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Effect of a conditional cash transfer programme on AIDS incidence, hospitalisations, and mortality in Brazil: a longitudinal ecological study

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Summary

Background—One of the biggest challenges of the response to the AIDS epidemic is to reach the poorest people. In 2004, Brazil implemented one of the world's largest conditional cash

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Contributors

DR and GAdSM developed the study concept. GAdSM, AFS, and JAO collected the data. DR, ID, JM, and GAdSM designed the study and investigation. DR and GAdSM did the data analysis, accessed and verified the underlying data reported, and wrote the first draft of the manuscript. All authors contributed to data interpretation, and reviewed and edited the manuscript. DR supervised the study process. All authors had full access to all data in the study and had the final responsibility for the decision to submit for publication.

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For the Portugese translation of the abstract see **Online** for appendix 1

See **Online** for appendix 2

For more on **Ministry of Development databases** see https://aplicacoes.cidadania.gov.br/ri/pabcad/

For more on **primary health-care information system for FHP coverage** see https://egestorab.saude.gov.br/paginas/acessoPublico/relatorios/relHistoricoCoberturaAB.xhtml

For more on the **Hospital Information System** see https://datasus.saude.gov.br

For more on datasets from the **Brazilian Institute of Geography and Statistics** see https://www.ibge.gov.br/

Declaration of interests

We declare no competing interests.

transfer programmes, the Bolsa Família Programme (BFP). We aimed to evaluate the effect of BFP coverage on AIDS incidence, hospitalisations, and mortality in Brazil.

Methods—In this longitudinal ecological study, we developed a conceptual framework linking key mechanisms of BFP effects on AIDS indicators and used ecological panel data from 5507 Brazilian municipalities over the period of 2004–18. We used government sources to calculate municipal-level AIDS incidence, hospitalisation, and mortality rates, and used multivariable regressions analyses of panel data with fixed-effects negative binomial models to estimate the effect of BFP coverage, which was classified as low (0–29%), intermediate (30–69%), and high (≥70%), on AIDS indicators, while adjusting for all relevant demographic, socioeconomic, and health-care covariates at the municipal level.

Findings—Between 2004 and 2018, in the municipalities under study, 601 977 new cases of AIDS were notified, of which 376 772 (62·6%) were in males older than 14 years, 212 465 (35·3%) were in females older than 14 years, and 12 740 (2·1%) were in children aged 14 years or younger. 533 624 HIV/AIDS-related hospitalisations, and 176 868 AIDS-related deaths had been notified. High BFP coverage was associated with reductions in incidence rate ratios of 5·1% (95% CI 0·9–9·1) for AIDS incidence, 14·3% (7·7–20·5) for HIV/AIDS hospitalisations, and 12·0% (5·2–18·4) for AIDS mortality. The effect of the BFP on AIDS indicators was more pronounced in municipalities with higher AIDS endemicity levels, with reductions in incidence rate ratios of 12·7% (95% CI 5·4–19·4) for AIDS incidence, 21·1% (10·7–30·2) for HIV/AIDS hospitalisations, and 14·7% (3·2–24·9) for AIDS-related mortality, and reductions in AIDS incidence of 14·6% (5·9–22·5) in females older than 14 years, 9·7% (1·4–17·3) in males older than 14 years, and 24·5% (0·5–42·7) in children aged 14 years or younger.

Interpretation—The effect of BFP coverage on AIDS indicators in Brazil could be explained by the reduction of households' poverty and by BFP health-related conditionalities. The protection of the most vulnerable populations through conditional cash transfers could contribute to the reduction of AIDS burden in low-income and middle-income countries.

Introduction

The association between HIV/AIDS and poverty is complex. Several studies have suggested that new cases of HIV/AIDS can be linked to poverty, although wealth might also drive HIV transmission among some populations.[1] Nevertheless, populations with socioeconomic and other vulnerabilities might be at an increased risk not only of contracting HIV, but also of facing barriers in receiving appropriate, timely, and continuous care and treatment.[2] In this sense, there is a consensus that, to reduce AIDS-related morbidity and mortality, it is necessary to plan interventions that act not only on health care but also on the social determinants of health.[2] HIV/AIDS reinforces the cycle of perpetuation of poverty because it is often associated with high levels of stigma, which can further increase poverty in populations that already live in situations of social vulnerability.[3]

The Brazilian response to HIV/AIDS has had many successful outcomes.[4] Indeed, the incidence of AIDS decreased by 2·3% between 2003 and 2012, and by 14% between 2013 and 2019,[5] mainly due to the policy of early universal access to antiretroviral therapy (ART). However, notifications of AIDS cases are still high for a middle-income country, with a

current national rate of 17·8 cases per 100 000 inhabitants and even higher rates among the more urban areas of the country.[5] The largest burden of AIDS cases in Brazil is in individuals aged 25–39 years, and the incidence is higher among men who have sex with men,[6] transgender women,[7] female sex workers,[8] and drug users in general.[5] Furthermore, since 2009, AIDS cases have been more prevalent in Black women than in White women, whereas among men this trend has been observed since 2012.[5]

