



The tradeoff between centralized and decentralized health services: Evidence from rural areas in Mexico

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ABSTRACT

This study investigates the effectiveness of centralized and decentralized health care providers in rural Mexico. It compares provider performance since both centralized and decentralized providers co-exist in rural areas of the country. The data are drawn from the 2003 household survey of *Oportunidades*, a comprehensive study of rural families from seven states in Mexico. The analyses compare out-of-pocket health care expenditures and utilization of preventive care among rural households with access to either centralized or decentralized health care providers. This study benefits from differences in timing of health care decentralization and from a quasi-random distribution of providers. Results show that overall centralized providers perform better. Households served by this organization report less regressive out-of-pocket health care expenditures (32% lower), and observe higher utilization of preventive services (3.6% more). Decentralized providers that were devolved to state governments in the early 1980s observe a slightly better performance than providers that were decentralized in the mid-1990s. These findings are robust to decentralization timing, heterogeneity in per capita government health expenditures, state and health infrastructure effects, and other confounders.

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Introduction

Decentralization has been a popular policy in countries with national health care systems (Bossert Beauvais, 2002; Faguet, 2004; Khaleghian, 2004). As in many other fields, decentralization is portrayed as a policy to procure efficiency in the financing and delivery of health care. The flexibility of decentralized health services is generally perceived as superior to the rigidities of centralized organizations since local knowledge and resources can be more effectively used to address local needs. A branch of the literature, however, predicts that a centralized provision of public services could be preferred under certain circumstances. Centralization can be effective if rapid action is needed, when services are easy to standardize, if economies of scale can be exploited or when the homogenization of services across populations and regions is desirable (Bolton & Farrell, 1990; Weitzman, 1974). It is thus an open question whether providing different types of health services is better under decentralized or centralized schemes.

This paper compares performance between centralized and decentralized health care providers in rural Mexico. In the 1970s, a centralized organization became responsible for the provision of

these services. During the 1980s, the government undertook an ambitious decentralization program that devolved health services to half the Mexican states. A new administration interrupted the process in 1989, and a subsequent decentralization program that started in the mid-1990s opted for the co-existence of centralized and decentralized providers in regions that were not decentralized before. This paper takes advantage of this duality in 17 of 31 states of Mexico to evaluate the performance of centralized and decentralized clinics that serve rural households in seven states of Mexico. It also looks into the clinics that were decentralized in the early 1980s to compare them with those clinics devolved in the mid-90s.

The analyses initially screen the data to determine the comparability of the populations served by both, centralized and decentralized health care providers. Once it is shown that the two populations are comparable, a series of log-linear and marginal probit regression models are used to test for the effectiveness of health care providers. Utilization of preventive services and out-of-pocket health expenditures are the main outcome measures in this study. Time of decentralization, per capita government health care expenditures in rural areas, household characteristics, state and community infrastructure effects are considered in separate specifications to test for the results' robustness.

The advantage of the centralized health care provider in all outcome measures raise some interesting questions for research in

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health services. Moreover, it partly contradicts the current consensus on the virtues of decentralization in the developing world. While this paper primarily focuses on the identification of performance differentials between centralized and decentralized health care providers in rural Mexico, the study also discusses the likely causes of this differential. It finally highlights the most relevant policy implications and ideas for future research.

Literature review

The literature on health care decentralization studies its main characteristics and the possible consequences of different decentralization arrangements (Bossert, 1998; Bossert & Beauvais 2002; Jeppsson & Okuonzi, 2000; Mills, 1994; Smith, 1997). A series of case studies, mostly in developing countries, classify types of decentralization policies and often compare national or regional health systems before and after its devolution to lower levels of government (Gershberg & Jacobs, 1998; Gilson, Kilma, & Tanner, 1994). Comparative studies place health care decentralization within a broader set of liberalization policies (Gibson, 2004; Kaufman & Nelson, 2004; Montero & Samuels, 2004).

Overall, the discussion in health services research has ambivalent conclusions about the outcomes of health care decentralization. Some contributions argue that decentralization neither increase local government health finances, nor improve equity, quality or efficiency (Collins & Green, 1994; Kristiansen & Santoso; 2006, Tang & Bloom; 2000). In many cases it has the opposite effect since performance deteriorates due to financial constraints and supply failures. Some positive effects of decentralization are sometimes identified mainly in the areas where community participation become more active and in some regions that traditionally devote more resources to health care and want more local autonomy (Griffin, 1999).

The evidence from the empirical literature on health care decentralization is mixed. Khaleghian (2004) finds that decentralized child immunization programs performed better in low-income countries, while the opposite occurs in middle-income countries. Faguet (2004) finds strong positive effects of health care decentralization analyzing health care spending in Bolivia. Empirical evidence, however, is often difficult to be conclusive since centralized and decentralized organizations rarely operate during the same time period and the different types of populations they reach is often not comparable.

Another main weakness of the literature is its failure to isolate the effect of decentralization from the overall consequences of economic adjustment. Most recent decentralization programs occurred in periods of deep economic crisis (Birn, 1999; Homedes & Ugalde, 2005; Laurell, 2000). Most research in this area thus overestimates the negative consequences of decentralization policies and cannot disentangle the isolated effect of decentralization on provider performance.

