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# Brazil's Conditional Cash Transfer Program Associated With Declines In Infant Mortality Rates

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**ABSTRACT** Conditional cash transfer programs are innovative social safety-net programs that aim to relieve poverty. They provide a regular source of income to poor families and are “conditional” in that they require poor families to invest in the health and education of their children through greater use of educational and preventive health services. Brazil's Bolsa Família conditional cash transfer program, created in 2003, is the world's largest program of its kind. During the first five years of the program, it was associated with a significant 9.3 percent reduction in overall infant mortality rates, with greater declines in postneonatal mortality rates than in mortality rates at an earlier age and in municipalities with many users of Brazil's Family Health Program than in those with lower use rates. There were also larger effects in municipalities with higher infant mortality rates at baseline. Programs like Bolsa Família can improve child health and reduce long-standing health inequalities. Policy makers should review the adequacy of basic health services to ensure that the services can respond to the increased demand created by such programs. Programs should also target vulnerable groups at greatest risk and include careful monitoring and evaluation.

Conditional cash transfer programs have emerged during the past decade as innovative and popular social safety-net programs that aim to keep poor and vulnerable households from falling into deeper poverty. Such programs seek to break the intergenerational cycle of poverty by providing a minimum regular source of income to poor families that is “conditional” on their investing in the health and education of their children through the increased use of educational and preventive health services. The programs frequently provide cash support directly to women, because women tend to make greater investments in their children's health and education than men do.<sup>1</sup>

Countries around the world have adopted conditional cash transfer programs at a rapid rate.<sup>2</sup> Almost every Latin American country has one.

They also exist in Bangladesh, Indonesia, Malawi, and Turkey. The programs have generated interest in developed countries as well. For example, New York City recently experimented with a conditional cash transfer program.<sup>3</sup>

Studies have provided evidence that the programs increase the use of preventive health services,<sup>4</sup> decrease poverty, protect families from income shocks, and increase women's bargaining power.<sup>2</sup> However, evaluations of the health impacts of these programs tend to focus on intermediate outcomes, such as health care use and immunization rates, instead of population health outcomes, such as infant and child illness and death. The relationship of the programs to infant mortality—an important indicator of child health—has been the subject of only one study: an impact evaluation of rural beneficiaries in Mexico's Oportunidades conditional cash

transfer program.<sup>5</sup>

This article examines whether the implementation and expansion of a major antipoverty program in Brazil, the Bolsa Família conditional cash transfer program, was associated with improved infant health. This is the first study to examine the population health impacts of Bolsa Família. Given that the program covers approximately 25 percent of the Brazilian population and provides financial incentives to use preventive health care services, it would be expected to have some impact on population-level health outcomes.

### Brazil's Conditional Cash Transfer Program

Brazil has traditionally been one of the most income-unequal countries in the world.<sup>6</sup> When the country emerged from a military dictatorship in 1988, it adopted a new constitution that decentralized the country and established the Unified Health System, which provides free public health care to all Brazilians. The system aims to guarantee universal and equitable access to health care. However, major problems related to the quality of health care and access to it remain, especially in the poorest parts of the country.<sup>7</sup>

The Bolsa Família conditional cash transfer program is an example of recent actions by the Brazilian government aimed at reducing poverty and inequality and increasing access to health care among the poor. Created in 2003, the program provides monthly cash transfers to poor families and requires them to comply with health and education conditionalities, or program mandates.<sup>8</sup> Payments are preferentially made to women and are credited directly to beneficiaries' electronic benefit cards.

The program's health conditionalities require parents to ensure that all children younger than age seven comply with routine growth monitoring and the national childhood vaccination schedule<sup>9</sup> and require pregnant women to obtain prenatal care through a local health services provider. The education conditionalities require that children ages 6–17 be enrolled in school and maintain a minimum daily attendance rate of 85 percent (75 percent for ages 16–17). Unlike some other conditional cash transfer programs, the Bolsa Família program does not provide a nutritional supplement.

From the start, the Bolsa Família program had as its goal the rapid and universal coverage of the poor, defined as households with per capita incomes below a program-specific poverty line.<sup>6</sup> Program expansion was achieved through a combination of geographic and household targeting. The federal government allocated Bolsa

Família program quotas of beneficiaries to municipalities according to estimates of poverty at the municipality level.<sup>6</sup> Municipalities collected data on households and forwarded the information to a national database for final eligibility decisions. This approach was intended to address drawbacks in earlier programs designed to reduce poverty, such as their lack of transparency in identifying beneficiaries, political manipulations, and potential problems in correctly identifying the poor that might exacerbate inequalities.

