An empirical evaluation of devolving administrative control to Costa Rican hospital and clinic directors

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ABSTRACT

In the early 2000s Costa Rica implemented comprehensive reforms to its health care system including devolving administrative power from the central government to some providers that remain part of the national system. In this paper, we evaluate how this aspect of the reform affected clinic efficiency and population health by analyzing administrative data on regional providers and mortality rates in local areas. We compare changes in outcomes across time between areas that signed performance contracts with the central government and received limited budgetary control to those that continued to be managed directly by the central government. We believe the reform created opportunities for providers to become more efficient and effective. Our results suggest that the reform significantly decreased costs without adversely affecting quality of care or population health.

Running head: Devolving administrative control: Costa Rica

TEXT

1. Introduction

Costa Rica has historically been a leader in health care, both in Latin America and the world. Despite its relatively low level of development, Costa Rica has improved health outcomes relative to income and has sustained this improvement since the 1970s (1,2). This success and the urgency of rising health care costs around the world have inspired study of the country's health care system by researchers seeking new ways to sustainably improve population health. We build on this literature by analyzing Costa Rica and its recent health care system reforms with the goal of providing valuable new information about health care system design.

Reforms in Costa Rica starting in the late 1990s included the devolution of power from the central government to other actors, with the goal of controlling costs and improving population health. Many developed and developing countries are now experimenting with decentralization in the provision of health services, but as Smith notes, the word "decentralization" has different meanings in different contexts and it is important to understand what models of decentralization are and are not effective (3).

In theory, decentralization can improve efficiency and health outcomes where there is information asymmetry. In a centralized system, a central institution makes all administrative decisions, including resource allocation, for

hospitals and clinics. If local actors know what will be effective in their particular area and the central government does not, then devolving power to these local actors allows them to act on this knowledge, producing more efficient management and/or better health outcomes. If this information asymmetry exists in places with lower efficiency or worse health, devolution of power can also improve equity. On the other hand, when the national authority has greater knowledge or skills, giving more administrative control to local actors could result in worse outcomes.

The Costa Rican deconcentration reform, implemented in the early 2000s, devolved power to the directors of hospitals and clinics, which remain part of a national system, rather than to local governments or provincial legislative assemblies (the latter of which do not exist in Costa Rica).The Costa Rican system is especially important for study since the debate concerning the appropriate level of decentralizing health policy remains unresolved. The Costa Rican system differs substantially from the federalism practiced in the United States and elsewhere in the world, which splits power between national and state governments. If the Costa Rican reform is effective, then it may prove a useful model for other initiatives to improve health.

This paper empirically estimates the effects of the Costa Rican deconcentration reform on clinical efficiency and health outcomes. Employing government administrative data on 103 local areas in Costa Rica from 2000 to

2010, we use a community-level fixed effects empirical approach that estimates the differential changes in outcomes across time in areas that did and did not deconcentrate. This allows us to net out any initial differences that may have existed since the program was not randomly assigned.

Our results are promising for the reform. We believe it created opportunities for providers to become more efficient and effective, and we find a robust decrease in cost per consult of 13% to 15% in deconcentrated clinics relative to clinics that remained centralized. We also find that providers were able to reduce these costs without adversely affecting quality of care or population health.

Our paper is structured as follows: Section 2 describes the main features of the Costa Rican health care system, both before and after the reform. Section 3 reviews the research literature, identifying a lack of empirical study of the effects of deconcentration reform in Costa Rica and worldwide. This paper addresses that gap in the literature. Sections 4 and 5 describe our data and empirical approach. Section 6 presents our results, and Section 7 discusses our findings and their implications for public policy.

2. The Costa Rican Health Care System

Costa Rica is unique among its peers in Latin America: it has experienced remarkable economic growth since the middle of the twentieth century and has

been politically stable. Costa Rica is a relatively small country with a population of 4.7 million in 2011 (4). Though in 1950 its GDP per capita ($1,963) ranked below the Latin American average ($2,531), by the end of the twentieth century, Costa Rica had tripled its GDP per capita ($6,174), putting it just below the average of the eight largest countries—Argentina, Brazil, Chile, Colombia, Mexico, Peru, Uruguay, and Venezuela ($6,424). In comparison, the region as a whole barely doubled its GDP (5). Costa Rica is also considered one of the most politically stable democracies in the world: it has been continuously democratic since the ratification of its current constitution in 1949 and its first presidential election in 1953.

