The Bolsa Família conditional cash transfer program is associated with reduced substance use disorder hospitalizations: a quasi-experimental study of the 100 million Brazilian cohort

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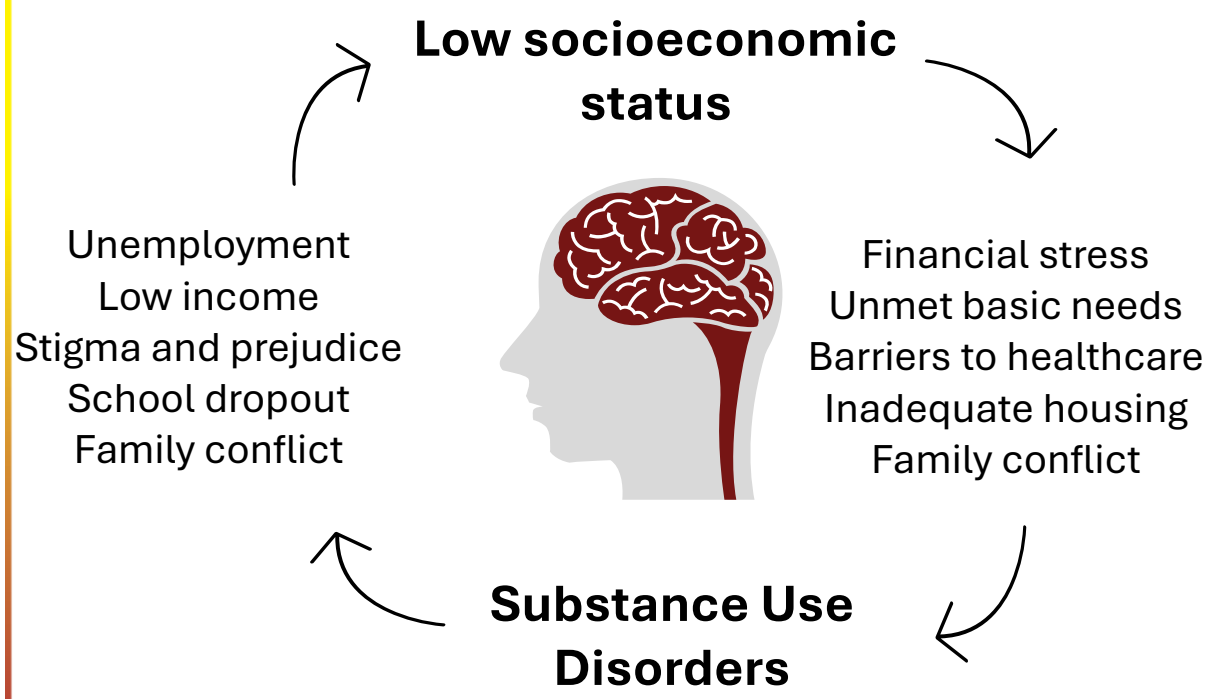
Background



(Adapted from Ridley et al., 2020)

Can economic interventions, such as **conditional cash transfer programs**, help to alleviate the burden of **substance use disorders**?

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Background

The Bolsa Família Program

Who can receive?

- Low-income families – Household per capita income ~ USD 43.

How much do beneficiaries receive?

- Monthly cash transfer.
- Example: 2023 – BRL 600 per month (~ USD 119)

Educational and Health Conditionalities

(1) Education
i.e., School attendance ≥ 60%

(2) Health
i.e., Health checkups, vaccination, prenatal

Aims

General

To analyze whether the conditional cash transfer program Bolsa Família program (BFP) is associated with a decrease in SUD hospitalization rates.

Specifics

To investigate differential associations according to

(i) primary cause of hospitalization: alcohol and other substances,

(ii) sex,

(ii) the material deprivation levels of the municipality in which participants resided (Brazilian Deprivation Index – IBP-CIDACS).

Methods

- **Study design:** quasi-experimental.
- **Data source:**

  (i) The National Hospitalization Information System and

  (ii) The BFP payroll database,

  (iii) linked to the 100 million Brazilian cohort´s baseline.

- **Study population:** People (≥ 5 years) enrolled at the cohort baseline between 01/01/2008 and 31/12/2015.

- **Variables**:

  (i) Exposure: The Bolsa Família Program (‘yes’ x ‘no’);

  (ii) Outcome: Hospitalization due to substance use disorders (ICD-10: F10-F19);

  (iii) Controls: sex, age, education, unemployment status, area of residence, housing conditions, and cohort entry year.

Methods

Statistical analysis

(i) Descriptive analyses of the baseline characteristic of non-exposed and exposed groups;

(ii) Since there were imbalances in the baseline characteristic of non-exposed and exposed groups [SMD values ≥ 0·2] we used the propensity score associated with weighting strategies to promote the balance of baseline characteristics between the two groups.