Financial incentives can be used to change individuals' behaviours, whereby the benefit might be linked to meeting requirements,[9] and can vary in size (target population), duration (short term and long term), and type of intervention (target outcomes).[10] Long-term conditional cash transfer programmes have been widely adopted in many low-income and middle-income countries (LMICs) as a means to improve the socioeconomic conditions of the poorest, mainly throughout Africa, Asia, and Latin America.[11] Short-term conditional cash transfer programmes, many of which were designed for the HIV/AIDS response and targeted girls and young women, have been used mostly in African countries.[10] Although the evidence is far from conclusive, existing studies suggest that conditional cash transfer programmes are effective in the reduction of mother-to-child HIV transmission[12] and might reduce HIV incidence in vulnerable populations.[13,14] Since conditional cash transfer programmes reduce household poverty, they might also reduce unprotected, age-disparate, and transactional sex,[14,15] and enhance adherence to ART.[16] Furthermore, conditional cash transfer programmes might improve the living conditions of people living with HIV through improved housing[17] and nutritional status,[18] and by reducing barriers to accessing education and health-care services.[19]

Brazil has made considerable progress in reducing poverty, mainly due to the success of one of the world's largest long-term conditional cash transfer programmes, the Bolsa Família Programme (BFP),[20] replaced by the Auxílio Brasil Programme in 2021. The BFP was designed to alleviate poverty through income transfer and its educational and health-related conditionalities. Implemented in 2004, its coverage had reached all Brazilian municipalities, and 14·2 million families had been enrolled by 2018. This programme was based on direct cash transfers from governments to poor households (ie, families earning US$18–36 per person per month, with an exchange rate of 5 Brazilian real to 1 US dollar). The monthly cash benefits ranged from US$17 to a maximum of $41 (depending on household size and composition), and with payments credited directly to a beneficiary debit card. The conditionalities for continuing to receive the benefits were that parents comply with health-care and education requirements for their children (eg, pregnant women must be present at antenatal and postnatal consultations, children must be up to date with nutrition monitoring and vaccinations, and school-aged children must attend school). Although a large focus of BFP was on families with children, individuals living in poverty, but with no children, could also qualify for and receive the benefits.[20]

Despite the expansion and success of the BFP in improving socioeconomic and living conditions, as well as improving several health outcomes, little is known about the effects of the BFP on HIV/AIDS outcomes in Brazil. From a socioecological model, and based on previous studies that evaluated the effect of the BFP on a broad range of health outcomes,[17,20–22] we built a theoretical model and hypothesised that the BFP would also

play an important part in reducing AIDS-related outcomes by mitigating the effects of structural factors such as poverty, unemployment, and gender and educational inequalities, which are associated with behaviours that increase the risk of HIV infection.[14,15,23–26] Moreover, we hypothesised that, as part of the existing health-related conditionalities, the BFP would increase attendance of people vulnerable to HIV/AIDS at primary health-care services, which would in turn improve the knowledge about, and attitudes surrounding, the disease and adherence to ART.[2,10] The BFP would thereby help to prevent transmission to other partners and also the progression from HIV to AIDS, reduce economic barriers of access to treatment, and reduce AIDS-related hospitalisations and future deaths[9] (figure). Therefore, we aimed to estimate the effect of BFP coverage levels on AIDS incidence, hospitalisations, and mortality from 2004 to 2018 in Brazil.

Methods

Study design

In this longitudinal ecological study, we used panel data for 5507 municipalities in Brazil during the period of 2004–18. We calculated BFP coverage of the target population as the ratio between the number of families enrolled in the BFP within a municipality and the number of eligible families according to the BFP criteria. Following previous studies,[17] we categorised the BFP coverage indicator of the target population as low (0–29%), intermediate (30–69%), and high (≥70%).

We selected three main sets of covariates at the municipal level that are essential for making the unit of analysis comparable and that might additionally confound the relationship between BFP and AIDS-related outcomes. The first set was municipal health services: coverage of community-based primary health care, known as the Family Health Programme (FHP), which we calculated as the ratio of the total number of individuals registered in the FHP and the total population in the municipality, and categorised as low (0–29%), intermediate (30–69%), high (≥70%); and the number of physicians, nurses, hospital beds, and specialised clinics per 1000 inhabitants. The second set was municipal-level household characteristics: mean number of residents in the household, proportion of garbage collected, proportion of households with piped water, and proportion of households with inadequate sewage disposal. The third set was municipal socioeconomic data: mean fertility rate, mean per-capita income, proportion of extremely poor population (earning up to a quarter of the minimum wage, about US$18 per person), illiteracy and unemployment rates, and municipal density (population per km^2). As in previous studies,[20,21] we estimated the annual values for socioeconomic variables in the period 2001–09 by linear interpolation, and for the period 2011–18 by extrapolation methods weighted by yearly household survey values (appendix 2 pp 6–9).

We dichotomised all municipal-level covariates into higher (versus lower) values as compared with the median value of their respective federative unit (eg, state). We also included a fixed-effects time dummy variable to adjust for national yearly fluctuations in the AIDS epidemic and for the introduction of new therapeutics and diagnostics. In the models, we used categorical variables because, although continuous variables allow the estimation of the average strength of an association along the entire range of its

values, the use of different categories of intervention coverage allows the verification of the existence of a gradient of effect, related to different degrees of implementation, and a more policy-oriented interpretation of the findings.[20] Moreover, categorical variables have been widely used in aggregate-level policy evaluations because they are usually more robust to unintended fluctuations and measurement errors in coverage estimations and non-linear extrapolations.[17,21] For the evaluation of the effect of BFP on AIDS mortality, we selected a subset of municipalities based on the adequacy and quality of vital information during 2000–07 (appendix 2 p 14). Moreover, we assumed constant adequacy for the remaining years because of improvements in gathering adequate vital information.[20]

It is important to highlight that registries of HIV cases only became compulsory in Brazil from 2014. Before this period, mandatory notification was restricted to specific cases of infection. For this reason, we only included cases reported as AIDS to avoid measurement errors, serving as a proxy for AIDS incidence. These analyses rely on deidentified, aggregated data and were therefore considered exempt from human participants' review.