The tradeoff between centralized and decentralized organizations

A more theoretical branch of the literature mostly developed by the public finances and comparative economics literatures have analyzed the costs and benefits of decentralization. Decentralization provides two main advantages, flexibility and the possibility of small-scale experimentation. Local authorities are assumed to be more responsive to local needs and tastes and are therefore more likely to provide public services of better quality more effectively (Besley & Coate, 2003). Central organizations face the costly process of information transmission from the periphery, poorly informed decision-making at the center, and institutional arrangements that may not fit local circumstances.

A few papers, however, propose a tradeoff between centralized and decentralized organizations. These contributions model cases where centralization is efficient, for example, when rapid action is needed; when a more equitable distribution of resources is desirable; to fund long-term projects; when coordination is better; or if duplication, delay or regional conflicts of interests are too inefficient (Bolton & Farrell, 1990; Qian & Roland, 2006; Weitzman, 1974).

One of the main concerns of decentralization in developing countries relates to the institutional weaknesses of local governments and the consequences of local health care financing (Bardhan, 2002). Several countries that have embraced decentralization lack basic institutions for an effective operation of public services. Rule of law, management capacity of local authorities, effective channels for political participation and a depoliticized relationship between the center and the periphery are often weak or missing. Some formal models predict that decentralization in this environment can lead to corruption and local “capture” by the dominant elites (Bardhan & Mookherjee, 2005). Moreover, the local financing of health care could contribute to the concentration of benefits in the most affluent regions of developing countries if the central government does not provide enough resources to the poorest regions (Prud’homme, 1995). Decentralization can thus contribute to individual and regional inequality, sponsor patronage among local politicians and can adversely affect quality and access to services (Banerjee, Deaton, & Duflo, 2004; Tamez & Eibenschultz, 2008).

Background

Mexican health care system

The Mexican health care system is broadly divided into three tiers. In the first tier, three social security institutes under the administration of the federal government provide health care to salaried employees and their dependents through directly administered clinics. The Mexican Social Security Institute (IMSS – *Instituto Mexicano del Seguro Social*) together with smaller social security institutes (for public workers and the military) cater to the employees of the formal sector and their dependents (50% of the Mexican population). No user fees or deductibles are charged for its services. Health services are financed through mandatory employer, employee and government contributions and they are mostly provided in urban areas (OECD, 2005).

In a second tier, the state ministries of health (MoH) are in charge of the safety net for the population that lacks access to the social security institutes. The MoH provide health services through government-owned clinics. In contrast with the health delivery systems of the social security institutes, these services are financed mostly through public funds and marginally by modest user fees for relatively affluent users. A new social health insurance program called *Seguro Popular* offers voluntary insurance coverage to families that are ineligible to enroll in social security (Frenk, Sepúlveda, Gómez-Dantés, Knaul, 2003; Frenk, 2006). This program waives user fees in clinics of the MoH, if enrollees pay a subsidized pre-payment.

In a third tier, the private sector offers health services with different degrees of quality and prices. Mexicans of all socioeconomic backgrounds in both rural and urban areas often use private services, either as an alternative to public care or to overcome the limitations of public clinics, such as drug supply or long waiting periods. Private health insurance coverage is restricted to only 3% of the population (OECD, 2005). Most private services are thus financed through highly inefficient and regressive out-of-pocket payments. Private health care spending in Mexico accounts for more than half of overall health expenditures since the early 2000s (Frenk et al., 2003).

Health care decentralization in Mexico

Since its creation in the mid-1940s, the public safety net for the population not covered by the social security institutes was under the supervision of the federal government. After the Debt Crisis of 1982, the federal government undertook an ambitious decentralization program in 14 of the 31 states of Mexico. State governments received several federal hospitals and clinics, although health care employees continued under the federal payroll and most resources remained under close central supervision. The decentralization process was subsequently interrupted for six years (1988–1994) since it was considered unsuccessful (González-Block, Leyva, Zapata, Loewe, & Alagón, 1989).

After the Currency Crisis of 1995, a new federal administration resumed health care decentralization nationwide. This policy comprised 17 states and the Federal District that were not decentralized before and concluded the decentralization process in the initial 14 states. The second decentralization was more ambitious since it endowed state MoH with the control and ownership of all clinics previously administered by the federal MoH. State MoH also received full budgetary autonomy (Moreno & Flamand, 2004). Decentralization, however, did not reduce disparities in the amount of public resources spent on health care. Policy reports have documented extensive differences in per capita government health expenditures across Mexican states (OECD, 2005).

Centralized and decentralized providers

Clinics and hospitals administered by the social security institutes were neither decentralized in the early-1980s nor in the mid-1990s. The federal government administers them from Mexico City as a vertically integrated organization. The Mexican Social Security Institute (IMSS) is currently the largest health care provider in Mexico. Although the IMSS is mostly in charge of providing health care to salaried employees, in 1979 this centralized agency was entitled to offer basic health coverage in the poorest rural areas of the country. Since employers and employees would not contribute to the financing of these services through mandatory wage contributions, the IMSS created a separate organization currently called IMSS-Oportunidades that is entirely funded by the federal government. In contrast with comprehensive health services provided by IMSS, IMSS-Oportunidades (centralized provider, subsequently) provides a limited bundle of cost-effective services comprising primary care, preventive services and basic hospitalization.

