Private Care and Public Health: Do Vaccination and Prenatal Care Rates Differ between Users of Private versus Public Sector Care in India?

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Objective. To determine whether patients who use private sector providers for curative services have lower vaccination rates and are less likely to receive prenatal care.
Data Sources/Study Setting. This study uses data from the 52d round of the National Sample Survey, a nationally representative socioeconomic and health survey of 120,942 rural and urban Indian households conducted in 1995–1996.
Study Design. Using logistic regression, we estimate the relationship between receipt of preventive care at any time (vaccinations for children, prenatal care for pregnant women) and use of public or private care for outpatient curative services, controlling for demographics, household socioeconomic status, and state of residence.
Data Collection/Extraction Methods. We analyzed samples of children ages 0 to 4 and pregnant women who used medical care within a 15-day window prior to the survey.
Principal Findings. With the exception of measles vaccination, predicted probabilities of the receipt of vaccinations and prenatal care do not differ based on the type of provider at which children and women sought curative care. Children and pregnant women in households who use private care are almost twice as likely to receive preventive care from private sources, but the majority still obtains preventive care from public providers.
Conclusions. We do not find support for the hypothesis that children and pregnant women who use private care are less likely to receive public health services. Results are consistent with the notion that Indian households are able to successfully navigate the coexisting public and private systems, and obtain services selectively from each. However, because the study employed an observational, cross-sectional study design, findings should be interpreted cautiously.

Key Words. Quality of care, primary care, vaccination, prenatal care, delivery of health care, global health

Governments in developing countries such as India spend the majority of their health care budgets on direct public provision of care. Though public services are offered free of charge, most patients, including those from the lowest income groups, seek ambulatory care in the private sector. In recent years,

governments and donor organizations have reassessed their traditional emphasis on the public sector, and, in recognition of its inability to achieve universal access and equity in financing as well as the complementary nature of the public and private sectors, gradually sought to shift responsibilities to private hospitals, clinics, and physicians (Bennett, McPake, and Mills 1997; Peters et al. 2002).

While private providers may be more responsive to patient demand, many observers are concerned about the ability of private sector physicians to provide public health services (Brugha and Zwi 1998; McPake 1997; Newell 2002). Private providers often lack the expertise and facilities to deliver high quality preventive services (Mills et al. 2002). Vaccines, in particular, require proper handling and storage, and private providers may fail to keep vaccines adequately refrigerated (Aljunid and Zwi 1997). On the demand side, patients' willingness to pay for preventive services will not reflect the positive externalities associated with reduced transmission of infectious diseases and decreased use of tertiary care in the public sector. Hence, private providers face suboptimal incentives to provide preventive care.

Another potential problem with the private sector vis-à-vis public health is that use of private versus public facilities may be associated with "missed opportunities" for vaccination and prenatal care. Narrowly defined, a "missed opportunity" occurs when an individual eligible for such care visits a health care facility for curative services and does not receive concurrent preventive services (Szilagyi and Rodewald 1996). Eliminating missed opportunities is a major goal of the "integrated management of childhood illness" approach to primary care promoted by the World Health Organization and other aid agencies (Nicoll 2000), based on the belief that targeting persons already in contact with the health care system represents a cost-effective method of increasing immunization rates and use of prenatal services (Khan, Saha, and Ahmed 2000; Patwari and Raina 2002). Some analysts have dismissed concerns about missed opportunities as a rationale for public provision of curative medical care (for example, Peters et al. 2002), but hard evidence is lacking.

The purpose of this study is to compare rates of vaccination and prenatal care between children and women who use private care for curative services and those who use public care for curative services. We do not measure missed

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opportunities for vaccination directly. More than 90 percent of vaccinations are provided by public facilities in India (Peters et al. 2002), so there is little doubt that the proportion of visits in which previously unvaccinated patients receive vaccinations is higher in public facilities. Instead, our approach is to compare vaccination and prenatal care rates overall, regardless of the facility type at which they were received. Just because private providers are less likely to administer vaccines does not mean that their patients are less likely to be vaccinated. Patients who use private care for curative services always have the option of obtaining preventive services from the public sector. That said, there are still reasons to suspect that use of private care for curative services may be associated with decreased use of public health services overall. Persons who regularly use private care may lack established relationships with public providers, and private providers may be less likely to exhort their patients to obtain preventive care.