Data sources

We used several information systems: Ministry of Social Development databases to calculate BFP coverage; primary health-care information system for FHP coverage; Notifiable Diseases Information System (SINAN) for AIDS notification cases; Mortality Information System (SIM) for AIDS mortality; Hospital Information System for HIV/AIDS-related hospitalisations; and Demographic Census of 2000 and 2010 and National Household Sample Survey of 2001–09 and 2011–18 for socioeconomic and geographical variables at municipal and state level (Brazilian Institute of Geography and Statistics). We considered the cases of AIDS as those individuals notified to SINAN who met at least one of the diagnostic criteria: adapted US Centers of Disease Control and Prevention criteria, Rio de Janeiro/Caracas criteria, and death criteria.[27] Mortality from AIDS was defined by deaths with the codes B20–24 from the tenth revision of the International Classification of Diseases as the basic cause in the SIM registries.

Statistical analysis

To evaluate the association between BFP coverage and AIDS incidence, hospitalisations, and mortality, we used negative binomial regression models for panel data. These models are indicated when the outcome is count data, and the assumption of the Poisson regression model that the mean is equal to the variance is not fulfilled due to the overdispersion of the data.[28] The time-variant municipal population was included as the offset term in the regression models. Initially, we evaluated the associations between BFP and AIDS outcomes considering all the municipalities. Because the AIDS epidemic in Brazil is very heterogeneous in terms of incidence rates across the country, we calculated an average municipal incidence rate of AIDS over the study period, expressed as mean incident cases per 100 000 inhabitant-years, and we classified it into more than 10, more than 20, and more than 30 cases (per 100 000). Thus, we performed and stratified all analyses according to these incidence rates. However, if municipalities did not present positive values for one of the outcomes analysed over the period, the estimation process automatically removed these municipalities from the sample. Finally, we investigated the effect of BFP on AIDS

incidence for both males and females older than 14 years, and for children aged 14 years or younger.

We estimated the models accounting for both fixed and random effects, and fixed-effects models were chosen based on the Hausman specification test. The fixed-effects model includes a second term in the regression equation to account for characteristics of the unit of analysis that are constant over the study period and have not been included in the model as confounding variables—eg, geographical, sociocultural, and historical aspects of each municipality.[28] In the fixed-effects model, unobservable factors that were not included in the regression were allowed to correlate with the relevant covariates in the model. This allowed for the control of unobserved variables related to the implementation of the intervention, and for this reason fixed effects are considered more robust in evaluation of interventions when using panel data.[28] We did goodness-of-fit tests with Akaike information criterion (AIC) and Bayesian information criterion (BIC) estimates. Because we modelled several possible models with different sets of covariates, we used AIC and BIC to compare them, with lower AIC and BIC scores indicating better model adjustment. The use of different levels of BFP coverage of the target population allowed the evaluation of whether there was a dose–response effect (ie, increasing degrees of effectiveness according to increasing intervention coverage).[20] The lowest coverage of BFP was considered as the reference category.

We did several sensitivity analyses to verify the robustness of the results: a fixed-effects Poisson model; a random-effects model; BFP coverage as a categorical variable, instead of a dummy variable that estimates the coefficients referred to a unique baseline category; BFP coverage as two categories (low, 0–29%; high, 30–100%); mean BFP coverage in the previous 4, 6, and 8 years to evaluate the BFP duration effects, which has been used in previous studies to capture the intensity of an intervention coverage along the years of its implementation;[21] and the estimates of BFP effect on AIDS mortality for all municipalities instead of the ones selected for quality of vital information. The set of sensitivity analyses estimates and power and sample size calculations are shown in appendix 2 (pp 11–20). We performed our analyses using Stata (version 16) and R (version 4.1.1).

Role of the funding source

The funder of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Results

Between 2004 and 2018, in the municipalities under study, 601 977 new cases of AIDS were notified, of which 376 772 (62·6%) were in males older than 14 years, 212 465 (35·3%) were in females older than 14 years, and 12 740 (2·1%) were in children aged 14 years or younger. 533 624 HIV/AIDS-related hospitalisations, and 176 868 AIDS-related deaths had been notified. From 2004 to 2018, a decrease was seen in the mean municipal AIDS incidence (−12·93%), hospitalisations (−30·65%), and mortality (−10·53%; table 1). The BFP coverage of the target population increased by 39·88% from 2004 to 2018, achieving a mean coverage of 86·94% in 2018. We also observed this trend in the FHP coverage. Socioeconomic variables changed over time, with reductions in the proportion of extremely

poor population, illiteracy rate, unemployment rate, and per-capita income, and increases in the proportion of garbage collected and households with piped water. Furthermore, the number of physicians, nurses, and specialised clinics (per 1000 inhabitants) increased over the study period, whereas numbers of hospital beds (per 1000 inhabitants) decreased.

All of the specifications show a negative association between BFP and the AIDS outcomes (table 2), with reductions of 5·1% (95% CI 0·9–9·1) in incidence, 14·3% (7·7–20·5) in hospitalisations, and 12·0% (5·2–18·4) in mortality when a high coverage of the target population (≥70%) was achieved compared with low coverage (≤29%). Moreover, compared with low BFP coverage, intermediate coverage (30–69%) was also associated with reductions of 5·0% (95% CI 0·9–8·9) in AIDS incidence, 13·9% (7·4–20·0) in AIDS hospitalisations, and 9·5% (2·6–15·9) in AIDS mortality.