In the first decentralization period in 14 states, the federal government transferred the clinics of the centralized provider to the state MoH (decentralized provider, subsequently). In the second decentralization of the mid-1990s, the federal government reconsidered decentralizing and merging the centralized provider with the hospital networks of the state MoH in the remaining 17 states. Political opposition, however, prevented this merger to happen.

In the 17 states where centralized and decentralized health care providers currently co-exist, they do not compete with each other. Since 1982, the Mexican government has made a conscious effort to avoid health care provider duplicities. Public rural clinics in Mexico are placed far enough to avoid provider competition, although it does not preclude members of a few households from using federal and state providers in some areas where the two types of providers are relatively close to each other, for example, close to state borders. Federal guidelines require centralized and decentralized providers to abide to cost-effective criteria. Consequently, there is no substantial heterogeneity in the type of services offered by the two systems. To encourage utilization of public clinics, services are free of charge in the two systems in rural areas only.

Data and methods

Data

The sample size for the analyses includes 8889 households, of which 2025 (22%) receive health care from the centralized provider and 6864 (78%) receive health care from decentralized providers. Data were gathered in seven of the 32 states of Mexico. In two of the seven states, centralized providers are absent since they were merged with decentralized providers in the early-1980s. Centralized and decentralized providers co-exist in the remaining five states that were decentralized in the mid-1990s (Fig. 1).

The analyses employ the 2003 household survey of Oportunidades, the main anti-poverty program of Mexico (INSP, 2006). This household survey contains detailed information on individuals, families and community characteristics from poor rural villages in Mexico. Although this database has mainly been used to evaluate the effects of the program in rural households, the literature has taken advantage of its multiple social and economic measures to study other phenomena that characterize rural households in Mexico.

Per capita government expenditures by type of health care provider in rural areas is estimated using three different sources. The centralized organization provides comprehensive information that is publicly available. Data on population coverage and per capita expenditure for 2003 are used in the analyses (FUNSALUD, 2004). To estimate the corresponding figures for decentralized providers, information from the Mexican Statistical Agency is used first to estimate the overall rural population in the seven states in 2003 (INEGI, 2004). The rural population reached by the centralized provider is subtracted in the five states where this organization operates. With budget data from the Mexican government, overall public expenditures in rural areas are estimated for each of the seven states in the sample, excluding expenditures for centralized clinics (SICUENTAS, 2004). This figure is later used to estimate per capita government health expenditures for decentralized providers.

Research hypotheses, dependent and explanatory variables

This study tests for the effectiveness of centralized and decentralized providers in rural Mexico using two main outcome measures, overall health expenditures and utilization of preventive services. The redundant study first hypothesizes that the type of provider that observes lower out-of-pocket health care expenditures is more effective. Out-of-pocket health expenditures is a useful outcome measure since centralized and decentralized providers offer free health care and drugs in rural clinics to reduce out-of-pocket expenditures that are highly regressive. If users of centralized or decentralized clinics cannot solve their health needs at the public clinic or if drugs are not available, they will choose to pay out-of-pocket in the private sector.

A second study hypothesis is that the type of provider that observes higher utilization of preventive services is more effective. Preventive health care has higher payoffs than curative health care (Russel, 2007). Centralized and decentralized clinics provide basic preventive care and are interested in increasing its use to reduce the cost of treating preventable conditions in the future. Increased utilization of preventive services is therefore used as a second performance measure in this study.

The main explanatory variable in all regression specifications is a dichotomous term that determines whether a household has access to a decentralized or a centralized provider, with access to centralized clinics as the reference category. Few families reported attending to both centralized and decentralized health care providers. These households were excluded from the analyses. The



Fig. 1. Sampled states in Mexico.

number of families excluded from the sample totaled 87, which represent the 0.009% of the total sample.

The statistical analyses control for differences in per capita government health expenditures by type of health care provider, and healthcare expenditure and utilization covariates, which are classified in predisposing, enabling and need factors (Aday & Andersen, 1974; Andersen, 1995). Predisposing factors in the regression models include age and years of schooling of the household head, family size and dependency ratio. Enabling factors include health insurance status (IMSS, Seguro Popular), cost to reach health care providers, having a migrant member abroad, employment and socioeconomic status. Need factors are captured by the sick status of a household member, frequency of care, days of sickness, days of inactivity due to health status, physical condition and hospitalization status.

Since more than 85% of the households in the survey receive aid from the Mexican government, this study always controls for the reception of welfare benefits. The analyses also include variables at the community level that influence health care utilization and expenditures. These community infrastructure variables control for a series of health services available in particular villages, such as health care campaigns, physician practice, pregnancy care, child delivery services, vaccination, diarrhea treatment, family planning, basic hospitalization, among others (Table 1). State fixed effects account for unobserved state heterogeneity. Household is chosen as the unit of analysis since health expenditures are often pooled among family members. Likewise, the decision to receive health care is often the responsibility of adult members in the family.

Data analysis

The analyses start with the means comparison by type of health care provider. This bivariate analysis is helpful to determine the comparability of households reached by centralized and decentralized health care providers. If the two types of providers served

rural populations with different population characteristics, the simple comparison of means would be biased. If the population looks similar in most observable characteristics, theory predicts that unobservable population characteristics are likely to be balanced (Lee, 2005; Wooldridge, 2002). In these circumstances the proposed comparison would be valid.