Costa Rica has excelled in improving life expectancy despite its limited resources. Costa Ricans' health expenditures per capita are one ninth of Americans' (6) and Costa Rica's GDP per capita is one-sixth that of the U.S. (7). However, Costa Rica maintained the second-highest life expectancy in the Americas in 2005 at 78.5, just behind Canada's 80.3 (8). Life expectancy in the United States has since overtaken Costa Rica's, but not by much: In 2010, Americans and Costa Ricans stood at 79.6 and 79.1 expected years of life at birth, respectively (9).

Costa Rica has also made remarkable strides in reducing child and infant morality. Since 1970, with less than one third of the Chilean economic growth rate, Costa Rica reduced infant mortality by levels similar to those in Chile and

the industrialized world (10). Caldwell attributes Costa Rica's dramatic success in reducing child mortality to the combination of empowerment of women, high levels of education, and improvements to an egalitarian health services system (1). Following up on Caldwell's work, Kuhn notes that Costa Rica has maintained low infant mortality rates and lowered adult mortality rates (2).

How Costa Rica has sustained its health successes remains an open question, but the system's design may provide at least a partial answer. Rosero-Bixby estimates that economic growth accounts for only one fifth of the reduction in child mortality, while three fourths are due to advances in public health services (11,12). Dow and Schmeer estimate that national health insurance alone can explain only a small fraction of the decrease in child mortality rates (13). These results suggest there is much to learn by studying the Costa Rican health care system's structure of service provision to better understand how it has achieved its past successes.

2.1. Structure

Costa Rica's health care delivery system has been historically centralized and controlled by the government, and the government has offered universal health insurance to its citizens since the 1970s. The Social Security Administration of Costa Rica (a.k.a. Caja Costarricense de Seguro Social or CCSS) became the sole provider of public hospital care in the 1970s, unifying the

health care system (10), while the Ministry of Health shares responsibility for public health. Reforms in the past two decades have moved the system toward a more local, decentralized approach, but the central government still provides most services. Though there is a private health care system, utilized primarily by the wealthy, citizens who use the free public system are required to go to the providers assigned to their geographic area.

The Costa Rican health services system has three branches (or "networks") divided by geography. Each branch covers a large contiguous area and has a hierarchical structure, with the *áreas de salud* serving as the first level of care. The government assigns each citizen to an *área de salud* based on their geographic location, and after visiting a clinic in their *área*, patients can be referred up to second-level clinics, peripheral hospitals and then regional hospitals, with a national hospital at the top of each branch. High-level specialized care (e.g., pediatrics, rehabilitation, and psychiatry) is provided by a group of six national hospitals that stand outside of these three networks.

2.2. Recent Reforms

Though Costa Rican health has improved tremendously over the past several decades, the country experienced a number of problems beginning in the 1980s and early 1990s. Inefficiency, rising costs, and long waiting lists became more commonplace during these years (14). In addition, many clinics provided

fairly limited services and little attention was paid to preventive care. Some evidence suggests that health outcomes stagnated during the early 1990s, with life expectancy at birth falling from 76.9 to 76.2 years between 1990 and 1995 (15). In response, Costa Rican officials designed reforms to achieve four specific goals: improve primary care; hold hospitals and clinics accountable; increase community involvement in health; and give more administrative independence to hospitals and clinics.

To address the need for better primary care, the government formulated health care teams known as EBAIS (*Equipos Básicos de Atención Integral de Salud*) and consolidated management of health care provision under the CCSS. The initial plan dictated that each team would integrate all of the medical functions provided in a geographic region for a small population. During the administration of President José Figueres (1994-1998), implementation of this primary care model was the main focus (14). Through 2008 the government had established 1,033 EBAIS, though the system must add 285 to 500 more units to reach its goal of each team servicing 3,000 to 3,500 people.

