS/IMAI/2004.1 (Geneva: WHO, 2004).
13. WHO, *Integrated Management of Childhood Illness: IMCI Adaptation Guide Version 5* (Geneva: WHO, 2002).
14. We omitted village midwives who completed special one-year diplomas under a large-scale accelerated deployment initiative during the 1990s.
15. Resource Management Consultants Ltd., *Indonesia Health Work Force and Services Project for the Republic of Indo-*

*nesia* (Washington: World Bank, 2002).

16. WHO, *Measuring Change in Nutritional Status* (Geneva: WHO, 1983).
17. MoH, *Health Center Manual*, 1997/1998, 1991/1992, and 1989/1990.
18. Veloski et al., "Clinical Vignette–Based Surveys."
19. S. Molla et al., eds., *Primary Care: America's Health in a New Era* (Washington: National Academies Press, 1996).
20. A cross-national study including 100 facilities from ten Indonesian districts reports a 40 percent staff absenteeism rate, of which 33 percent was attributed to unauthorized leave or not being punctual. See N. Chaudhury et al., "Missing in Action: Teacher and Health Worker Absence in Developing Countries," *Journal of Economic Perspectives* 20, no. 1 (2006): 91–116.
21. S.L. Barber, P.J. Gertler, and P. Harimurti, "Differences in Access to High-Quality Outpatient Care in Indonesia," *Health Affairs* 26, no. 3 (2007): w352–w366 (published online 27 March 2007; 10.1377/hlthaff.26.3.w352).
22. World Bank, *Indonesia's Health Work Force.*
23. Proposals to modify the deployment criteria during the 1990s by using facility utilization levels were not successful, in part because of the lack of data. Recently the MoH issued population-based standards for public staff, although they are similar to the facility-based blueprint, in MoH, "Guidelines for Community Health Services," Ministerial Decree 1205 (Jakarta: MoH, 2004).
24. The continued lack of attention to quality can be illustrated by the government's decision in 2001 to eliminate the national examination for physicians and a standard competence level for undergraduate medical education. For discussion of the rapid growth of nonaccredited medical education programs, which purport to support the government's staffing targets, see H. Thabrany, "Human Resources in Decentralized Health Systems in Indonesia: Challenges for Equity," *Regional Health Forum WHO SEARO* 10, no. 1 (2006): 75–88.
25. K Chomitz et al., *What Do Doctors Want? Developing Incentives for Doctors to Serve in Remote and Rural Areas* (Washington: World Bank, 1998).
26. In 1996, physicians serving in remote regions were given an increased probability of civil-service recruitment. However, the civil-service system retains those with a high school education or less—who earn more in the civil service compared with the private sector; in contrast, university graduates earn more in the private sector compared with their civil-service counterparts. See D. Filmer and D.L. Lindauer, *Does Indonesia Have a Low Pay Civil Service?* (Washington: World Bank, 2001); and D.Y. King, "Qualifications of Indonesia's Civil Servants: How Appropriate Are They to the Dynamic Environment?" *Journal of Military and Political Sociology* 26, no. 1 (1998): 23–28.
27. Joint Learning Initiative, *Human Resources for Health.*
28. The number of Indonesian civil servants in 2005 was 3.7 million, representing 1.7 percent of the population compared with 3.4 percent in developing countries. See National Civil Service Board, Republic of Indonesia, "Improving Quality of Indonesia Civil Servants through Effective Civil Service Recruitment System" (Presentation at Thirteenth Association of Southeast Asian Nations [ASEAN] Conference on Civil Service Matters [ACCSM] Main Conference, Phnom Penh, 20–22 December 2005); and United Nations, *Public Sector Indicators* (New York: UN Secretariat, 2000).