A series of linear and non-linear regression-based models are used to test the proposed hypotheses. The regression models for out-of-pocket health expenditures use a Log-linear regression specification to address the natural skewness in the distribution of this variable. Households with zero health expenditures receive a positive constant equal to one. This procedure is often used for the analysis of health expenditures as a dependent variable (Manning, Newhouse, Duan, Keeler, & Leibowitz,). A log-linear regression model is chosen for this test since the previous literature finds it useful to interpret the magnitude of the coefficients (Manning, Newhouse, Duan, Keeler, & Leibowitz, 1987).

Models where preventive health care is used as a dependent variable follow a Probit specification. The estimated parameter corresponds to a dichotomous dependent variable where families report if at least one household member use preventive health care services. Probit is selected over Logit since coefficients are more accurately identified and converted using marginal Probit estimations (Altman, Cooper, & Cunningham, 1999; Gibbons & Wilcox-Gok, 1998). The coefficients in this set of regression models refer to the likelihood of attending preventive health care. Standard errors are clustered at the community level in all means comparisons and regression models to address unobserved community differences.

The historical events that lead to the duality of providers in Mexico also offer the opportunity to compare the outcomes of state providers that were decentralized in the early 1980s, in contrast to those that were decentralized in the mid-1990s. Decentralization timing is included in the analyses through an interaction term. The interaction term in the Log-linear model is relatively

Table 1
Summary statistics.

	Mean	Linearized SE	Conf. Interval (95%)	
State distribution				
Guerrero	0.0824806	0.0158736	0.0513113	0.1136498
Hidalgo	0.1593182	0.0168972	0.126139	0.1924973
Michoacán	0.1257529	0.0151415	0.0960211	0.1554847
Puebla	0.1411613	0.0164832	0.1087951	0.1735276
Querétaro	0.0594994	0.0154145	0.0292316	0.0897673
Sinaloa	0.1807789	0.0172277	0.1469507	0.2146071
Veracruz	0.2510087	0.0198713	0.2119896	0.2900278
Socioeconomic and demographic characteristics				
Out-of-pocket health Ex.	119.1293	3.790055	111.6872	126.5715
Preventive care	0.550845	0.0096136	0.5319678	0.5697222
Per capita gov health Ex	310.4287	3.407264	303.7377	317.1197
Age of HH head	48.63753	0.2262174	48.19333	49.08173
Years of school HHh	3.17154	0.0511455	3.071111	3.271969
Family size	6.125636	0.0437601	6.039709	6.211563
Dependency ratio	2.864595	0.0290735	2.807507	2.921684
Sex comp (Male = 1)	0.4965717	0.0012169	0.4941823	0.4989612
Works	0.363631	0.0029798	0.3577799	0.3694822
Migrant in HH	0.3353897	0.0060386	0.3235323	0.3472472
Income	2653.413	64.64456	2526.478	2780.349
Expenditure	2187.22	46.28299	2096.339	2278.101
Food Ex.	1384.916	36.8615	1312.535	1457.297
School Ex.	78.24239	2.385558	73.55813	82.92665
Transp. Ex.	138.7127	4.515406	129.8462	147.5791
Tobacco Ex.	6.052556	0.4434181	5.181863	6.923248
Sick HH member	0.4204432	0.0075028	0.4057108	0.4351757
Frequency of care	0.9878419	0.0208357	0.9469291	1.028755
Hospitalization	0.2517397	0.0059486	0.240059	0.2634204
Health insurance (IMSS)	0.0312262	0.0021873	0.0269312	0.0355213
Seguro popular	0.0146483	0.0019091	0.0108995	0.018397
Cost to reach provider	23.76405	0.8550308	22.08512	25.44298
Death member	0.0837378	0.0020026	0.0798054	0.0876702
Health infrastructure at the community level				
Health campaign	0.6682065	0.0238828	0.6213104	0.7151026
Freq health campaign	3.941663	0.1177739	3.710403	4.172923
Physician practice	0.2787849	0.0255351	0.2286443	0.3289254
Pregnancy care	0.3148646	0.0246894	0.2663847	0.3633446
Child delivery services	0.2157476	0.0224948	0.1715769	0.2599183
Child preventive care	0.3469388	0.0254252	0.297014	0.3968635
Vaccination	0.448658	0.0253478	0.3988852	0.4984308
Diarrhea treatment	0.4295363	0.0253494	0.3797604	0.4793121
Family planning	0.4297702	0.0252475	0.3801945	0.4793459
Basic hospitalization	0.1044676	0.0160535	0.072945	0.1359902
Injection application	0.7041401	0.0216343	0.6616593	0.746621
Distance				
Physician practice	6.915938	0.4676597	5.997645	7.834231
Pregnancy care	7.031978	0.5888145	5.875786	8.18817
Child del. Services	10.28179	0.7852	8.739975	11.8236
Child preventive care	6.204905	0.504266	5.214732	7.195078
Vaccination	4.909477	0.4197664	4.085227	5.733727
Diarrhea treatment	5.106334	0.4256912	4.27045	5.942218
Family planning	5.296295	0.4796209	4.354515	6.238075
Basic hospitalization	15.69811	0.8599542	14.00951	17.38671

*Statistically significant $\geq 5\%$. Sources: *Oportunidades* (2003), *Sicuentas* (2004), *INEGI* (2004) and *Funsalud* (2004). Notes: Clustered standard errors at the community level. At the time of the survey, the exchange rate was approximately 10 Mexican Pesos for one USD.

straightforward. For the interaction term in the Probit regression, the standard errors are adjusted accordingly (Norton, 2004).