In addition to the EBAIS, the Figueres administration pursued *compromisos de gestión*, or performance contracts, intended to hold hospitals and clinics accountable for certain levels of health "production." These contracts set aside about 10% of clinic and hospital budgets as performance incentives based on measures of health care quality and resource utilization including intra-hospital

infections, mortality, re-admission rates, average length of waiting lists, average length of stay, and absence rates among health care personnel (16). The control ceded to hospitals and clinics by the contracts is fairly modest, as it does not give them any control over firing. When Figueres left office in May 1998, he had signed performance contracts with all of the hospitals in the system and with the clinics in the *áreas de salud*.

To increase public participation in the health care system, the government created *juntas de salud* for each hospital and large clinic. These committees consist of seven representatives: three elected by public insurees, two selected from employer organizations, and two from non-labor-union community organizations. The *juntas de salud* were originally charged with functions such as budget execution, performance contracts, and director selection, but their role has typically been to assist officials in campaigns to improve public health (17).

2.3. Deconcentration

In this paper we focus on the effects of deconcentration, a part of the reform whose implementation is unique to Costa Rica and that up until now has not been evaluated empirically. Deconcentration became a priority when President Miguel Ángel Rodríguez took office in 1998, and became law later that year. It allowed hospital and clinic directors to apply for independent legal status when they sign performance contracts and create functioning *juntas de salud*.

With the intention of improving efficiency, this legal status allows hospital and clinic directors to execute contracts with third parties, manage their own budgets, and hire, but their power is limited. They are not allowed to charge fees, purchase some products (e.g., medicine), or fire employees. Central authorities must approve major spending and organizational changes, while wages continue to be set during national union negotiations.

Deconcentration was also intended to promote cooperation among the leaders of hospitals and clinics. Under the previous model, hospital and clinic directors, typically physicians promoted from within the organization, frequently clashed with administrators, who controlled the budget and were appointed by CCSS authorities. Directors often sought to protect their institutions and viewed the administrators as "spies from headquarters" (14). Under the new model, directors of deconcentrated hospitals and clinics can choose their own administrators and work with them to achieve the goals established in performance contracts.

By allowing hospitals and clinic directors to manage their own resources and select their own management partners, deconcentration aims to improve efficiency and health outcomes. As discussed above, independence in budgeting could allow deconcentrated units to be more responsive to local needs. Unlike a politically decentralized approach where decisions are made by local governments, deconcentration has the benefit of devolving power to hospital and clinic directors,

who have historically been trained physicians and who may be more able to respond to population needs.

Deconcentration was implemented gradually and then stalled. The first ten hospitals and four *áreas de salud* officially deconcentrated in 2000, and the process continued in 2001 with another twenty units, but none have been deconcentrated since. This halt in deconcentration was less a deliberate choice than the result of a major corruption scandal in 2004 that destabilized the CCSS and led to the appointment of a new executive president who shifted the focus away from deconcentration (17). The central government continued to manage human resources and purchasing for those units that were not deconcentrated. In our empirical work, we attempt to determine the average causal effect of the reform as it was implemented on clinical efficiency and population measures of health outcomes in deconcentrated áreas de salud.

3. Literature Review

The literature evaluating recent reforms of the Costa Rican health care system from a quantitative or economic perspective is limited. Rosero-Bixby evaluates the effects of the earlier parts of these reforms (primarily the introduction of the EBAIS model) and finds significant reductions of mortality and improvements in equity (18). Arocena and García-Prado also used quantitative measures when evaluating the effect of performance contracts in

hospital settings during the years 1997-2001 (19). These findings focus on hospital performance based on metrics of service quality (number of discharges, outpatient procedures, and readmissions) rather than patient health and on efficiency, using cost as an input rather than an outcome.

This paper makes a unique contribution in its examination of the effects of deconcentration on clinic efficiency and population health. Though Arocena and García-Prado focused on hospital performance in their analysis of the Costa Rican reforms, they were primarily interested in the effects of management contracts (19). These management contracts were required for deconcentration, but only set goals for each provider in the Costa Rican health care system. They devolved very little actual power to hospitals or clinics.