Overall program and policy management, including the management of the national database, eligibility determination, and data verification, were conducted centrally by the Ministry of Social Development or the Caixa Econômica Federal, the agency that administered the program. By 2007 Bolsa Família reportedly covered 100 percent of Brazil's poor.<sup>6</sup> It is now the largest conditional cash transfer program in the world, covering more than thirteen million families.<sup>10</sup>

Unlike Mexico's Oportunidades conditional cash transfer program, which designed a randomized experiment to evaluate its impacts, Bolsa Família did not begin with an evaluation strategy in place. Therefore, relatively little is known about the program's effects on poverty levels or health and education indicators.<sup>2</sup> In recent years, researchers have examined the program's impacts on equity,<sup>11</sup> family decision making,<sup>12</sup> food security and nutrition,<sup>13–18</sup> and health and education services.<sup>19</sup> However, many of these studies have methodological limitations, such as cross-sectional designs or a lack of appropriate comparison groups.

### Infant Mortality In Brazil

Infant mortality is an important indicator of child health, especially in developing countries, where data on child health may be lacking or weak. The infant mortality rate is the number of deaths of infants (children age one or younger) per 1,000 live births in a given year.<sup>20</sup> Infant mortality is an important measure for Brazil, given its higher-than-expected infant mortality rate relative to countries of similar income levels.<sup>21</sup> Infant mortality data existed prior to the implementation of the Bolsa Família program, thereby providing important pre-intervention baseline data.

When disaggregated from national levels, infant mortality rates illustrate the range of disparities that exist across Brazil, especially at the municipal level. For example, in 1991 the infant mortality rate was 11 per 1,000 live births in some municipalities in the southeast but more than 130 per 1,000 live births in some municipalities

in the northeast.<sup>22</sup>

The Bolsa Família program may affect infant mortality through a number of different paths. For example, the program may increase the use of prenatal care services, increase rates of immunization coverage, and improve beneficiaries' familiarity with the health care system. It may also reduce financial barriers to obtaining health services, such as transportation costs and potential lost wages, and improve basic living conditions through increased income.

Between 1970 and 2000 the national infant mortality rate in Brazil declined significantly, from 115 to 27 per 1,000 live births.<sup>23</sup> Many factors contributed to this rapid decline, including improvements in basic living standards, declines in the fertility rate, and the implementation of the Family Health Program.<sup>24</sup> The Family Health Program is a large, decentralized program that sends health workers into communities to deliver primary health care services. It began in 1994, and by 2008 it covered 49 percent of the population.<sup>25</sup> The positive health impacts of this program that have been reported include reduced infant,<sup>21,26</sup> child,<sup>27</sup> and adult<sup>28</sup> mortality and reduced hospitalizations among adults with chronic conditions that could be effectively managed by primary care.<sup>29,30</sup> The studies used data from a period prior to the implementation of the Bolsa Família program, did not take the Bolsa Família program into account, or both. However, this article builds on these previous studies and examines the impact of the Bolsa Família program on infant mortality rates while accounting for Family Health Program coverage and the potential interaction between the two programs. (Note that the term *coverage* in this context refers to the percentage of households in a municipality using or registered for a program, not the insurance sense of accepting a package of benefits.)

### Study Data And Methods

**DATA** The data sources for this study were the Brazilian Unified Health System database, called DATASUS;<sup>31</sup> the Ministry of Social Development; and the Brazilian Institute of Geography and Statistics. Data were obtained at the municipal level, which is the level most relevant for the Bolsa Família program and for health policy, given Brazil's decentralized health system.<sup>32</sup>

**METHODS** The primary outcome variable for the study was the municipal-level all-cause infant mortality rate, constructed from vital statistics data on deaths and live births. Infant mortality rates were calculated for each municipality and year from 1998 to 2008. The Bolsa Família program began in 2003, but infant mortality data

were obtained for earlier years to control for pre-intervention trends.