The regression results first report raw differences in the main outcome variables including the predisposing, enabling, and need determinants of healthcare expenditures and utilization described before. Separate specifications include state fixed effects, health infrastructure controls, per capita government health expenditures and the interaction term for decentralization timing, respectively. These alternative specifications test for the robustness of the initial results and are useful to take into account heterogeneous per capita government health care expenditures. State fixed effects are useful to take into consideration within-state differences. Health infrastructure controls address observable differences at the community level.

Results

Table 1 shows the main socioeconomic, demographic and health characteristics of the population reached by the two types of providers. Rural families in the sample have on average low education levels (3 years of schooling for household heads), large families (6 members per household), and a relatively high dependency ratio (2.87). Average household out-of-pocket health care expenditures (119 MXP) represent approximately 5% of total household expenditures (2187 MXP), while the average per capita government health expenditure (310 MXP) is equivalent to 14% of total household expenditures. At the time of the survey the exchange rate was approximately 10 Mexican Pesos (MXP) for one

USD. In addition, more than half of all households (55%) in the sample report some use of preventive health care in the previous year.

Table 2 shows that households reached by decentralized providers report higher out-of-pocket health expenditures and

lower utilization of preventive services. Families that receive care from decentralized providers spend almost 40% more out-of-pocket (163 MXP vs 115 MXP). Preventive care utilization is 7% lower (65% vs. 72%) compared to households from communities reached by the centralized provider. Most variables in Table 2, by

Table 2
Population characteristics by health care provider.

	Centralized	Decentralized	Coefficient	S.E.	t-value
Out-of-pocket health Ex.	115.1635	163.0648	-47.90123	8.737856	-5.48*
Preventive care	0.7249383	0.6519522	0.0729861	0.0174714	4.18*
Socio-economic status					
SES (HH index)	0.5926608	0.5918274	0.0008334	0.0071175	0.12
Welfare receipt	0.877037	0.8502331	0.0268039	0.025845	1.04
HH income	2623.294	2815.994	-192.6993	112.7497	-1.71
HH expenditure	2111.259	2293.661	-182.4028	122.7686	-1.49
Food Ex.	1315.315	1435.271	-119.9559	112.095	-1.07
School Ex.	81.72527	86.94624	-5.220974	4.3422	-1.20
Transp. Ex.	144.6446	147.5342	-2.889623	11.14702	-0.26
Tobacco Ex.	5.054305	5.818944	-0.7646392	0.998974	-0.77
Per capita government health expenditure					
Per capita gov health Ex by state	386.3664	288.4793	97.88712	5.866131	16.69*
Hidalgo	468	213	255		
Puebla	346	321	25		
Sinaloa	398	371	27		
Michoacán	309	370	-61		
Veracruz	378	273	105		
Querétaro		261			
Guerrero		207			
Household characteristics					
Age of HH head	48.60148	48.16394	0.4375342	0.5814968	0.75
Years of school HHH	5.271111	5.254079	0.0170319	0.1633127	0.10
Family size	6.324938	0.9467932	-0.1434475	0.1017373	-1.41
Dependency ratio	0.9205243	0.9548909	-0.0262689	0.0221514	-1.19
Sex comp (male = 1)	0.4942266	0.492894	0.0013326	0.0042761	0.31
Works	0.343716	0.3475332	-0.0038172	0.0064027	-0.60
Migrant member	0.3491358	0.347465	0.0016708	0.0146105	0.11
Death member	0.0874074	0.0846445	0.0027629	0.0073107	0.38
Health status & utilization					
Sick HH member	0.6301235	0.6437937	-0.0136702	0.0178836	0.76
Days of sickness	7.666173	7.913462	-0.2472887	0.4311392	0.57
Days of inactivity	3.114074	3.13039	-0.0163164	0.2569028	0.06
Physical condition	13.47302	13.12733	0.3456926	0.4339744	0.80
Has hypertension	0.1758025	0.1717366	0.0040659	0.0045421	0.90
Has diabetes	0.1066667	0.1131993	-0.0065326	0.0089296	-0.73
Frequency of care	2.415802	2.443777	-0.0279745	0.0635376	0.44
Hospital stay (>3 years)	0.3041975	0.3259033	-0.0217057	0.0156737	1.38
IMSS health insurance	0.0197531	0.0170455	0.0027076	0.0036395	0.74
Seguro popular	0.025679	0.0196678	0.0060112	0.0086819	0.69
Cost to reach provider	30.86616	42.91214	-12.04599	3.47633	3.47*
Community infrastructure					
Health campaign	0.6158025	0.6907051	-0.0749027	0.0376561	-1.99*
Freq of health campaign	4.168971	3.931855	0.2371166	0.1765755	1.34
Physician practice	0.3254321	0.3186189	0.0068132	0.0435374	0.16
Pregnancy care	0.374321	0.3457168	0.0286042	0.0419978	0.68
Child delivery services	0.2676543	0.2325175	0.0351368	0.0407521	0.86
Vaccination	0.4434568	0.4865967	-0.0431399	0.0399066	-1.08
Diarrhea treatment	0.457284	0.4745047	-0.0172207	0.0402812	-0.43
Family planning	0.4479012	0.4578963	-0.009995	0.0405882	-0.25
Basic hospitalization	0.1945679	0.1047494	0.0898185	0.0365779	2.46*
Injection application	0.7101235	0.7236305	-0.0135071	0.0340014	-0.40
Distance					
Physician practice	5.840241	6.023533	-0.1832921	0.5450836	-0.34
Pregnancy care	5.246987	6.532712	-1.285725	0.7256262	-1.77
Child delivery services	9.081131	9.650197	-0.5690657	0.9634589	-0.59
Vaccination	3.971065	4.242481	-0.2714161	0.4449379	-0.61
Diarrhea treatment	4.20091	4.381782	-0.1808722	0.4540533	-0.40
Family planning	4.177814	4.608215	-0.430401	0.5025226	-0.86
Basic hospitalization	14.06825	15.86664	-1.798389	1.297827	-1.39
N	2025	6864			