3.1. Decentralization and Health Care

In theory, decentralization of public services benefits constituents by changing the structure of decision-making. According to this theory, decentralization gives people more control over decision-making processes so that policy expresses their preferences (20). Assuming these preferences are more responsive to local needs, decentralization can improve the provision of public resources, making the process more efficient and more equitable.

In empirical studies of health care systems, however, the theorized benefits of decentralization have often failed to materialize. This result may occur

if local decision-makers are less technically able to deliver services than the central government (21). A study in Mexico showed centralized health care providers perform better overall than decentralized providers (22). Moreover, studies of reform in other countries generally show decreases or no change in equity due to decentralization. One study of health sector reforms in Latin America and Africa argues that decentralization often reinforces existing inequalities and power relations (23). Other authors have found decentralization in Italy similarly worsened interregional inequalities (24).

The Costa Rican reform is innovative, however, in its emphasis on devolving administrative and spending power to the directors of health care-providing entities. Most empirical studies focus on spending by sub-national agencies or provinces, whereas in Costa Rica the government has devolved power to hospital and clinic directors within a national framework. Some authors theorize that lack of guidance and direction by a central authority causes decentralization to impact developing countries negatively (25), but decentralized Costa Rican clinics and hospitals remained part of the national network. It is therefore possible that Costa Rica's reforms contained sufficient centralization in resource planning and allocation to avoid this problem.

4. Data

Since the goal of the reform was to improve clinic management while maintaining population health, we evaluate deconcentration's success based on its effects on clinic operations and population health indicators. This data is drawn from the Sistema de Información Cantonal y por Áreas de Salud (SICA), which CCSS has been compiling annually since 2000 from statistics collected by a variety of different government agencies. It is the only dataset known to provide information at the level of áreas de salud (the lowest level of deconcentration and defined by non-overlapping geographic areas) and is therefore uniquely suited for use in evaluating changes at the population level. We combine this data with government documents, which list deconcentrated áreas and the position of each área in the greater Costa Rican health care network.[1]

We focus on one efficiency outcome from the SICA data set: the natural log of cost per consult (in *colones*). To understand how the reform may have affected patient treatment, we analyze two management outcomes: the number of consults per hour and medications dispatched per consult. We also analyze four health outcomes: general mortality (per 1,000 people), infant mortality (age <1 year deaths per 1,000 births), mortality rate due to heart attack (per 100,000 people), and mortality rate due to malignant tumors (per 100,000 people). All of these outcomes are available for all 11 years of the dataset, making them ideal for comparing effects before and after the implementation of reform. The dataset also provides several useful demographic variables at the área level including

dependency indices for children (under age 14) and for the elderly (over age 65) and birth rates (per 1,000 people). We also use three variables as measures of each área's average socioeconomic status: the natural log of electricity consumption (in kilowatt-hours per person), primary school and secondary school enrollment rates,[2] and the natural log of the proportion of residents covered by the *regimen no contributivo* (a form of welfare in Costa Rica). To measure economic development and occupational risk across areas, we also use measures of the proportion of workers in different industries. These proportions are calculated by dividing the number of insured workers in each industry category by the total number of insured workers. These industry categories are: agriculture, hunting, silviculture, fishing; mining; industrial manufacturing and processing; utilities; construction; wholesale trade and retail, restaurants, hotels; transportation, storage, communications; finance, insurance, real estate, business services; and communal, personal and social services. We use these descriptive variables to assess the differences between the áreas that did and did not deconcentrate.

Some áreas lacked observations for some dependent variables in certain years. Following usual practice, we excluded 18 (out of 103) áreas missing pre-program data from our study in order to use the same sample for all analyses. After excluding observations missing data in later years and obvious outliers, our final dataset consists of 910 observations from 85 áreas.[3]

5. Empirical Approach

Not all clinics chose to deconcentrate, and we must account for the fact that this choice was not random in our empirical analysis since those that deconcentrated likely differed from those that did not with regard to both observed and unobserved characteristics before the reform was implemented. We use área-level fixed effects to control for pre-program differences in outcome variables across áreas, flexible controls for time and potential confounding variables that vary across time. This fixed effects approach is common in econometric program evaluation studies (26), and nets out any unobserved time-invariant variables that might be correlated with deconcentration and also determine outcomes. The method's underlying assumption is that the additive change across time in the outcome would have been the same in all áreas if the program had not existed. That is, pre-program outcomes can differ in áreas that did or did not later receive the treatment since the program effect calculation relies on differential trends in outcomes. For example, if mortality rates drop more between 2000 and 2002 in the treatment áreas than the control áreas, we attribute this differential drop to the causal effect of the program.