High BFP coverage in different strata of mean municipal AIDS incident number of cases over the study period was associated with progressive reductions in the AIDS outcomes (table 3): high BFP coverage was associated with reductions of 4·6% (95% CI 0·2–8·8) for municipalities with a mean of more than 10 incident AIDS cases per 100 000 inhabitant-years, 8·8% (3·7–13·7) for those with a mean of more than 20 AIDS incident cases per 100 000 inhabitant-years, and 12·7% (5·4–19·4) for those with a mean of more than 30 AIDS incident cases per 100 000 inhabitant-years. The BFP effects were more pronounced on AIDS-related hospitalisations, which were associated with reductions of 16·0% (95% CI 8·9–22·5), 20·3% (11·3–28·3), and 21·1% (10·7–30·2) for hospitalisations in municipalities with high BFP coverage for different mean AIDS incidence rates (>10, >20, and >30 per 100 000 inhabitant-years, respectively). Moreover, a high coverage of the BFP showed reductions in AIDS mortality of 12·7% (95% CI 5·7–19·2), 15·4% (7·8–22·4), and 14·7% (3·2–24·9) when considering the increasing mean AIDS incidence rates over the study period.

Finally, in municipalities with a mean of more than 30 AIDS incident cases per 100 000 inhabitant-years, a high coverage of BFP was associated with reductions in AIDS incidence rates of 14·6% (95% CI 5·9–22·5) in females older than 14 years, 9·7% (1·4–17·3) in males older than 14 years, and 24·5% (0·5–42·7) in children aged 14 years or younger (table 4). Furthermore, we found in our set of sensitivity analyses more of the same effect estimates when compared with our main results.

Discussion

The results of our study show that high levels of BFP coverage were associated with significant reductions in AIDS incidence, hospitalisations, and mortality from 2004 to 2018 in Brazil, with a stronger effect in municipalities with higher AIDS endemicity and larger effects on incidence in females older than 14 years and children aged 14 years or younger.

To the best of our knowledge, no other studies have evaluated, over an extended period of time, the nationwide effect of a conditional cash transfer programme on such a comprehensive range of AIDS-related outcomes (incidence, hospitalisations, and mortality) in Brazil or other LMICs.

The positive effect of conditional cash transfer programmes on health has already been shown in Brazil and other countries, with reductions in tuberculosis incidence,[17] leprosy,[22] child[20] and maternal[21] mortality, and neglected tropical diseases.[11] Studies done in other LMICs, such as Malawi, showed a reduction of more than 60% in HIV prevalence among adolescents who received financial aid, regardless of the programme's conditionalities,[13] and an increase in the number of HIV tests.[29] Studies in Tanzania showed an association between a small conditional economic reward and reduction of 25% in sexually transmitted diseases (proxy for HIV),[30] and findings from a randomised trial confirm that incentives are a safe and effective tool to promote short-term adherence and potentially avert early deaths at the critical time of HIV treatment initiation.[31]

Other interventions and economic incentives based on the contingency management theory (short-term gratification that can influence behaviours immediately) have also shown effectiveness. A systematic review and meta-analysis of randomised controlled trials assessed the effectiveness of financial incentives on behavioural changes and showed that these interventions are effective in improving the HIV care continuum through the increased uptake of HIV testing and ART adherence, and continuity of care.[9] Several studies have shown that conditional cash transfer programmes can contribute to improvement in HIV prevention and treatment[10] and reduction of AIDS-related morbidity and mortality through several mechanisms.[14,16] Compared with individuals not receiving the benefits, those receiving them test more often for HIV and for other sexually transmitted infections, have a lower number of sexual partners, are less affected by domestic violence, have lower prevalence of HIV infection, and better adherence to ART when infection is present.

Our findings show a long-term effect of the BFP on the main AIDS outcomes. The positive effect can be explained through the increased household income and the health-related conditionalities required to receive the benefits. The mechanisms by which the BFP could contribute to reduced AIDS-related morbidity and mortality are, for example, by improving the socioeconomic conditions of families, especially in contexts of extreme poverty; decreasing the possibility that women practise commercial sex work (or transactional sex) on an occasional basis to obtain income or essential goods,[14] in part explained by the greater empowerment of female beneficiaries; and reducing risky sexual behaviour that prevents new cases of HIV infection and transmission.[8] The BFP could also delay or inhibit the conversion from HIV infection to AIDS, and avert AIDS-related hospitalisation and mortality because it allows improved nutritional status,[18] and could reduce the economic and geographical barriers for access to HIV/AIDS specialised services (eg, subsidising transport costs). Increased access to health-care services and cost-free access to the continuum of care and ART contributes to the autonomy of care for people with HIV and to higher adherence to ART. Our findings support this idea since the strongest effect both in terms of analysed outcomes and coverage intensity was on reduced AIDS-related hospitalisation, followed by mortality rates. Some of the associations between the BFP and AIDS outcomes showed more of a threshold effect (from low to increasing levels of coverage) than a dose–response effect: this was probably due to the larger effect of the BFP on extremely poor individuals, who are prioritised by the BFP, and to the smaller effect on the rest of the population.