Notes: Clustered standard errors at the community level.

*Statistically significant $\geq 5\%$. Sources: Oportunidades (2003), Sicuentas (2004), INEGI (2004) and Funsalud (2004).

contrast, show no differences in means for predisposing (i.e. age, years of schooling, family size and dependency ratio), enabling (i.e. health insurance status, migration status, employment and socioeconomic status), need (i.e. the sick status from a household member, frequency of care, days of sickness, days of inactivity due to health status, physical condition and hospitalization status) factors and most community infrastructure measures.

The population differs only in six measures: Out-of-pocket health expenditures, utilization of preventive services, per capita government health expenditures, cost to reach providers, access to health campaigns and availability of basic hospitalization services. These are all measures related to health care financing, organization and provision and thus independent of population characteristics. These results suggest that families reached by centralized and decentralized providers are identical for statistical purposes, which validates the identification strategy since it simulates the conditions of randomization (i.e. mean independence condition) for methodological purposes (Lee, 2005; Wooldridge, 2002). In other words, even if centralized and decentralized clinics in rural Mexico were not randomly allocated ex-ante, their placement looks random ex-post.

The results from the regression models confirm what was initially suggested in the differences in means comparison (Tables 3 and 4). The first two specifications in Table 3 show a strong difference on private health expenditures between centralized and decentralized health systems. A robust difference between centralized and decentralized providers remains in the last two specification tests once the model accounts for differences in government expenditures, decentralization timing, community infrastructure variables, state fixed effects and other confounders. The coefficients are positive and strongly statistically significant.

When differences in per capita government health expenditures are included in the specification model, the gap between the two systems drops by 8%, from 40% in Model 2 to 32% in Models 3 and 4 (Table 3). In the case of decentralization timing, the results in Model 4 show that those households from states that experienced decentralization in the early 1980s report marginally lower yet statistically significant out-of-pocket health expenditures compared to households reached by decentralized providers in states that were decentralized in the mid-1990s. According to Model 4 of Table 3, households of lower socioeconomic status, that receive welfare, that use health care more often, that report hospitalization in the previous three years and that reported higher costs to reach health services are more likely to experience higher out-of-pocket health expenditures.

The second part of the regression analyses compares differences in rates of preventive health care utilization. Table 4 confirms once again the better performance of the centralized provider since households with access to its clinics are more likely to attend preventive care (5.3% in Model 2). When differences in per capita government health expenditures are included in the model, differences drop to approximately 3.6% in Model 3 and 4 (Table 4). The interaction term for time of decentralization was also statistically significant, suggesting that those clinics that were decentralized in the early 1980s are more likely to provide preventive services compared to clinics that were decentralized in the mid-1990s. According to Model 4 of Table 4, households that receive welfare, with older household heads, with a sick household member, that use health care more often, with IMSS and *Seguro Popular* health insurance, that report hospitalization in the previous three years, that report higher costs to reach health care providers and with household members with hypertension and diabetes are more likely to utilize preventive health care services.

Table 3
Log health expenditures by health care provider.

	(1)	(2)	(3)	(4)
Decentralized provider	37.988 (0.065)**	39.934 (0.069)**	31.917 (0.079)**	31.917 (0.079)**
Early decentralization	17.234 -0.105	17.821 -0.141	8.329 -0.156	-69.699 (0.152)**
Decentralized provider*				258.228
Early decentralization				(0.156)**
Log per cap gov health Ex.			-20.388 -0.187	-20.228 -0.188
SES (HH Index)	821.654 (0.204)**	604.276 (0.201)**	624.274 (0.202)**	624.999 (0.202)**
Welfare receipt	-33.701 (0.104)**	-35.789 (0.101)**	-35.982 (0.101)**	-35.982 (0.101)**
Age H head	-0.200 -0.001	-0.200 -0.001	-0.200 -0.001	-0.200 -0.001
Education H head	-0.896 -0.009	-0.797 -0.009	-0.896 -0.009	-0.896 -0.009
Indigenous	-12.803 -0.071	-9.877 -0.075	-10.237 -0.075	-10.147 -0.075
Family size	1.715 -0.009	2.122 (0.010)*	2.224 (0.010)*	2.224 (0.010)*
Sick member	41.765 (0.057)**	41.058 (0.055)**	40.917 (0.055)**	40.917 (0.055)**
Frequency of care	11.405 (0.014)**	10.738 (0.013)**	10.628 (0.013)**	10.628 (0.013)**
Days sick	1.715 (0.002)**	1.613 (0.002)**	1.613 (0.002)**	1.613 (0.002)**
IMSS health insurance	-38.430 (0.232)*	-35.338 -0.225	-35.853 -0.227	-35.853 -0.227
<i>Seguro Popular</i>	-18.617 -0.159	-7.965 -0.15	-8.149 -0.149	-8.149 -0.149
Hospital stay (Last 3 years)	34.313 (0.046)**	30.996 (0.045)**	30.604 (0.045)**	30.604 (0.045)**
Preventive care	-13.238 (0.049)**	-13.757 (0.047)**	-13.757 (0.047)**	-13.757 (0.047)**
Log Cost to reach the clinic	80.941 (0.020)**	82.942 (0.020)**	82.759 (0.020)**	82.759 (0.020)**
Constant	-12.977 -0.19	-25.323 -0.241	195.944 -1.179	191.830 -1.18
State fixed effects	NO	YES	YES	YES
Community infrastructure	NO	YES	YES	YES
Observations	8889	8889	8889	8848
R square	0.31	0.32	0.32	0.32