The 18 observed áreas that deconcentrated did so in two waves. In late August 2000, the first four areas deconcentrated, and in December of 2001 the rest of the group followed. Our first set of regression models controls for time using a dummy for observations after 2000 and a linear time trend:

$$(1)\ y_{it} = \beta_0 + \beta_1\ \text{Deconcentrated}_i + \beta_2\ \text{After2000}_t + \beta_3\ t + \omega_i + \psi X_{it} + \varepsilon_{it}$$

y_{it} is the outcome of interest. The $\text{Deconcentrated}_{it}$ variable is equal to 1 in years 2001 and later for the áreas that deconcentrated in the first wave and equal to 1 in years 2002 and later for the áreas that deconcentrated in the second wave. It is equal to 0 otherwise. Our estimate of β_1, the coefficient on $\text{Deconcentrated}_{it}$, is our estimate of the program effect.

ω_i represents the área-level fixed effect—that is, the average levels of the outcome variable in each área before program implementation. X_{it} denotes the three time-varying control variables. The *regimen no contributivo* (RNC) control variable, the natural log of the proportion of residents covered by welfare, is missing for year 7. In order to check for the robustness of different forms of this control, we performed regressions without RNC in one set of models and with interpolated values for year 7 in another set. These two methods produced similar results and we only report regressions with interpolated values. The other two time-varying controls are área birth rate and secondary school enrollment rate. In addition, we allow the time trend to differ by geographic region.

Our second set of models controls for time using a complete set of dummy variables denoted by γ_t, but is otherwise identical to the first:

$$(1)\ y_{it} = \beta_0 + \beta_1\ \text{Deconcentrated}_i + gt + \omega_i + \gamma_t + \psi X_{it} + \varepsilon_{it}$$

5.1. Checking Assumptions

Our fixed effects approach is robust to arbitrary differences across áreas in population health or efficiency of the health care system prior to the treatment period, but it relies upon the assumption that the *changes* in outcomes across áreas would have been the same in the absence of the deconcentration program. If áreas that deconcentrated were on a different trajectory than those that stayed centralized, our estimates of the program effect will be biased. Because the SICA dataset does not include years before 2000, it is difficult to compare trends in the pre-treatment period, but we attempt to mitigate this problem through three analyses: (1) an examination of the observed differences in 2000 between those áreas that did and did not deconcentrate; (2) a comparison of pre-program trends (2000 to 2001) between the programs that remained centralized throughout the study period and those that deconcentrated after 2001; and (3) a qualitative GIS comparison of those areas that deconcentrated and those that remained centralized along both geographic and demographic factors.

We first perform t-tests on several área-level measures, comparing deconcentrated and centralized áreas. In Table 1, we see general, myocardial infarction, and tumor-specific mortality; the elderly dependency index; secondary school enrollment; and the proportion of workers in the electric, gas and water industries show a significant difference at the $p<.05$ level while most measures do

not. Our empirical approach allows for the possibility of pre-existing differences in these values, but it is comforting to know the treatment áreas are not massively different. In fact, most of the major socioeconomic measures do not differ significantly, suggesting neither group (treatment or control) represents uniformly poorer or richer regions, which could skew the hypothetical trends our method measures. Though the differences in some variables may cause some concern, none of them are suggestive of a difference in trend and many of the differences are likely driven by the higher elderly dependency index, which raised general and specific mortality rates.

As noted above, we are unable to analyze a long pre-treatment time series to assess similarity of pre-treatment trends, but we can look at differences between 2000 and 2001 for the control áreas and the 13 wave 2 treatment áreas. While it is not a very powerful test due to the small number of observations, Table 2 shows only one statistically significant difference in the changes across this time period: the proportion of workers in the electricity, gas and water industries. On the whole, these results suggest that trends in the outcomes between pre-reform deconcentrated and centralized areas did not differ much.