Methods

Statistical analysis

(iii) Main model: Poisson regression model with PS and the inverse probability of treatment weighting (IPTW) → to evaluate the association of BFP with SUD (Relative Risk ratio [IRR])

(ii) Robustness check: Poisson regression models:

* Unadjusted;
* Adjusted by the control variates;
* Using stabilized inverse probability of treatment weighting (SIPTW);
* Using kernel weighting.

(iii) Poisson regression models by:

* Sex,
* Susbtance type;
* Brazilian Deprivation Index – IBP-CIDACS.

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Results

Table 1. Baseline characteristics overall and by Bolsa Família Program beneficiaries and non-beneficiaries, Brazil, 2008-2015

	Original cohort			
	Overall	**Non-BFP**	***BFP**	**SMD**
N	35,926,326	18,471,683	17,454,643	
***SUD Hospitalization**				0·00773
Yes	39,891 (0·1)	18,195 (0·1)	21,696 (0·1)	
No	35,886,435 (99·9)	18,453,488 (99·9)	17,432,947 (99·9)	
Age				0·53604
Child (5-12 years old)	13,901,351 (38·7)	5,351,541 (29·0)	8,549,810 (49·0)	
Adolescent (13-18 years old)	2,677,408 (7·5)	1,233,265 (6·7)	1,444,143 (8·3)	
Young adult (19-24 years old)	3,118,664 (8·7)	1,608,987 (8·7)	1,509,677 (8·6)	
Adult (25-64 years old)	14,275,425 (39·7)	8,489,933 (46·0)	5,785,492 (33·1)	
Older adult (65+ years old)	1,953,478 (5·4)	1,787,957 (9·7)	165,521 (0·9)	
Sex				0·08114
Male	16,976,511 (47·3)	8,365,302 (45·3)	8,611,209 (49·3)	
Female	18,949,815 (52·7)	10,106,381 (54·7)	8,843,434 (50·7)	
Education level				0·37269
Never attended school	9,323,024 (26·0)	3,784,013 (20·5)	5,539,011 (31·7)	
Preschool	1,759,206 (4·9)	769,175 (4·2)	990,031 (5·7)	
Primary school	593,464 (1·7)	295,228 (1·6)	298,236 (1·7)	
Junior high school	15,583,639 (43·4)	8,374,600 (45·3)	7,209,039 (41·3)	
High school	6,372,803 (17·7)	4,051,731 (21·9)	2,321,072 (13·3)	
College/university	539,639 (1·5)	461,545 (2·5)	78,094 (0·4)	
Missing	1,754,551 (4·9)	735,391 (4·0)	1,019,160 (5·8)	
Unemployed				0·21912
No	8,633,239 (24·0)	5,368,946 (29·1)	3,264,293 (18·7)	
Yes	19,283,186 (53·7)	9,744,132 (52·8)	9,539,054 (54·7)	
Missing	8,009,901 (22·3)	3,358,605 (18·2)	46,512,296 (26·6)	
Area of residence				0·08535
Urban	29,227,504 (81·4)	15,331,071 (83·0)	13,896,433 (79·6)	
Rural	6,667,102 (18·6)	3,131,670 (17·0)	3,535,432 (20·3)	
Missing	31,720 (0·1)	8,942 (0·0)	22,778 (0·1)	
Living conditions	4·05 (1·42)	4·19 (1·35)	3·90 (1·47)	0·20009
Year of registration				0·56395
2008	5,135,143 (14·3)	2,572,121 (13·9)	2,563,022 (14·7)	
2009	5,326,721 (14·8)	1,566,195 (8·5)	3,760,526 (21·5)	
2010	5,073,606 (14·1)	2,227,776 (12·1)	2,845,830 (16·3)	
2011	4,176,114 (11·6)	1,672,941 (9·1)	2,503,173 (14·3)	
2012	5,642,786 (15·7)	3,426,490 (18·5)	2,216,296 (12·7)	
2013	4,160,937 (11·6)	2,450,717 (13·3)	1,710,220 (9·8)	
2014	3,772,755 (10·5)	2,676,299 (14·5)	1,096,456 (6·3)	
2015	2,638,264 (7·3)	1,879,144 (10·2)	759,120 (4·3)	

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Results

Table 2. Proportion and respective 95%CI of the covariates used to calculate the propensity score after balanced by IPTW weighting