The Indian Health Care System

As in most other developing countries, the Indian health system is comprised of a mix of public and private providers. The large public health infrastructure, financed out of general tax revenues, operates largely through primary health centers. Administrative decisions are made primarily at the state level, though some states have decentralized managerial functions to local bodies. Public clinics do not charge for professional services, but patients must pay for the facility and supply costs associated with treatment (for example, drugs, diagnostics, supplies, and inpatient lodging). The availability of public clinics varies greatly between states and regions within states, and for some patients travel costs are prohibitive.

At independence in 1947, the private sector comprised only a small share of clinics and hospitals. Since then, the number of private providers has grown rapidly. According to recent estimates, between 80 and 85 percent of physicians are employed in the private sector and 80 percent of outpatient visits in India are to private clinics (Peters et al. 2002). There is tremendous variation in terms of the size of facilities, the range of services offered, and the expertise of physicians. Most clinics are for-profit, and though physicians have formal training in Western medicine, they may also prescribe traditional Indian healing therapies.

Private clinics charge user fees. Less than 10 percent of Indians have health insurance or receive reimbursement for medical expenses from

employers, and most finance care out of current income, savings, or debt. Consequently, upper-income patients tend to seek care at private facilities, while the reverse is true for poorer patients. However, the degree of sorting by income is not as great as one would think; among hospitalized patients, 39 percent of patients in the lowest-income quintile were admitted to private facilities, while 33 percent of patients in the highest-income quintile received care at public hospitals (Peters et al. 2002). One explanation is that poorer patients often pay discounted fees at private providers.

Despite a greater willingness among Indians to pay out-of-pocket for private care in recent years, the public sector continues to serve as the primary vehicle for supplying preventive health services, including 60 percent of prenatal visits and 90 percent of immunizations (Peters et al. 2002). Generally, vaccinations are administered at public health clinics, though in some cases aid agencies or the government conduct outreach efforts to immunize children in their communities. Vaccination and prenatal care are state service priorities, and even advocates for lessening the government's role in direct provision of medical care assume that public facilities will continue to play a role in the delivery of public health services (Berman 1997; Peters et al. 2002).

METHODS

Data

The data consist of individual and household level observations drawn from the 52d round of the National Sample Survey (NSS), a nationally representative socioeconomic survey of urban and rural households, which included a special module on health and health care utilization, conducted between July 1995 and June 1996. The NSS survey contains information on the respondent and other household members' use of curative and preventive care by type of facility (public or private), illnesses, consumption patterns, education, and demographics. The survey is widely used to characterize the use and costs of medical care in India. The rural and urban samples together include information on 120,942 households and the 629,888 individuals within them.

We draw two different samples for the analysis. The first is comprised of children ages 0 to 4 years who sought outpatient medical treatment for an ailment within a 15-day window prior to the survey date. (The survey does not report information on vaccination for children older than 4 years of age.) For households with more than one child meeting this criterion, we included only the oldest child.

The second sample is comprised of women who were pregnant within the 365 days prior to the survey and who sought outpatient medical treatment within a 15-day window prior to the survey date. We excluded women if the primary reason for seeking care was pregnancy (as opposed to an ailment, which may or may not have been related to the pregnancy). For the small number of households with more than one woman meeting this criterion, we randomly selected one of the women for inclusion in the sample.