Figure 1 shows the locations of the different áreas in Costa Rica and demonstrates the geographic diversity of the deconcentrated áreas, which are spread throughout the country. This diversity is likely indicative of variability in socioeconomic, health and demographic trends. In addition, when we compare

this map to the map of the incidences of critical shortages among households shown in Figure 2 created by the Costa Rican government's Instituto Nacional de Estadística y Censos, we can see that deconcentrated áreas experienced varying levels of poverty as of 2001, the earliest applicable year census data was available.[4] Taken together, we see no evidence that the key identifying assumption underlying our empirical approach does not hold.

6. Results

Our estimates of the effects of the program on clinic efficiency and management are shown Table 3. All regressions contain área fixed effects and, per usual practice, standard errors have been corrected for clustering at the área level. The results show a consistent and significantly negative effect on cost per consult of between 13% and 15% relative to the áreas that did not deconcentrate. This result is robust to whether we control for time with a linear trend or a full set of year fixed effects.

A significant cost reduction such as the one we find could raise the concern that aggressive management practices affected patient treatment. We find no significant program effects on the number of consults per hour or medications prescribed per consultation. That is, there is no evidence that clinics changed how much time they were spending with patients or how they treated their patients.

Our estimates of the effects of deconcentration on population health are shown Table 4. We find no significant program effects with regard to general mortality, myocardial infarction mortality, or infant mortality. Mortality due to malignant tumors shows a significant decline when time is controlled for with a linear trend, but this result does not hold up when we include year fixed effects. Overall, we find no strong evidence of any changes (positive or negative) in population health due to the program.

7. Discussion and Policy Implications

Our analysis suggests that deconcentration reduced costs at the clinic level, an encouraging finding given the global trend of rising health care expenditures. More budgetary control likely incentivized administrators to become more efficient in their use of resources. Although the model is not currently seen as a useful tool for improving efficiency, our results challenge that belief (17). It is important to note that more study is needed before we can infer the program's effect on total costs. Because Costa Rican patients are referred up the chain of the public health care system, it is possible local costs were transferred to or even increased at higher-level facilities. Any cost savings, however, is significant and reflects a positive result at the *área* level.

Unfortunately we are not able to closely examine the mechanisms by which costs were reduced. Though our work establishes that local costs did

decrease, the question of how management practices changed as a result of the reform is left for future study. However, since most costs are a factor of price and volume and the reform did not give clinic directors sufficient power to make significant changes to labor costs, we hypothesize costs may have decreased because clinic directors optimized procurement by purchasing fewer unnecessary goods and/or negotiating better prices.

While reducing costs, the reform did not significantly affect health, and the two inputs in quality of care we are able to measure, physician-patient time and medications prescribed per consult, did not decrease. We consider this a positive finding as it suggests that the combination of performance incentives and budgetary control allowed clinics to maintain quality. At the same time, some may be disappointed that the reform did not significantly improve population health.

7.1. Limitations

There are a few limitations of our study. Because the SICA dataset aggregates individual outcomes at the level of *áreas de salud*, we can only infer from our analysis how the reform affects other parts of Costa Rican health care. It is also not entirely clear how individuals are affected by this reform. Moreover, this level of aggregation reduces our statistical power, attenuating our results. It is possible this has caused us to under-estimate important program effects.

Our empirical approach depends on observations of outcomes before and after program implementation and this restriction forces us to exclude information available for later years that were not collected in 2000. We were therefore unable to use some health variables such as death rates due to conditions including chronic respiratory disease, prostate cancer, and breast cancer.

It is also possible that costs in the areas that deconcentrated would have declined in the absence of the program. If the área directors who chose to deconcentrate implemented important cost-saving initiatives that were unrelated to their newfound power, we would inadvertently attribute them to the deconcentration reform.