Infant mortality was decomposed into neonatal mortality and postneonatal mortality, which may be differentially affected by the Bolsa Família program. The neonatal mortality rate is the number of deaths during the first twenty-eight days of life per 1,000 live births.<sup>20</sup> The postneonatal mortality rate is the number of deaths after twenty-eight days of life but before one year of life per 1,000 live births. Postneonatal mortality is considered one of the outcomes that is most sensitive to primary care services.<sup>33,34</sup>

The primary explanatory variable was Bolsa Família program coverage. Additional control variables included municipal characteristics that might affect infant health. Family Health Program coverage was the percentage of households registered in that program in a municipality. Because program impacts might not take effect immediately, one-year lagged values of Bolsa Família program and Family Health Program coverage were used throughout the study.

Other municipal-level variables, selected based on the infant mortality literature<sup>35,36</sup> and data availability, were population size; fertility; literacy; per capita income; the presence of piped water, a sewage system, and electricity; health supply, or the numbers of physicians per 1,000 residents and nurses per 100 residents; and percentage of population living in urban areas. Data were obtained from the Brazilian Institute of Geography and Statistics population surveys, and linear interpolation and extrapolation were used for the years in which data were not available, as has been done in previous studies.<sup>5,27,32,37</sup>

A pooled, time-series, cross-sectional design was used that approximated a natural experiment by taking advantage of the heterogeneous expansion of Bolsa Família across municipalities. Fixed-effects models were used to control for unmeasured time-invariant municipal characteristics (such as geography and local cultural practices) that might affect infant mortality rates and to correct for serial correlation of repeated measures.<sup>38</sup> This approach assessed whether yearly differences in infant mortality rates were associated with yearly changes in Bolsa Família program coverage, while controlling for potential confounders; it has been well established in the literature.<sup>5,21,26,29,32</sup>

**LIMITATIONS** This study had several limitations. The aggregated data used in studies of this type do not allow for an examination of how the programs may affect health. Also, program adoption may depend on existing health conditions in localities. In this case, the Bolsa Família

11.4 million

#### Families in Bolsa Família

The program expanded rapidly during its first five years, covering 3.6 million families in 2003 and 11.4 million families in 2008.

program's consistent and rapid expansion, driven by the Ministry of Social Development and not the Ministry of Health, suggests that adoption was relatively independent of health conditions in municipalities.

Municipal fixed effects should account for any time-invariant municipality factors. All analyses presented below included municipal characteristics and municipal and year fixed effects.

## Study Results

Between 1998 and 2008 infant, postneonatal, and neonatal mortality rates declined in Brazil (Exhibit 1). Infant mortality rates were already falling prior to the start of Bolsa Família in 2003, but the rate of decline appears to have increased after the program's implementation. The program expanded rapidly during its first five years, covering 3.6 million families in 2003 and 11.4 million families in 2008.

Bolsa Família program coverage was associated with a decline in the infant mortality rate (Exhibit 2; for a more detailed version, see Appendix Exhibit 1).<sup>39</sup> The average "treatment effect" of the program, calculated by multiplying the impact on beneficiaries by the mean level of program coverage, was a 9.3 percent decline in the infant mortality rate and a 24.3 percent decline in the postneonatal mortality rate. Both

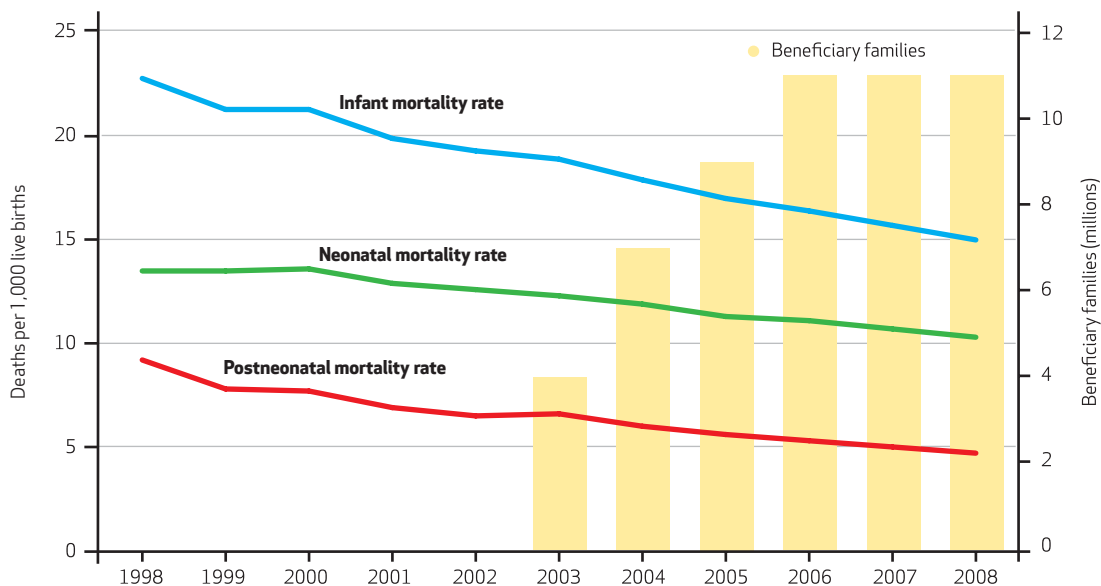
declines were significant ( $p < 0.01$ ). An increase in Bolsa Família program coverage was not associated with a significant change in the neonatal mortality rate.