Notes: Clustered standard errors at the community level.

*Significant 5%; **Significant 1%. All coefficients were converted using the formula $100\{\exp(\beta)-1\}$ to estimate geometric means that allow for the direct interpretation of coefficients. Sources: Oportunidades (2003), Sicuentas (2004), INEGI (2004) and Funsalud (2004).

Discussion

The centralized provider consistently observes better performance in the two outcome measures used for this study even after confounders of health care expenditures and utilization are included in the analyses. A second relevant finding is that decentralization timing accounts for some differences in the outcome variables, which suggests an improved performance of decentralized providers over time. Nevertheless, an important gap that the Mexican government should address remains between centralized and decentralized providers. The rural population that has access to decentralized providers is in clear disadvantage compared to those families that are reached by centralized providers.

The high heterogeneity of per capita government health expenditures across states show that centralized clinics benefit on average from more public resources that can translate into better performance. A strong difference in the outcome variables, however, remains after disparities in government expenditure are taken into consideration. A possible explanation for the relative success of the centralized provider, in addition to having more resources, may be

Table 4
Marginal probit: preventive care utilization by health care provider.

	(1)	(2)	(3)	(4)
Decentralized provider	-0.065 (0.017)**	-0.053 (0.016)**	-0.036 (0.023)*	-0.036 (0.02)*
Early decentralization	-0.024 -0.029	-0.054 -0.036	-0.022 -0.038	-0.94 (0.003)**
Decentralized provider*				0.73
Early decentralization				(0.008)**
Log per cap gov health Ex.			0.092 -0.05	0.094 -0.05
SES (HH Index)	0.068 -0.053	0.067 -0.051	0.055 -0.05	0.056 -0.051
Welfare receipt	0.211 (0.025)**	0.221 (0.025)**	0.218 (0.025)**	0.218 (0.025)**
Age H head	0.002 (0.000)**	0.002 (0.000)**	0.002 (0.000)**	0.002 (0.000)**
Education H head	-0.001 -0.002	-0.001 -0.002	-0.002 -0.002	-0.002 -0.002
Indigenous	-0.004 -0.018	-0.003 -0.018	-0.001 -0.017	-0.001 -0.017
Family size	0.002 -0.003	0.003 -0.003	0.003 -0.003	0.003 -0.003
Sick member	0.033 (0.013)*	0.029 (0.013)*	0.027 (0.012)*	0.027 (0.012)*
Frequency of care	0.024 (0.003)**	0.024 (0.003)**	0.024 (0.003)**	0.024 (0.003)**
IMSS Health Insurance	-0.111 (0.039)**	-0.093 (0.039)*	-0.096 (0.039)*	-0.096 (0.039)*
Seguro Popular	0.195 (0.031)**	0.203 (0.029)**	0.204 (0.029)**	0.204 (0.029)**
Hospital stay (last 3 years)	0.031 (0.011)**	0.029 (0.011)**	0.028 (0.011)*	0.028 (0.011)*
Has diabetes	0.122 (0.015)**	0.124 (0.015)**	0.125 (0.015)**	0.125 (0.015)**
Has hypertension	0.22 (0.037)**	0.223 (0.037)**	0.227 (0.037)**	0.227 (0.037)**
Log cost to reach the clinic	-0.007 -0.005	-0.01 (0.004)*	-0.009 (0.004)*	-0.009 (0.004)*
State effects	NO	YES	YES	YES
Community infrastructure	NO	YES	YES	YES
Observations	8889	8889	8848	8848

Notes: Clustered standard errors at the community level *Significant 5%; **Significant 1%. Sources: Oportunidades (2003), Sicentas (2004), INEGI (2004) and Funsalud (2004).

related to the costs and benefits of decentralization. The economic loss from duplicated activities among decentralized organizations (e.g. budgeting, purchasing, coordination of health services) could be larger than the benefit from more flexibility and possibilities of local experimentation. Likewise, the main advantage of the centralized provider in terms of economies of scale and coordination may offset the costs of a vertical administration of health services, which is less sensitive to local heterogeneity.