Perhaps the most distressing limitation of the study is our inability to say anything about the effects of deconcentration on equity. As discussed above, decentralization has been shown to exacerbate inequality of care in some contexts and reduce it in others. In Costa Rica, it is likely that the program did not have uniform effects across áreas. On the one hand, it may be that the wealthier or more educated parts of the country were better able to use their additional control than the less well-off regions. On the other, there may have been more opportunities for cost control or care improvement in the initially poorer-performing regions. Because we have data on a relatively small number of deconcentrating áreas (only 18), we simply do not have the statistical power to estimate treatment effects separately based on their initial characteristics.

7.2. Conclusion

The empirical work presented here has obvious importance for Costa Rican policy makers as they decide whether it should continue to allow or even expand the independent decision-making of hospitals and clinics, but our results may have implications for other health systems. The deconcentration program in Costa Rica lacks perfect analogies in other decentralized systems, but if voluntary deconcentration under a national framework can make clinics and hospitals operate more efficiently without adversely affecting health, then other countries should consider implementing similar systems. In the U.S., it may be difficult to move from the current fragmented health care system to a national system organized around local decision-makers, but some states may be in a position to regulate their health systems and incorporate ideas from this reform.

We caution, however, that these findings may be unique to Costa Rica. Further study separating the effects of the EBAIS, performance contract, and deconcentration reforms even more precisely is important. It is possible that interactions between the different reforms described above were a major driver of these results, and in other contexts deconcentration alone may not have the effects we find here. In particular, we believe there are synergies between the incentives in the performance contracts and the ceding of some budgetary control to the local

providers. The former seem to be a way to prevent declines in quality of care while the latter encourages creativity and independence that can lower costs.

Though we hypothesize the most likely actions clinics took after the reform, this paper does not examine that question. Without understanding how the administrators of these clinics innovated, or otherwise changed their management, it is difficult for us to understand the mechanisms by which the observed changes occurred. Study of best, common, and worst practices with regard to changes in management is needed.

We do find that the current level of deconcentration seems to have had a significant and positive effect on cost-reduction at the clinic level in the Costa Rican context. We also find that on average, these costs savings did not arise from reductions in medications dispensed or patient-physician time, and these savings did not induce significant declines in population health as measured by mortality rates. In fact, it is possible the deconcentration reform did not offer enough independence for clinics to effectively improve health outcomes and even more power should be devolved to providers. We hope our work will lead to further study of Costa Rica's promising health care reform.

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FOOTNOTES

[1] Caja Costarricense de Seguro Social, Junta Directiva, *Art. 12 Session 7472*, 24 Aug 2000.

Caja Costarricense de Seguro Social, Junta Directiva, *Art. 10 Session 7553*, 31 May 2001.

Caja Costarricense de Seguro Social, Junta Directiva, *Art. 25 Session 7606*, 6 Dec 2001.

Email correspondence with Dr. Daisy Corrales, director of the Department of Innovation and Strengthening of the Networks of Health Services.

[2] We corrected school enrollment for clerical errors so 100 percent is the maximum value.

[3] When we replicated our regressions with the largest possible set of observations for each dependent variable we found similar results in each case, confirming that our results are robust to these changes in the dataset. These results are available from the authors upon request.

[4] These shortages were determined based on an index of household situations regarding shelter, sanitation, access to health services, and access to education. For more information, see http://www.inec.go.cr.

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TABLES

Table 1: Comparison of Pre-program Characteristics by Deconcentration

	Centralized Mean	Deconcentrated Mean	p-value
Consults per Hour	3.63	3.64	0.940
ln(Cost per Consult)	8.68	8.99	0.075^
Medications per Consult	2.82	2.92	0.558
General Mortality/1000	3.64	4.13	0.012*
Infant Mortality/1000	10.11	10.96	0.410
Myocardial Mortality/100000	3.40	4.24	0.041*
Tumor Mortality/1000	6.94	8.54	0.008**
Dep Ind Children	53.30	51.25	0.409
Dep Ind Elderly	8.19	9.19	0.017*
Birth Rate/1000	20.40	19.83	0.528
ln(PC Elec Cons kwh)	6.35	6.35	0.974
ln(RNC/Pop)	-4.11	-3.95	0.290
% Prim School Cov	88.53	89.93	0.535
% Sec School Cov	56.30	66.55	0.040*
Prop Agriculture	0.22	0.16	0.216
Prop Mining	0.00	0.01	0.377
Prop Industry	0.10	0.13	0.204
Prop Utilities	0.00	0.01	0.016*
Prop Construction	0.03	0.03	0.971
Prop Commerce	0.09	0.11	0.167
Prop Transport	0.02	0.03	0.154
Prop Finance	0.02	0.03	0.263
Prop Services	0.16	0.20	0.113
	n = 68	n = 17	