The conditionality of antenatal care for pregnant women means that pregnant women are tested for HIV and other diseases. Increased information on serological status through testing improves monitoring of women and children by the health team and social assistance, mitigation of comorbidities acting in the final stages of AIDS, access to adequate health information on adherence to treatment, reduction of vertical transmission, and prevention of transmission to other partners.[32] Despite the fact that around 50% of AIDS cases are concentrated in the populations at risk in Brazil (men who have sex with men, sex workers, injecting drug users, and transgender people), the BFP targeted individuals and families based only on their income per capita and socioeconomic vulnerability, so both overall and at-risk populations were included.

Our study has limitations. Although the evaluation was comprehensive in terms of the health outcomes analysed, stratifications, and the broad range of adjusting variables, limitations in the data sources meant that it was not possible to adjust for risky sexual behaviour of the individuals. However, these risk factors should be considered mediators of the BFP and of the social determinants included in the models, which might influence access to the care continuum and ART adherence, and their inclusion in the regressions could lead to an over-adjustment of the models.[33] Our study also did not allow us to establish whether the programme could modify the behaviour of individuals; an individual-level analysis could determine the validity of this hypothesis. Moreover, if cultural and behavioural factors are considered to be approximately constant over the study period, the municipal fixed-effects terms should adjust for their confounding effects in the multivariable regression. If they are assumed homogeneously time-variant in all municipalities over the period, the dummy time variable should adjust for their effects in the model.

One of the strengths of the study is that it uses the BFP coverage of the target population instead of the municipal coverage adopted in some previous studies.[17,21] Although BFP municipal coverage allows the full capture of the effects of BFP externalities,[20] the use of BFP coverage of the poor eligible population is more efficient in the identification of the effect on the most vulnerable subpopulation,[17] in which a reduction of poverty levels could have a stronger effect on AIDS morbidity and mortality. However, the effects of BFP coverage on AIDS incidence, hospitalisation, and mortality rates are related to the overall population, and this allows the partial capture of the effects of externalities in the non-beneficiaries of the BFP. The BFP effects we found were maintained even after the adjustment for all demographic, socioeconomic, and health-care variables, and were robust to a wide range of sensitivity analyses. Moreover, policies and governmental actions that contributed to improvement of the socioeconomic situation, and other HIV/AIDS control interventions implemented but not included as variables over the study period, have been captured by the fixed-time effects of the model. Selecting municipalities with adequate information on mortality also represents a strength of our research, which improves the study's internal validity. Although the BFP was replaced by the Auxílio Brasil Programme in 2021, the latter has essentially the same characteristics and conditionalities as the BFP. We assume its effects will be similar to the former programme.

Our findings suggest that financial benefits to vulnerable individuals living with HIV/AIDS could improve the outcomes related to this disease, and that social protection should be

considered an essential part of any strategy to address HIV and AIDS. Specifically, our study provides evidence that cash transfer programmes can significantly reduce HIV/AIDS morbidity and mortality in a large LMIC such as Brazil, and they could represent important interventions for the achievement of the AIDS-related Sustainable Development Goal 3.3, and fundamental mitigation factors during the current global COVID-19-related economic crisis.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Data sharing

All data used in the analyses are available from public websites hosted by Brazilian government agencies. All data management and analysis computer code are available on request to the corresponding author.

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Research in context

Evidence before this study

Conditional cash transfer programmes are essential components of government actions to increase social protection for the most economically vulnerable individuals, allowing people to afford basic needs such as food, education, and medical care. Recent studies suggest that conditional cash transfer programmes might be effective in reducing the number of cases of HIV infection in some populations. To find studies that evaluated possible associations between receipt of cash transfer programmes and outcomes related to HIV/AIDS, we searched Embase and MEDLINE, with no restriction on publication date or language, on April 15, 2022, using the following search strategy: ("cash transfer program"/syn OR "cash transfer"/syn) AND ("acquired immune deficiency syndrome"/syn OR "human immunodeficiency virus"/syn) AND ("acquired immune deficiency syndrome"/dm OR "human immunodeficiency virus infection"/dm) AND ("case control study"/de OR "cohort analysis"/de OR "cross sectional study"/de OR "longitudinal study"/de OR "multicenter study"/de OR "observational study"/de OR "prospective study"/de OR "quasi experimental study"/de OR "randomized controlled trial"/de). We found 39 studies, among which 11 evaluated the impact or effect of different conditional cash transfer programmes on outcomes involving HIV infection, mostly in sub-Saharan Africa. These studies found that individuals receiving conditional cash transfers test more often for HIV and for other sexually transmitted infections, have a lower number of sexual partners, are less affected by domestic violence, have lower prevalence of HIV infection, and have better adherence to antiretroviral therapy when infection is present. However, we did not find any evidence on the long-term (ie, longer than a decade) effects of conditional cash transfers on morbidity and mortality from AIDS.

Added value of this study

To the best of our knowledge, no studies have evaluated, over an extended period of time, the nationwide effect of a conditional cash transfer on a comprehensive range of AIDS-related outcomes—ie, incidence, hospitalisation, and mortality rates. Our results reinforce previous findings that long-term conditional cash transfer programmes are an effective tool to ameliorate AIDS-related outcomes, averting or delaying new hospitalisations and early deaths in addition to preventing new HIV infections. In particular, the strength of the health-related conditionalities imposed by the Bolsa Família Programme, by which vulnerable women can access primary care services, test for HIV, receive antiretroviral therapy free of cost, and access the continuum of care, mean that transmission from mother to child and other partners and disease progression can be avoided.