The relative advantage of the centralized provider can be summarized in four points:

Type of product: The provision of a handful of cost-effective interventions to the rural population does not require a high degree of specialization. The possible earnings from flexibility and local experimentation from decentralized organizations may not be as significant compared to the savings from a homogenous provision in all rural areas. In other words, as the administered product is relatively simple and easy to standardize, it may be less sensitive to local taste and variation, and in this case a centralized provider is more efficient.

Quality of care: On average the centralized provider has more public resources that may be used to administer better services and to offer additional incentives and monitoring services to improve quality of care. The centralized provider, for example, offers more generous pensions and benefits to their employees

compared to the average decentralized provider (OECD, 2005). Health personal can be more motivated and it can translate into better health care. Central administrators could also implement more widespread quality of care systems that benefit from economies of scale.

Experience: Another possible explanation relates to the expertise of the centralized provider in this area. In almost thirty years, it established a functional vertically integrated organization. Even if decentralized providers have implemented a similar provision model, its replication may be facing circumstances that the centralized provider solved long time ago.

Local capacity: If the centralized provider has more expertise, more resources and benefits from economies of scale, the main advantage of state providers is its local knowledge. Even if local authorities are closer to their communities and are more familiar with their characteristics and limitations, they need managerial skills to provide health services that require some level of expertise. If these skills are less developed among decentralized providers, they will not be able to perform better than centralized providers.

Study limitations

Some limitations of the analyses need to be acknowledged. The first is the use of state per capita government health expenditures rather than clinic-level expenditures. While the use of state-level per capita government expenditures in rural areas is a useful measure to account for overall differences in funding, a more comprehensive evaluation of the causes of this difference (e.g. human resources, waiting times, drug supply) could only be analyzed with clinic-level data. This comparison, however, is challenging due to the availability of information. Further micro-level research will require the collection of primary sources of information, mainly in areas served by decentralized providers.

A second limitation is the interpretation of differences in out-of-pocket health expenditures. The present study pools all health expenditures since the raw measure of out-of-pocket health expenditures is a useful proxy for overall performance. The analysis of the final recipient of these resources is the subject of a new research project.

The cross-sectional nature of the analyses also limits the possibility of observing changes in performance over time within the same communities. The two decentralization periods in Mexico, however, are useful to analyze the effect of decentralization timing. While rural households in Mexico and other developing countries share socioeconomic and demographic characteristics, it should be acknowledged that the study findings are representative of the rural population from seven states in Mexico (See Fig. 1).

Policy implications

The Mexican government should address the heterogeneous distribution of per capita government health expenditure to tackle the causes of differences in performance between centralized and decentralized health care providers. A more homogeneous health care provision is desirable since it can affect the effectiveness of different public programs targeted to the rural population of Mexico. For example, if two very similar families receive cash grants from the Mexican government and they require health care, the family with access to a decentralized clinic will be in disadvantage as a higher share of its cash grants may be used to pay out-of-pocket for health services.

The single advantage enjoyed by the population reached by decentralized clinics is access to health campaigns (Table 2). Health

campaigns are useful to provide basic interventions (e.g. vaccination, testing) and health education. State governments may respond to higher costs of reaching the public clinics by offering more mobile health services compared to centralized providers. Effective health care campaigns, however, could also be supported by a stronger network of clinics where follow up treatments should be available to the population reached by health campaigns.

The population reached by the centralized provider, in contrast, benefits from lower costs to reach the clinic and more availability of basic hospitalization services. Policymakers can focus their efforts on these two areas that may help reduce out-of-pocket health care expenditures and increase utilization of preventive health care. The expansion of *Seguro Popular*, a new social health insurance program that offers more hospitalization services to households that receive care from decentralized providers could be a positive step toward improving service delivery among these providers (Frenk et al., 2003; Frenk, 2006). The expansion of this program, however, should address its main shortcomings to avoid further fragmentation and inequities in the Mexican healthcare system (Laurell, 2000).

The previous literature finds that decentralization has been more effective in lower-income developing countries (Faguet, 2004; Khaleghian, 2004). In the cases of higher-income developing countries the evidence is mixed, and often times finds that decentralization has been less effective because state governments not always match the public resources that are taken away by the federal government (Banerjee et al., 2004; Kristiansen & Santoso, 2006; Prud'homme, 1995). This study provides empirical evidence about how a centralized provision of basic health care in rural areas of Mexico is still more effective, even after accounting for funding disparities. The Mexican experience can be useful to other developing countries in Latin America (e.g. Chile or Brazil) and other areas of the developing world (e.g. China, Iran, Turkey) where relatively professional centralized governments have considered decentralization as a policy mechanism to reform their national health systems.

Conclusions

Previous studies that analyze health care decentralization in developing countries often encounter challenges to isolate the effect of decentralization, since centralized and decentralized organizations rarely operate within the same country, during the same time period or cater to comparable populations. The present study overcomes these limitations to analyze the effectiveness of centralized and decentralized health care providers in rural areas of the developing world. It is hypothesized that the type of provider that observes lower out-of-pocket health expenditures and higher utilization of preventive services is more effective. The analyses show that families from rural Mexico who receive benefits from centralized clinics pay less out-of-pocket for health care, and use preventive care more often than those who access decentralized clinics. A second relevant finding is that decentralization timing explains some differences in the outcome variables, which suggests an improved performance of decentralized providers over time.

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