Cost per consult in ln(colones); 1 USD approximately equal to 500 CRC

^ p<0.10 * p < .05 ** p < .01

Table 2: Comparison of Change from 2000 to 2001

	Centralized Mean Change	Deconcentrated Mean Change	p-value
Consults per Hour	-0.016	0.012	0.812
ln(Cost per Consult)	0.271	0.140	0.383
Medications per Consult	0.156	0.251	0.461
General Mortality/1000	0.068	0.066	0.986
Infant Mortality/1000	0.140	1.251	0.493
Myocardial Mortality/100000	0.234	0.138	0.830
Tumor Mortality/1000	9.006	8.802	0.902
Dep Ind Children	0.013	0.000	0.761
Dep Ind Elderly	-0.008	0.000	0.680
Birth Rate/1000	-0.920	-1.186	0.501
ln(PC Elec Cons kwh)	0.019	0.028	0.780
ln(RNC/Pop)	0.113	0.131	0.523
% Prim School Cov	-0.297	0.128	0.752
% Sec School Cov	3.015	3.489	0.796
Prop Agriculture	0.024	-0.006	0.353
Prop Mining	-0.001	-0.004	0.234
Prop Industry	0.019	0.007	0.291
Prop Utilities	0.001	-0.004	0.006**
Prop Construction	0.023	0.011	0.609
Prop Commerce	0.031	0.035	0.854
Prop Transport	0.011	0.010	0.850
Prop Finance	0.026	0.011	0.137
Prop Services	0.053	0.040	0.760
	n = 68	n = 13	

Cost per consult in ln(colones); 1 USD approximately equal to 500 CRC

^ p<0.10 * p < .05 ** p < .01

Table 3: Clinic Efficiency and Management

	ln(Cost per Consult)		Consults per Hour		Medications per Consult	
Program Effect	-0.146**	-0.130*	-0.104	-0.0698	0.475	0.490
	(0.0538)	(0.0645)	(0.115)	(0.124)	(0.286)	(0.323)
Birth Rate/1000	-0.00535	-0.00929	-0.0173	-0.0176	-0.0181	-0.00257
	(0.00694)	(0.00695)	(0.0108)	(0.0106)	(0.0305)	(0.0295)
% Sec School Cov	-0.00238	0.00121	0.000788	-0.00109	0.00603	-0.00768
	(0.00149)	(0.00209)	(0.00223)	(0.00281)	(0.00687)	(0.00972)
ln(RNC/Pop)	0.0533	-0.0142	-0.0880	0.00198	-0.632*	0.0382
	(0.0652)	(0.0774)	(0.0989)	(0.122)	(0.279)	(0.395)
Hosp Net 1*Year	-0.0132	-0.0140	-0.0153	-0.0132	0.0280	0.0411
	(0.0148)	(0.0150)	(0.0183)	(0.0186)	(0.0418)	(0.0424)
Hosp Net 2*Year	0.00919	0.0104	-0.00989	-0.00889	-0.0198	-0.0103
	(0.0212)	(0.0209)	(0.0161)	(0.0161)	(0.0484)	(0.0510)
Time Fixed Effects	No	Yes	No	Yes	No	Yes
After reform? (0/1)	0.117*		-0.0718		-0.106	
	(0.0480)		(0.0546)		(0.112)	
Years after 2000	0.139***		0.00688		0.234***	
	(0.0138)		(0.0140)		(0.0273)	
Constant	9.202***	8.798***	3.588***	4.070***	0.266	3.472
	(0.378)	(0.453)	(0.549)	(0.689)	(1.639)	(2.285)
Observations	910	910	910	910	910	910

All regressions also contain área fixed effects.

Standard errors corrected for clustering at the área level in parentheses

^ p<0.10 * p < .05 ** p < .01