Dependent Variables

The NSS asks respondents whether the children and pregnant women in their household have ever received certain types of preventive care, and, if so, whether the services were delivered at a public or private provider. (It is not possible to link preventive services to specific ambulatory visits.) For the child sample, we characterized use of preventive services by the receipt of four vaccinations: BCG (for immunization against tuberculosis), oral polio vaccine, DPT (for immunization against diphtheria, whooping cough, and tetanus), and measles vaccine. For the sample of pregnant women, we characterized use of preventive care by the receipt of tetanus vaccination, iron supplements, and prenatal physician care and also by whether or not the woman was registered for prenatal care with a provider. Typically, pregnant women will register at the hospital where they expect to deliver.

Provider Type

The main independent variable of interest measures the type of provider at which subjects sought curative care. We divide the samples into three groups: those who used public care, those who sought private care because of the proximity of private providers (or the inaccessibility of public providers), and those who sought private care out of concern for low quality or long waiting times in the public sector. We compare differences in the receipt of preventive care between the public and private for proximity groups and, separately, the public and private for quality groups.

The NSS does not record any information about the availability of public or private medical providers, and so we do not actually observe the distances between subjects' households and medical providers or the waiting lines in nearby public clinics. Responses regarding the reasons for seeking private care represent the perceptions of surveyed household members.

Control Variables

Control variables included the age of the subject, coded as a categorical variable (for children, <1, 1, 2, 3, and 4; for pregnant women, ≤ 20, 21–25, 26–30, 31–50), the number of days that the subject was confined to bed because of the ailment, the nature of the ailment (diarrhea; short fever; respiratory; other), the quartile of the household's per capita average monthly expenditure (measured in rupees) (35 Rs = US$1 in 1996), whether there is a latrine in the household, whether household residents were members of a scheduled tribe or caste, whether there was a smoker in the household, whether the household was urban or rural, and the Indian state of the household for the largest 16 states. Additional control variables for the child sample included the gender of the child, the education level of the mother (illiterate; literate with a middle school education or less; literate with more than a middle school education), the mother's age, and the father's occupation (self-employed in agriculture; self-employed, non-agricultural; employed for a regular wage; other). Additional control variables for the sample of pregnant women included the number of pregnancies, the woman's education level, the spouse's education level, and the spouse's occupation.

Analysis

The association between receipt of preventive care and provider type was measured by first estimating logistic regressions where provider type is the independent variable of interest and then using parameter estimates to compute predicted probabilities for the entire sample. Let *PC* be an indicator variable equal to 1 if a subject received preventive care and 0 otherwise. Consider the following model of the probability of receiving preventive care:

$$\begin{aligned}\Pr(PC = 1 | PRVD_i, PRVQ_i, X_i) \\ = \Lambda(\beta_1 + \beta_2 \times PRVD_i + \beta_3 \times PRVQ_i + \alpha X_i) \qquad (1)\end{aligned}$$

where $\Lambda(\cdot)$ is the logistic cumulative density function, $\beta_1 - \beta_3$ and α are parameters, $PRVD_i = 1$ if subject i used private care for proximity, $PRVQ_i = 1$ if subject i used private care for quality, and X_i is a vector of control variables. If a subject used public care, then $PRVQ_i = 0$ and $PRVD_i = 0$.

To summarize the impact of provider type and reason, we calculated predicted probabilities of the receipt of preventive care under three scenarios. The first is the predicted probability with the variables indicating provider

type set to indicate use of public care for every subject (regardless of their actual value):

$$\Pr(PC = 1|PRVQ = 0,\ PRVD = 0,\ X_i) = \Lambda(\hat{\beta}_1 + \hat{\beta}_2 \times 0 + \hat{\beta}_3 \times 0 + \hat{\alpha}X_i) \quad (2)$$

We compute this quantity for every subject and take the average, yielding the theoretical proportion of the sample that would have received preventive care if everyone had used public care for curative services:

$$\frac{1}{N}\sum_i \Pr(PC = 1|PRVQ = 0,\ PRVD = 0,\ X_i). \quad (3)$$

We compute analogous expressions to (1) and (2) for the case of $PRVQ = 1$ and $PRVD = 0$ and for $PRVQ = 0$ and $PRVD = 1$, yielding a total of three predicted probabilities for each subject. Computing predicted probabilities in this manner essentially isolates differences in the receipt of preventive care due to provider type, netting out the impact of the independent variables included in the initial logistic regression.