	Non-BFP	*BFP	STd-diff
Age			0·04
Child (5-12 years old)	0·39 (0·39, 0·39)	0.49 (0·49, 0·49)	
Adolescent (13-18 years old)	0·10 (0·10, 0·10)	0.08 (0·08, 0·08)	
Young adult (19-24 years old)	0·09 (0·09, 0·09)	0.08 (0·08, 0·08)	
Adult (25-64 years old)	0·39 (0·39, 0·39)	0.32 (0·32, 0·32)	
Older adult (65+ years old)	0·17 (0·17, 0·17)	0·00 (0·00, 0·00)	
Sex			0·01
Male	0·49 (0·49, 0·49)	0.48 (0·48, 0·48)	
Female	0·50 (0·50, 0·50)	0·51 (0·51, 0·51)	
Education level			-0·07
Never attended school	0·30 (0·30, 0·30)	0·39 (0·39, 0·39)	
Preschool	0·03 (0·03, 0·03)	0·05 (0·05, 0·05)	
Primary school	0·01 (0·01, 0·01)	0·01 (0·01, 0·01)	
Junior high school	0·47 (0·47, 0·47)	0·39 (0·39, 0·39)	
High school	0·16 (0·16, 0·16)	0·14 (0·14, 0·14)	
College/university	0·00 (0·00, 0·00)	0·00 (0·00, 0·00)	
Unemployed			0·04
No	0·24 (0·24, 0·24)	0·24 (0·24, 0·24)	
Yes	0·75 (0·75, 0·75)	0·75 (0·75, 0·75	
Area of residence			0·01
Urban	0·77 (0·77, 0·77)	0·78 (0·78, 0·78)	
Rural	0·22 (0·22, 0·22)	0·21 (0·21, 0·21)	
Living conditions			-0·00
0	0·04 (0·04, 0·04)	0·05 (0·05, 0·05)	
1	0·05 (0·05, 0·05)	0·05 (0·05, 0·05)	
2	0·07 (0·07, 0·07)	0·07 (0·07, 0·07)	
3	0·11 (0·11, 0·11)	0·12 (0·12, 0·12)	
4	0·19 (0·19, 0·19)	0·18 (0·18, 0·18)	
5	0·51 (0·51, 0·51)	0·50 (0·50, 0·50)	
Year of registration			-0·03
2008	0·19 (0·19, 0·19)	0·17 (0·17, 0·17)	
2009	0·27 (0·27, 0·27)	0·22 (0·22, 0·22)	
2010	0·14 (0·14, 0·14)	0·17 (0·17, 0·17)	
2011	0·07 (0·07, 0·07)	0·13 (0·13, 0·13)	
2012	0·10 (0·10, 0·10)	0·12 (0·12, 0·12)	
2013	0·09 (0·09, 0·09)	0·08 (0·08, 0·08)	
2014	0·06 (0·06, 0·06)	0·05 (0·05, 0·05)	
2015	0·04 (0·04, 0·04)	0·03 (0·03, 0·03)	

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Results

Table 3. IRR of *SUD hospitalizations among *BFP beneficiaries in the original and weighting cohorts, Brazil, 2008-2015

Confounder adjustment	N	Estimated IRR (95% CI) from a Poisson regression model	p-value
IPTW weighting	30,556,848	0·83 (0·81, 0·85)	0·000
Unadjusted	35,002,823	0·93 (0·91, 0·95)	0·000
Adjusted	25,805,305	0·97 (0·95, 0·99)	0·000
SIPTW weighting	25,805,305	0·93 (0·91, 0·95)	0·000
Kernel Weighting	25,805,219	0·83 (0·81, 0·85)	0·000

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Table 4. IRR of SUD hospitalizations weighting with IPTW by specific causes and stratified by sex and deprivation area index among BFP beneficiaries compared to non-beneficiaries, Brazil, 2008-2015

	IRR (95% CI)	p-value	N
ICD-10 specific causes			
Alcohol use disorders	0·74 (0·71, 0·77)	0·000	25,789,737
Other SUD (except alcohol)	0·89 (0·86, 0·92)	0·000	30,538,974
Stratified by Sex			
Male	0·79 (0·77 0·81)	0·000	11,953,579
Female	0·89 (0·84, 0·94)	0·000	13,851,726
Stratified by Deprivation area (IBP-CIDACS)			
Low deprivation	0·90 (0·87, 0·92)	0·000	17,056,504
Medium deprivation	0·63 (0·58, 0·68)	0·000	6,559,288
High deprivation	0·59 (0·49, 0·71)	0·000	2,189,513

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What could explain these results?

The program acts to improve the social determinants of SUD

Increasing family income, access to education and health care

Low socioeconomic status

Financial stress
Unmet basic needs
Barriers to healthcare
Inadequate housing
Family conflict

Substance Use Disorders

Unemployment
Low income
Stigma and prejudice
School dropout
Family conflict

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Main takeways

- Alleviating financial pressure, fulfilling basic needs, improving socioeconomic status, promoting health access, and encouraging educational attainment may all mediate the protective association of BPF against SUD hospitalizations.
- Our findings adding a new dimension to SUD prevention strategies.
- The BFP may lead to better health outcomes among people who use substances .
- The BFP appears to be cost-effective for health systems preventing high-cost hospitalizations.

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