The number of infant deaths declined during the study period, but the causes of infant deaths also changed (Appendix Exhibit 2).<sup>39</sup> There was a large decline in the percentage of infant deaths attributed to infectious and parasitic diseases (from 11.0 percent in 1998 to 5.3 percent in 2008); diseases of the respiratory system (from 7.9 percent to 5.5 percent); and endocrine, nutritional, and metabolic diseases (from 2.7 percent to 1.5 percent). In contrast, a greater share of infant deaths was attributed to conditions originating in the perinatal period (from 50.5 percent to 58.8 percent) and to congenital malformations, deformations, and chromosomal abnormalities (from 10.3 percent to 18.2 percent). Similar changes occurred in the causes of postneonatal deaths.

The Bolsa Família program encourages families to seek preventive health care, and the presence of the Family Health Program in a municipality may help beneficiaries meet the Bolsa Família program's conditionalities. The association between Bolsa Família program coverage and declines in infant mortality and postneonatal mortality rates was greatest in municipalities with high levels of Family Health Program coverage (Appendix Exhibit 3),<sup>39</sup> which high-

### EXHIBIT 1

Infant, Neonatal, and Postneonatal Mortality Rates in Brazil, 1998–2008, And Bolsa Família Program Coverage, 2003–08



**SOURCES** Data from DATASUS (Note 31 in text), Brazilian Ministry of Social Development, and Brazilian Institute of Geography and Statistics. **NOTES** The blue, green, and red lines denote deaths per 1,000 live infant births and relate to the left-hand y axis. The yellow bars denote millions of beneficiary families and relate to the right-hand y axis.

EXHIBIT 2

Association Between Bolsa Família And Family Health Program Coverage And Infant, Postneonatal, And Neonatal Mortality Rates

Program	All municipalities	Large municipalities <sup>a</sup>	Larger municipalities <sup>b</sup>	Urban municipalities <sup>c</sup>
<b>INFANT MORTALITY RATE</b>				
Bolsa Família	-0.067***	-0.068***	-0.080***	-0.102***
Family Health Program	-0.013***	-0.020***	-0.028***	-0.009**
<b>POSTNEONATAL MORTALITY RATE</b>				
Bolsa Família	-0.067***	-0.073***	-0.081***	-0.093***
Family Health Program	-0.010***	-0.016***	-0.024***	-0.008***
<b>NEONATAL MORTALITY RATE</b>				
Bolsa Família	0.001	0.009	0.006	-0.014
Family Health Program	-0.003	-0.006**	-0.006	-0.002

**SOURCES** Author's analysis of data from DATASUS (Note 31 in text), Brazilian Ministry of Social Development, and Brazilian Institute of Geography and Statistics. **NOTES** The exhibit shows that a 10 percent increase in Bolsa Família program coverage was associated with, for example, a reduction of 0.67 infant deaths per 1,000 live births (-0.067 × 10 percent) in all municipalities. Both Bolsa Família coverage and Family Health Program coverage are lagged one year. Values of infant, postneonatal, and neonatal mortality rates (all defined in the text) greater than 150 were considered outliers and were set to missing values. Municipal characteristics (listed in the text), including Family Health Program coverage, and municipal and year fixed effects were controlled for. <sup>a</sup>More than 5,000 residents in 1998. <sup>b</sup>More than 10,000 residents in 1998. <sup>c</sup>At least 50 percent of the population in urban areas in 1998. \*\*p < 0.05 \*\*\*p < 0.01

lights the importance of public health infrastructure to the Bolsa Família program's success.