Standard errors for differences between public and private predicted probabilities were computed using the delta method. The significance of the differences between the predicted probabilities was assessed using a two-tailed *t*-test. All analyses were performed using *Stata* statistical software (Stata Corporation 2001).

RESULTS

The child sample contains 4,844 observations. Of these, 1,258 (26 percent) children used public care, 1,682 (35 percent) used private care for proximity, and 1,904 (39 percent) used private care for quality. The sample of pregnant women contains 889 observations. Of these, 259 (29 percent) used public care, 292 (33 percent) used private care for proximity, and 338 (38 percent) used private care for quality.

Table 1 displays the unadjusted proportions of the child and pregnant women samples receiving preventive care by provider type and reason. In general, rates of preventive care use are lower among children and pregnant women who sought private care for proximity. There is no consistent pattern to the differences in receipt of preventive care between the "public" and "private for quality" groups. Overall, these figures indicate that large proportions of the population do not receive recommended vaccinations and

Table 1: Source of Curative Care and Receipt of Preventive Care

		Source of Care for Ailment		
	Overall	*Public*	*Private for Proximity*	*Private for Quality*
Proportion of Children Age $\leq$ 4 Vaccinated				
BCG	0.789	0.807	0.748	0.814
Polio	0.765	0.762	0.747	0.784
DPT	0.737	0.753	0.707	0.752
Measles	0.494	0.533	0.448	0.508
N	4,844	1,258	1,682	1,904
Proportion of Pregnant Women Receiving Prenatal Care				
Tetanus vaccination	0.702	0.722	0.671	0.713
Iron supplement	0.556	0.614	0.524	0.538
Prenatal visit	0.485	0.533	0.459	0.470
Registered for care	0.595	0.664	0.527	0.601
N	889	259	292	338

prenatal services, even though they are available free of charge to most families from public providers and charities.

Sample means of independent variables are shown in Table 2. The first column shows means for the child sample, the second for the sample of pregnant women. Descriptors of variables for the sample of pregnant women are shown in brackets when they differ from those for the child sample. For example, 36 percent of children are less than 1 year of age, and 15 percent of pregnant women are less than 20 years of age.

The most common reason for seeking care was short fever in both samples, and the average number of days patients were confined to bed was 1.71 in the child sample and 1.85 in the sample of pregnant women. Education levels in both samples are fairly low. Forty-five percent (45 percent) of the children have illiterate mothers, and 52 percent of pregnant women are illiterate. Most households lack a latrine.

Means of the indicator variables for Indian state of residence are not shown. The samples are fairly evenly distributed across the 16 Indian states included as dummy variables. Persons residing in the other Indian states and Union Territories comprise the omitted group in the logistic regressions.

Predicted probabilities from the logistic models are displayed in Table 3. Coefficient estimates from the logistic models are in an appendix, available upon request from the authors. The interpretation of predicted probabilities, assuming that results are causal and free of bias due to omitted variables, is as follows. If all children in the sample used public care, the proportion receiving