Implications of all the available evidence

Our results, together with the other evidence from the literature and theoretical considerations, show the importance of conditional cash transfers for the attainment of the AIDS-related Sustainable Development Goal 3.3, which advocates the end of AIDS

by 2030, especially during the current increase in poverty and inequalities due to the COVID-19 pandemic.

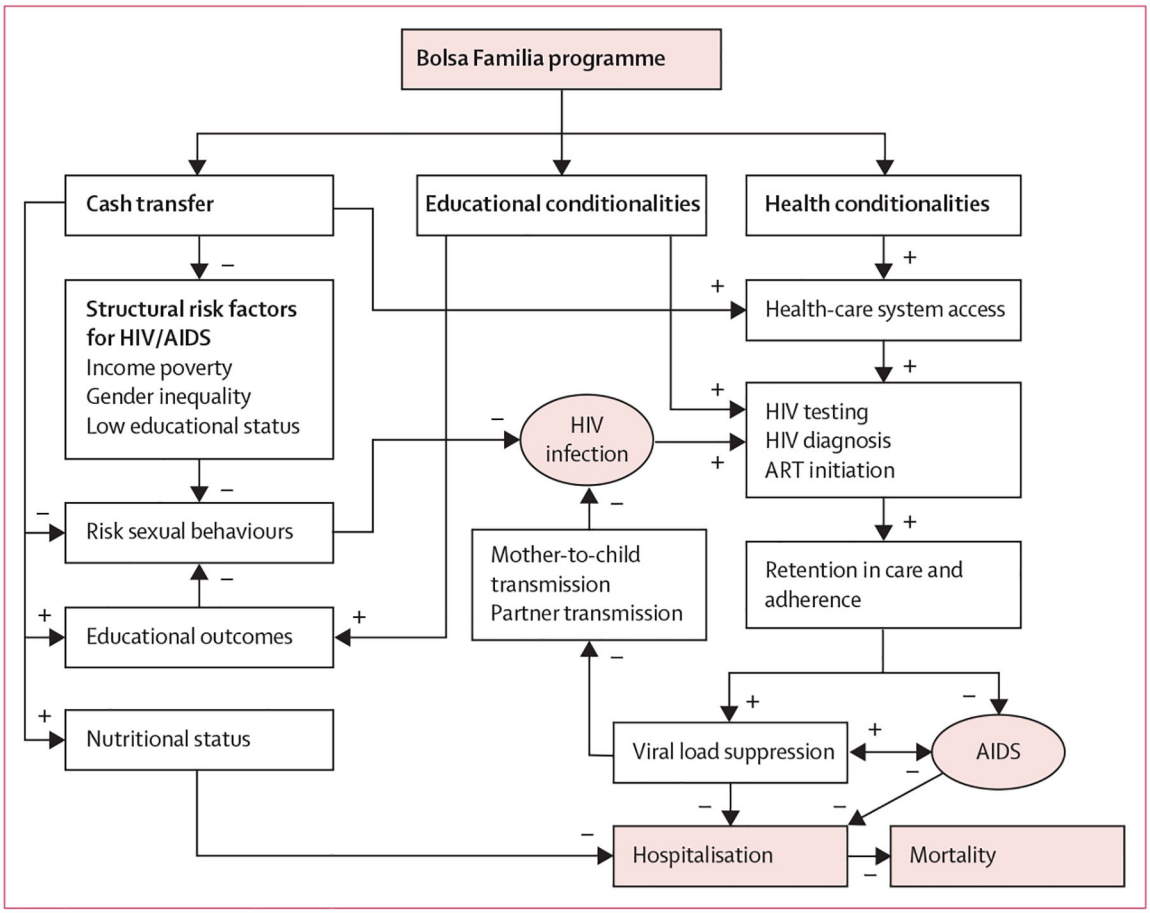

Figure: Conceptual framework of selected structural determinants of AIDS incidence, hospitalisations, and mortality, and of the hypothesised effects of the Bolsa Familia Programme on this process

ART=antiretroviral therapy.

Table 1:

AIDS incidence, hospitalisations, and mortality, BFP and FHP coverage, and socioeconomic variables in Brazil, 2004–18

	2004	2018	Percentage change, 2004–18
AIDS outcomes			
AIDS incidence (per 100 000 population)	20·95	18·24	−12·93%
AIDS hospitalisations (per 100 000 population)	21·53	14·93	−30·65%
AIDS mortality (per 100 000 population)	5·98	5·35	−10·53%
BFP target population coverage, %	62·15% (22·35)	86·94% (18·92)	39·88%
Low (0–29%)	17·83% (8·64)	22·18% (5·94)	24·39%
Intermediate (30–69%)	54·68% (10·84)	55·12% (10·65)	0·80%
High (≥70%)	82·50% (9·09)	94·74% (8·57)	14·83%
Health services			
FHP municipal coverage, %	62·30% (38·28)	88·45% (22·03)	41·98%
Low (0–29%)	6·81% (9·91)	11·24% (11·73)	65·01%
Intermediate (30–69%)	51·04% (11·79)	54·03% (11·07)	5·85%
High (≥70%)	94·07% (9·16)	96·92% (7·00)	3·02%
Physicians (per 1000 population)	0·59 (0·51)	0·80 (0·76)	33·93%
Nurses (per 1000 population)	0·34 (0·23)	0·88 (0·44)	158·47%
Hospital beds (per 1000 population)	2·14 (2·46)	1·75 (2·01)	−18·22
Specialised clinics (per 1000 population)	0·02 (0·07)	0·11 (0·16)	285·48%
Household characteristics			
Number of residents in the household	3·71 (0·47)	2·98 (0·41)	−19·67%
Proportion of households with piped water	61·82% (21·85)	75·06% (20·09)	21·41%
Proportion of households with garbage collection	59·28% (24·78)	79·22% (20·11)	33·64%
Proportion of households with inadequate sewage disposal	21·35% (18·99)	8·90% (13·75)	−58·31%
Municipal socioeconomic status			
Fertility rate	3·83 (0·71)	3·03 (0·51)	−20·85%
Per-capita income, BRL	892·24 (480·36)	559·66 (416·31)	−37·27%
Extremely poor, %	16·98% (14·75)	6·69% (9·36)	−60·59%
Illiteracy rate, %	17·85% (10·49)	11·24% (7·37)	−37·03%
Unemployment rate, %	9·35% (4·71)	4·74% (4·83)	−49·30%
Municipal density, population per km^2	104·19 (555·71)	119·27 (623·93)	14·47%