**UNDERREPORTING OF BIRTHS AND DEATHS** Underreporting of births and deaths was a problem in parts of Brazil in the past,<sup>40</sup> but registration has improved.<sup>24</sup> About 80 percent of the population now lives in areas with satisfactory levels of live birth and mortality information.<sup>41</sup>

Underreporting may vary across municipalities, but as long as the rate of underreporting was stable over the study period, fixed effects will control for the effect of underreporting on reported infant mortality. Also, as long as the underreporting did not change in a manner that was correlated with changes in Bolsa Família program coverage, the estimates will be unbiased.

Smaller and more rural municipalities are more likely than large urban municipalities to have lower-quality vital statistics data.<sup>26</sup> Smaller and more rural municipalities may not record all births, some of which may occur outside of health facilities. When the analysis was limited to large, larger, or urban municipalities, the magnitude of the Bolsa Família program's impact increased (Exhibit 2). A study of the health effects of decentralizing primary care in Brazil also focused on larger municipalities, to help ensure data reliability.<sup>26</sup> Excluding smaller or rural municipalities did not affect the significant association between Bolsa Família program coverage and declines in infant mortality and postneonatal mortality rates.

Furthermore, during the study period there

was essentially no change in the percentages of live births occurring in hospitals or other health facilities and at home, while the percentages of deaths occurring in hospitals or other health facilities increased (Appendix Exhibit 2).<sup>39</sup>

**HETEROGENEITY OF THE TREATMENT EFFECT** In the context of Brazil's long-standing health inequalities, it is important to examine whether the Bolsa Família program mitigates or worsens inequalities. Additional analyses showed a greater association between increased Bolsa Família program coverage and lower infant and postneonatal mortality rates in municipalities with higher infant mortality rates at baseline than in municipalities with lower infant mortality rates at baseline (Exhibit 3). Thus, the program appears to reduce inequalities in infant health.

**Discussion**

This study found that expanding coverage of the Bolsa Família conditional cash transfer program was significantly associated with a reduction in infant mortality, especially during the postneonatal period. Infant mortality rates were already declining in the decades leading up to the program's implementation in 2003, but the Bolsa Família program was associated with a further decline in infant mortality and postneonatal mortality rates. The average treatment effect of the Bolsa Família program was a 9.3 percent decline in infant mortality rates and a

24.3%

**Decline in postneonatal mortality**

The average treatment effect of the Bolsa Família program was a 9.3 percent decline in infant mortality rates and a 24.3 percent decline in postneonatal mortality rates.

24.3 percent decline in postneonatal mortality rates. These results were robust to different model specifications and when a range of municipal characteristics—including Family Health Program coverage, fertility rates, and per capita income—were controlled for.

This study has many similarities with the evaluation of Mexico's Oportunidades conditional cash transfer program,<sup>5</sup> including the types of data used, the definition of the treatment variable, and the use of a fixed-effects approach. The Oportunidades program was found to result in an 8 percent decline in the rural infant mortality rate in Mexico,<sup>5</sup> similar to the 9.3 percent decline in infant mortality rates found in this study in Brazil. The Oportunidades program's impact on the neonatal mortality rate was not consistently significant in Mexico. Similarly, this study did not find a significant association between Bolsa Família program coverage and neonatal mortality in Brazil. It is promising that two different conditional cash transfer programs are associated with similar impacts on infant health, despite differences in the programs' designs.

The association between Bolsa Família program coverage with greater improvements in infant health during the postneonatal period is consistent with the program's incentives to use primary care services to which postneonatal mortality is very sensitive. Recent studies of the Family Health Program have found similar impacts, with declines in infant mortality rates being largely driven by particularly rapid declines in the postneonatal component of infant mortality.<sup>21,32</sup>

Postneonatal deaths have historically resulted largely from viral and bacterial infections and injuries that have been closely linked to socioeconomic factors, such as poverty.<sup>34,42</sup> The Bolsa Família program directly affects poverty through cash payments to families. In addition, the proportion of postneonatal deaths due to infectious and parasitic diseases, which are sensitive to interventions like this program, has declined.