Table 2: Summary of Independent Variables

Child [Pregnant Woman] Sample Characteristics	*Children Age ≤ 4*	*Pregnant Women*
Age		
<1 [≤ 20]	0.36	0.15
1 [21–25]	0.15	0.37
2 [26–30]	0.18	0.29
3 [31–50]	0.18	0.20
4	0.13	
Male	0.56	
Number of pregnancies		3.17
Days confined to bed	1.71	1.85
Diagnosis		
Diarrhea	0.13	0.07
Short fever	0.50	0.44
Respiratory	0.14	0.08
Other	0.23	0.41
Mother's age	26	
Mother's [Woman's] education		
Illiterate	0.45	0.52
Literate, ≤ Middle School	0.36	0.32
Literate, > Middle School	0.18	0.16
Spouse's education		
Illiterate		0.30
Literate, ≤ Middle School		0.47
Literate, > Middle School		0.22
Father's [Spouse's] employment		
Self-employed, agriculture	0.29	0.21
Self-employed, non-agriculture	0.22	0.14
Earns wage/salary	0.19	0.14
Other	0.30	0.51
Household per capita consumption (rupees)	39,485	38,403
No latrine	0.58	0.63
Scheduled tribe	0.08	0.09
Scheduled caste	0.21	0.21
Smoker in household	0.53	0.51
Urban	0.41	0.37

BCG vaccination would be 0.789, the value for expression (3) above. Conversely, if all children in the sample used private care for proximity, the proportion receiving BCG vaccination would be 0.787. The difference between them is -0.002 (in percentage points), the standard error of the difference is 0.014 (from the delta method), and a two-sided t-test fails to reject the null hypothesis that the difference equals zero.

Differences between provider types in the predicted probabilities for childhood vaccinations are mostly small in magnitude. Only the predicted probability for the receipt of a measles vaccination if all children used private care for proximity, 0.470, differs from the corresponding public probability, 0.511, at the 5 percent level.

In contrast to the actual proportions, the predicated probabilities for use of private care for proximity are the highest and the predicted probabilities for use of private care for quality are the lowest. However, differences between the predicted probabilities for private care and public care are not significantly different from zero.

The divergence between observed (in Table 1) and predicted (in Table 3) proportions receiving preventive care is mostly due to differences between states. Once state controls are introduced to logistic regressions, coefficients on provider type become small and insignificant. Other variables that predict receipt of preventive care in logistic regressions include education and consumption levels.

Access to public clinics differs between urban and rural areas. Though we have included a control for urban versus rural residence, the baseline models do not allow for variation in the impact of provider type on preventive care use between cities and the countryside. To examine the sensitivity of results to restricting the sample to either the rural or urban portions of the NSS,

Table 3: Predicted Probabilities of Receipt of Preventive Care

	Provider Type				
	Public	*Private for Proximity*		*Private for Quality*	
	Prob.	*Prob.*	*Difference*	*Prob.*	*Difference*
Children Age ≤ 4					
BCG	0.789	0.787	− 0.002 (0.014)	0.791	0.003 (0.014)
Polio	0.746	0.773	0.027 (0.016)	0.771	0.025 (0.016)
DPT	0.732	0.740	0.008 (0.016)	0.737	0.005 (0.016)
Measles	0.511	0.470	− 0.040* (0.017)	0.503	− 0.008 (0.017)
Pregnant Women					
Tetanus vaccination	0.703	0.714	0.010 (0.037)	0.689	− 0.014 (0.037)
Iron supplement	0.561	0.586	0.025 (0.038)	0.524	− 0.037 (0.038)
Prenatal visit	0.496	0.507	0.010 (0.037)	0.457	− 0.039 (0.038)
Registered for care	0.614	0.591	− 0.024 (0.036)	0.584	− 0.030 (0.036)

Standard errors are in parentheses.

*$p < 0.05$ for difference between public and private probabilities.

Table 4: Proportion Receiving Preventive Care at Private Provider

		Source of Care for Ailment		
	Overall	*Public*	*Private for Proximity*	*Private for Quality*
Vaccinated Children Age ≤ 4				
BCG	0.17	0.10	0.16	0.22
Polio	0.13	0.07	0.13	0.17
DPT	0.15	0.08	0.15	0.20
Registered for care	0.20	0.12	0.20	0.26
Pregnant Women Receiving Prenatal Care				
Tetanus vaccination	0.36	0.21	0.40	0.44
Iron supplement	0.32	0.20	0.33	0.42
Registered for care	0.32	0.19	0.34	0.40

we reestimated models separately for each group. Results were qualitatively similar, and so we have presented only results from the full model.