Data are mean (SD) unless otherwise stated. BFP=Bolsa Família Programme. BRL=Brazilian real. FHP=Family Health Programme.

Table 2:

Fixed-effect negative binomial models of the association between BFP coverage and AIDS incidence, hospitalisations, and mortality in Brazil, 2004–18

	AIDS incidence				AIDS hospitalisations				AIDS mortality			
	Unadjusted incidence rate ratio (95% CI)	p value	Adjusted incidence rate ratio (95% CI)	p value	Unadjusted incidence rate ratio (95% CI)	p value	Adjusted incidence rate ratio (95% CI)	p value	Unadjusted incidence rate ratio (95% CI)	p value	Adjusted incidence rate ratio (95% CI)	p value
BFP target population coverage												
Low (0–29%)	1 (ref)	..	1 (ref)	..	1 (ref)	..	1 (ref)	..	1 (ref)	..	1 (ref)	..
Intermediate (30–69%)	0·971 (0·931–1·012)	0·16	0·950 (0·911–0·991)	0·018	0·756 (0·707–0·808)	<0·0001	0·861 (0·800–0·926)	0·0001	0·964 (0·900–1·032)	0·29	0·905 (0·841–0·974)	0·0074
High (≥70%)	0·967 (0·928–1·008)	0·11	0·949 (0·909–0·991)	0·018	0·708 (0·663–0·756)	<0·0001	0·857 (0·795–0·923)	<0·0001	0·900 (0·842–0·962)	0·0020	0·880 (0·816–0·948)	0·0008
Health services												
FHP municipal coverage												
Low (0–29%)	..	..	1 (ref)	..	..	..	1 (ref)	..	..	..	1 (ref)	..
Intermediate (30–69%)	..	..	0·952 (0·939–0·966)	<0·0001	..	..	0·912 (0·888–0·936)	<0·0001	..	..	0·921 (0·896–0·947)	<0·0001
High (≥70%)	..	..	1·054 (1·030–1·077)	<0·0001	..	..	1·199 (1·157–1·242)	<0·0001	..	..	1·003 (0·951–1·058)	0·91
Physicians (per 1000 population)	..	..	1·024 (1·006–1·043)	0·0095	..	..	0·934 (0·908–0·960)	0·0001	..	..	0·982 (0·937–1·029)	0·44
Nurses (per 1000 population)	..	..	1·014 (1·001–1·028)	0·038	..	..	0·908 (0·887–0·930)	<0·0001	..	..	1·016 (0·981–1·052)	0·38
Hospital beds (per 1000 population)	..	..	0·922 (0·904–0·941)	<0·0001	..	..	0·865 (0·837–0·893)	<0·0001	..	..	0·952 (0·899–1·009)	0·10
Specialised clinics (per 1000 population)	..	..	1·002 (0·984–1·020)	0·86	..	..	0·862 (0·837–0·887)	<0·0001	..	..	1·059 (1·021–1·099)	0·0023
Household characteristics												
Number of residents in the household	..	..	0·995 (0·981–1·008)	0·43	..	..	0·985 (0·961–1·010)	0·25	..	..	1·067 (1·035–1·100)	<0·0001
Proportion of households with piped water	..	..	1·056 (1·029–1·083)	<0·0001	..	..	0·944 (0·910–0·981)	0·0029	..	..	1·073 (1·002–1·149)	0·043
Proportion of households with garbage collection	..	..	1·023 (0·998–1·048)	0·070	..	..	0·986 (0·949–1·024)	0·46	..	..	1·054 (0·993–1·119)	0·085