The lack of association between Bolsa Família program coverage and reductions in neonatal mortality is not surprising, given that neonatal mortality has been primarily linked to problems associated with birth (such as congenital abnormalities and delivery complications)<sup>34</sup> and therefore depends largely on the quality of care at delivery,<sup>27</sup> which is not linked to the program's conditionalities.

The study found an important interaction between the Bolsa Família program and the Family Health Program. The association between Bolsa Família program coverage and declines in infant mortality was strongest in municipalities with

### EXHIBIT 3

#### Associations Between Bolsa Família Program Coverage And Infant And Postneonatal Mortality Rates, By Quintiles Of Infant Mortality Rates, 1998

Program	Quintile				
	1	2	3	4	5
<b>INFANT MORTALITY RATE</b>					
Bolsa Família	0.007	-0.038	-0.037	-0.046	-0.115***
Family Health Program	0.004	-0.010	-0.015**	0.004	-0.015
<b>POSTNEONATAL MORTALITY RATE</b>					
Bolsa Família	-0.020	-0.040***	-0.059***	-0.067***	-0.101***
Family Health Program	-0.0001	-0.004	-0.009***	-0.001	-0.012

**SOURCES** Author's analysis of data from DATASUS (Note 31 in text), Brazilian Ministry of Social Development, and Brazilian Institute of Geography and Statistics. **NOTES** Quintile 1 had the lowest and quintile 5 the highest infant mortality rates at baseline, in 1998. The exhibit shows that a 10 percent increase in Bolsa Família program coverage was associated with, for example, a reduction of 1.15 infant deaths per 1,000 live births ( $0.115 \times 10$  percent) in quintile 5. Both Bolsa Família coverage and Family Health Program coverage were lagged one year. Values of infant mortality and postneonatal mortality rates (both defined in the text) greater than 150 were considered outliers and were set to missing values. Municipal characteristics (listed in the text), including Family Health Program coverage, and municipal and year fixed effects were controlled for. \*\* $p < 0.05$  \*\*\* $p < 0.01$

the highest levels of Family Health Program coverage. In Mexico the Oportunidades program ensured that there would be an adequate supply of high-quality health care services in program areas.<sup>5</sup> Although the Bolsa Família program did not explicitly increase the supply of health care, the concurrent expansion of the Family Health Program likely helped increase the availability of primary health care.

The study also found that the Bolsa Família program had a heterogeneous impact, with the greatest impact in municipalities with the highest infant mortality rates at baseline. This result suggests that the program effectively targeted the most vulnerable municipalities and helped mitigate long-standing health inequalities. The finding is consistent with a previous study's conclusion that the Family Health Program had greater impacts in municipalities with lower levels of development and higher infant mortality rates.<sup>32</sup>

### Policy Implications

This is the first study to examine the impact of the implementation and expansion of the Bolsa Família conditional cash transfer program on infant mortality in Brazil. The program was associated with significant improvements in infant health in Brazil, and those improvements were greatest in the postneonatal period in municipalities with high Family Health Program coverage and those with poor baseline infant mortality rates.

Given the important interaction between the Bolsa Família program and the Family Health Program, policy makers should examine the adequacy of the existing health infrastructure as conditional cash transfer programs expand to other countries, especially in low-income settings. Such programs impose conditionality requirements on beneficiaries that rely on the availability of basic health services to meet the increased demand created by the programs.<sup>43</sup> In Brazil the launch of the Family Health Program likely helped strengthen the public health infrastructure and improve access to preventive health care.

Future research should examine the potential mechanisms at work in conditional cash transfer programs. Although this study found a positive relationship between the Bolsa Família program and infant health, the relative importance of different program components could not be examined in aggregated data. However, it could be explored in household survey data or health care utilization data. Research in this area would help address one of the key gaps in the literature on these programs: the question of which program components are most important in improving outcomes.<sup>44</sup>

## Conditional cash transfer programs like Bolsa Família have great potential to improve population health.

### Conclusion

Conditional cash transfer programs like Bolsa Família have a great deal of potential to improve population health, especially if they build on strong public health infrastructure, complement existing health services, and target poor and vulnerable groups at greatest risk. As countries consider adopting or expanding conditional cash transfer programs, careful monitoring and evaluation of program impacts will be important to ensure that the programs truly reduce inequality and poverty and improve health. ■

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