To better understand the implications of private care for receipt of preventive care, we calculated the proportion of children and women receiving preventive care at private providers by ailment source of care (obviously excluding those who did not receive preventive care). Results in Table 4 indicate, for example, that 10 percent of children who used public care for curative services received their BCG vaccination from private providers. By contrast, 16 percent of children who used private care for proximity for curative care received their BCG vaccination from private providers. The NSS did not report source of care for measles vaccination. Overall, children and pregnant women who used private care were almost twice as likely to receive preventive care from private sources, but the majority still obtained preventive care from public providers.

DISCUSSION

In most developing countries, public hospitals and clinics exist alongside an extensive but largely unregulated private system. One of the justifications for government provision of medical care is that the public system represents the best mechanism for delivering the vaccinations, prenatal care, and other public health measures necessary to improve health in areas where infectious diseases are prevalent and infant mortality rates high. Government provision may entail costs, however, in terms of inefficiency, inflexibility, and lack of responsiveness to consumer demand.

Restricting the scope of services offered by public providers and using the savings to increase access to private providers via insurance or other financing arrangements represents one policy for reconciling the need to maintain access to public health services with consumers' desire to use private providers (Berman 1997; Peters et al. 2002). A potential downside of this reform strategy, however, is that persons may be less likely to receive preventive care from public sources if they use private providers for curative services. Based on this concern, this study was designed to assess the hypothesis that rates of vaccination and prenatal care are lower among consumers who use private services for curative care. With the exception of measles vaccination, we do not find support for the hypothesis. Results suggest that Indian households are able to successfully navigate the coexisting public and private systems, and obtain services selectively from each. However, for the reasons listed below, our findings should be interpreted cautiously.

Due to small sample sizes, the analyses of the sample of pregnant women lack power to detect reasonable differences (for example, 5 percentage points) in the receipt of preventive care. Furthermore, the samples for this study were narrow subsamples of the households in the NSS data, specifically, those where a child or pregnant women used curative medical care. The results may not be generalizable to households where family members are less likely to use medical care. The dependent variables in this study indicate receipt of preventive care but not its quality. To the extent that preventive care delivered in the private sector is less effective due to inadequate facilities or lack of provider knowledge, the study may yield misleading findings. Along the same lines, data are self-reported, and though analyses in U.S. settings report reasonable kappa levels for self-reported vaccinations (MacDonald et al. 1999; Zimmerman et al. 2003), we are not aware of similar types of validation studies for developing countries.

Another limitation of this study is its use of an observational, cross-sectional study design. Our findings may be biased by failure to control adequately for household characteristics correlated with both choice of provider and receipt of preventive care. To examine the sensitivity of results to biased selection by provider type, we computed propensity score estimates of differences in the receipt of preventive care using the radius matching algorithm and the formulae for computing average treatment effects and the corresponding standard errors in Abadie et al. (unpublished, available at: http://emlab.berkeley.edu/users/imbens/statamatch_02oct17.pdf). In all cases, we failed to reject the null hypothesis of no differences by provider type in receipt of preventive care at the 5 percent level. Of course to the extent that estimates

are biased by unobserved characteristics, both logit and propensity score estimators will yield inaccurate results. Future studies could address this problem by combining individual and facility-level data to examine receipt of preventive care as a function of the availability of different provider types or use longitudinal study designs to take advantage of changes in the availability of different types of providers over time.

Moving forward, it is important that researchers monitor the impact of "vertical" reform strategies—where the public sector provides "basic" services and the private sector provides curative care—on public heath. Though we would not expect large changes in the receipt of preventive services based on these results alone, systemic changes to the health system may produce vastly different outcomes. In particular, reforms that severely curtail access to public facilities may decrease use of preventive care. Though initial studies on the use of incentives to increase provision of preventive care in the private sector have been encouraging (Palmer 2000), at the present time most Indians, even those who use the private system for curative care, rely on the public sector for preventive care.

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