	AIDS incidence				AIDS hospitalisations				AIDS mortality			
	Unadjusted incidence rate ratio (95% CI)	**p value**	**Adjusted incidence rate ratio (95% CI)**	**p value**	**Unadjusted incidence rate ratio (95% CI)**	**p value**	**Adjusted incidence rate ratio (95% CI)**	**p value**	**Unadjusted incidence rate ratio (95% CI)**	**p value**	**Adjusted incidence rate ratio (95% CI)**	**p value**
Proportion of households with inadequate sewage disposal	..	..	0·986 (0·968–1·004)	0·12	..	..	0·960 (0·932–0·988)	0·0060	..	..	1·020 (0·976–1·066)	0·38
Municipal socioeconomic status												
Fertility rate	..	..	0·966 (0·947–0·986)	0·0009	..	..	0·946 (0·915–0·977)	0·0010	..	..	0·964 (0·917–1·012)	0·14
Per-capita income, BRL	..	..	1·086 (1·069–1·103)	<0·0001	..	..	1·056 (1·028–1·084)	0·0001	..	..	1·045 (1·004–1·088)	0·033
Extremely poor, %	..	..	1·104 (1·088–1·121)	<0·0001	..	..	1·067 (1·039–1·095)	<0·0001	..	..	1·186 (1·146–1·226)	<0·0001
Illiteracy rate, %	..	..	0·942 (0·920–0·965)	<0·0001	..	..	1·042 (1·005–1·081)	0·027	..	..	0·970 (0·917–1·026)	0·29
Unemployment rate, %	..	..	1·112 (1·098–1·127)	<0·0001	..	..	1·165 (1·137–1·193)	<0·0001	..	..	1·088 (1·053–1·124)	<0·0001
Municipal density, population per km^2	..	..	0·869 (0·832–0·907)	<0·0001	..	..	0·718 (0·681–0·757)	<0·0001	..	..	1·080 (0·945–1·235)	0·26

Complementary information of the estimates is in the appendix 2 (p 21). BFP=Bolsa Família Programme. BRL=Brazilian real. FHP=Family Health Programme.

Table 3:

Adjusted fixed-effect negative binomial models for the effect between BFP and AIDS incidence, hospitalisations, and mortality according to municipal AIDS mean incident cases per 100 000 inhabitant-years in Brazil, 2004–18

	Total sample		>10 AIDS incident cases per 100 000 inhabitant-years		>20 AIDS incident cases per 100 000 inhabitant-years		>30 AIDS incident cases per 100 000 inhabitant-years	
	Incidence rate ratio (95% CI)	p value	Incidence rate ratio (95% CI)	p value	Incidence rate ratio (95% CI)	p value	Incidence rate ratio (95% CI)	p value
AIDS incidence								
Low BFP target population coverage (0–29%)	1 (ref)	..	1 (ref)	..	1 (ref)	..	1 (ref)	..
Intermediate BFP target population coverage (30–69%)	0·950 (0·911–0·991)	0·018	0·953 (0·911–0·997)	0·036	0·914 (0·866–0·965)	0·0012	0·903 (0·836–0·975)	0·0096
High BFP target population coverage (≥70%)	0·949 (0·909–0·991)	0·018	0·954 (0·912–0·998)	0·042	0·912 (0·863–0·963)	0·0010	0·873 (0·806–0·946)	0·0009
Observations	79 020	..	29 850	..	8175	..	2385	..
Municipalities	5268	..	1990	..	545	..	159	..
AIDS hospitalisations								
Low BFP target population coverage (0–29%)	1 (ref)	..	1 (ref)	..	1 (ref)	..	1 (ref)	..
Intermediate BFP target population coverage (30–69%)	0·861 (0·800–0·926)	0·0001	0·849 (0·784–0·920)	0·0001	0·805 (0·725–0·894)	0·0001	0·802 (0·712–0·903)	0·0003
High BFP target population coverage (≥70%)	0·857 (0·795–0·923)	<0·0001	0·840 (0·775–0·911)	<0·0001	0·797 (0·717–0·887)	<0·0001	0·789 (0·698–0·893)	0·0002
Observations	66 090	..	28 305	..	7995	..	2310	..
Municipalities	4406	..	1887	..	533	..	154	..
AIDS mortality								
Low BFP target population coverage (0–29%)	1 (ref)	..	1 (ref)	..	1 (ref)	..	1 (ref)	..
Intermediate BFP target population coverage (30–69%)	0·905 (0·841–0·974)	0·0074	0·891 (0·827–0·961)	0·0028	0·859 (0·790–0·934)	0·0004	0·858 (0·765–0·963)	0·0092
High BFP target population coverage (≥70%)	0·880 (0·816–0·948)	0·0008	0·873 (0·808–0·943)	0·0006	0·846 (0·776–0·922)	0·0001	0·853 (0·751–0·968)	0·014
Observations	22 425	..	12 345	..	3600	..	1080	..
Municipalities	1495	..	823	..	240	..	72	..

Incidence rate ratios and 95% CIs are the inverse of the percentages and 95% CIs presented in the text. BFP=Bolsa Família Programme.

Table 4:

Adjusted fixed-effect negative binomial models between BFP coverage and AIDS incidence according to sex and age in municipalities with a mean of more than 30 AIDS incident cases per 100 000 inhabitant-years in Brazil, 2004–18

	Females older than 14 years		Males older than 14 years		Children aged 14 years or younger	
	Incidence rate ratio (95% CI)	p value	Incidence rate ratio (95% CI)	p value	Incidence rate ratio (95% CI)	p value
Low BFP target population coverage (0–29%)	1 (ref)	..	1 (ref)	..	1 (ref)	..
Intermediate BFP target population coverage (30–69%)	0·876 (0·798–0·963)	0·0059	0·934 (0·857–1·017)	0·12	0·764 (0·587–0·995)	0·046
High BFP target population coverage (≥70%)	0·854 (0·775–0·941)	0·0014	0·903 (0·827–0·986)	0·023	0·755 (0·573–0·995)	0·046
Observations	2355	..	2385	..	2070	..
Municipalities	157	..	159	..	138	..

Incidence rate ratios and 95% CIs are the inverse of the percentages and 95% CIs presented in the text. BFP=Bolsa Família Programme.