Heterogeneous effects of Anti-Poverty Programs on Health Outcomes. Evidence from the NYC Opportunities-Family Rewards Randomized Controlled Trial

Emilie Courtin[1], James Riccio[2], Nandita Verma[2], Mauricio Avendano[3,4], Peter Muennig[5]

[1]Harvard Center for Population and Development Studies
Harvard University, Cambridge, MA

[2]MDRC
New York City, NY

[3]Department of Global Health and Social Medicine
King's College London, UK

[4]T.H. Chan School of Public Health
Harvard University, Boston, MA

[5]Mailman School of Public Health
Columbia University, New York City, NY

Abstract

Objectives. We explored whether a randomized control trial of a conditional cash transfer (CCT), NYC Opportunities-Family Rewards (2007-2010) improved the health of respondents with high baseline disadvantage.

Methods. Family Rewards randomized 4,749 families to either receiving cash rewards in return for investments in education, employment and health or to a control group not eligible to the cash transfers. Participants were followed-up at 18 and 42 months after randomization. We used a regression-based subgroup analysis to identify households with high baseline disadvantage and assess whether that subgroup accrued different health benefits from the intervention.

Results. Relative to the control group, the Family Rewards intervention group was previously found to have modest improvements in mental health and no differences in physical health or health behaviors. When focusing on households with high baseline disadvantage, we found that at 18 months the intervention reduced their Body Mass Index (BMI) and likelihood of reporting high blood pressure and high cholesterol. At 42 months, eligibility to the program was associated with a reduction in BMI and higher hope scores for this population subgroup.

Conclusions. These results underscore the importance of considering heterogeneous effects when assessing the health effects of anti-poverty programs. They may also point to the potential of CCTs in improving the health of the most disadvantaged families in the United States.

Introduction

It is well-documented that individuals with lower socio-economic status (SES) have poorer health and shorter life expectancy [1, 2]. Health inequalities have also been shown to be self-reinforcing: poor health can lead to unemployment [3], bankruptcy [4] and impoverishment [5]. Poor health in early life is associated with lower educational attainment [6, 7] and negative labour market outcomes [8], potentially contributing to the reproduction of gaps in income and wealth across generations [7, 9].

As the correlation between income and health has grown stronger in the past decades in the United States, recent studies have called for research into the potential role of anti-poverty programs to reduce health inequalities [10]. Conditional Cash Transfers (CCTs) are interesting candidate policies as they provide cash to eligible families on the condition that they engage in activities that might benefit them, such as using preventive care services or increasing children's school attendance [11]. They pursue two simultaneous objectives: reducing immediate family financial hardship, and building longer-term human capital [12]. Because they combine both material (cash is transferred to eligible families) and immaterial (the program incentivizes health-promoting behaviors such as employment and health care use) rewards, CCTs are a promising intervention to address negative feedback loops between poverty and health.

In 2007, the Center for Economic Opportunity at the New York City Mayor's Office initiated the first comprehensive CCT in the US, Opportunity NYC-Family Rewards ('Family Rewards' hereafter). The program was offered to low-income families in six of New York's most deprived neighborhoods [13]. It operated for three years and provided cash rewards in the areas of children's education, preventive health care and employment. Families earned on average $8,674 over the duration of the program [14]. Previous research indicated that the program's effects on poverty, education and parental employment were significant but relatively small in magnitude [14]. The experiment also led to modest improvements in health insurance coverage, parental self-reported health and levels of hope but had no effect on physical health [15]. Existing studies have examined average treatment effects, potentially masking heterogeneous effects by a number of characteristics. In particular, it remains unclear whether the program has different effects among households who had already accumulated considerable socioeconomic and health disadvantage when they entered the program.

In this paper, we take a deeper dive into the data to comprehensively evaluate whether the impact of Family Rewards on health differed among the most disadvantaged families. Specifically, we used a regression-based method to assess subgroup impacts in experimental studies. The added value of this approach is to maintain the integrity of the randomized controlled trial while identifying families for whom Family Rewards might have been the most effective based on multiple baseline characteristics.

Methods

The Family Rewards Experiment

The program was conceived by the Center for Economic Opportunity at the Mayor's Office, in partnership with MDRC (a nonprofit social policy evaluation firm), and Seedco (a workforce and economic development organization). The study sample was recruited between July and December 2007 and the program operated for three years (**Figure 1**). Eligibility was based on a combination of family income (at or below 130% of the federal poverty level), entering grade of the child in September 2007 (4^{th}, 7^{th} and 9^{th} grade), home location (six community districts in the

Bronx, Brooklyn and Manhattan) and citizenship status (citizen or legal resident at the time of enrolment).

Intervention and Control Groups

The program was evaluated using a randomized controlled trial: the 4,749 families recruited at baseline were randomly allocated to either receiving the existing services and benefits available for poor New Yorkers (control group, n=2,372) or to Family Rewards in addition to these services (intervention group, n=2,377). The intervention group was offered cash rewards for 22 activities in the areas of education, employment and health (see **Table 1** for a list of all rewards and associated cash amounts). A family receiving all rewards could earn up to 25-30% of the average family income. Participating families received the cash transfers every two months. All rewards were verified using administrative data or coupons submitted by families. No limits or conditions were imposed on how families decided to spend the rewards. Previous research has shown that families in the intervention group earned on average $8,674 over the three years of the program [14]. Over 97% of families received cash in the education and health domains while only 53% earned a work reward [16].

Data

Survey data were first collected at baseline for all participants (4,749 families), providing demographic, socioeconomic and health status information prior to study entry. A randomly selected subset of the sample was then surveyed at in-program at 18 months (3,082 families) and post-program at 42 months (2,966 families). Response rates at 18 and 42 months were 84% and 82% for the program group; and 80% and 76% for the control group, respectively. Although the differences in response rates were significant, previous research has confirmed that both groups at the two measurement points were representative of the full-sample and were well-matched on baseline characteristics [14, 16].

Measures

Self-reported health was measured on a scale, ranging from 1 (very poor) to 5 (excellent). Respondents' Body Mass Index was measured based on self-reported weight and height. Respondents were also asked to report whether they had been diagnosed with asthma, high blood pressure, high cholesterol or diabetes (yes/no). Respondents were asked if they were currently smoking (yes/no). The mental health of participants was assessed through the 'State of Hope' scale, a validated six-item measure of the respondent's level of hope for the future [17]. The scale ranges from 6 (low hope) to 24 (high hope). At the 18-month survey, respondents were asked if they had experienced a serious psychological distress in the past month and administered the Kessler Psychological Distress (K10) scale, a validated 10-item measure of psychological distress experienced in the past month [18]. Scores range from 10 (no distress) to 50 (severe distress). The 'State of Hope' scale and the K10 scale were measured among a randomly selected sub-sample of respondents (N=2,043).

Statistical Analyses

In order to assess whether the effect of the program differed among respondents who had accumulated disadvantage at entry in Family Rewards, our analysis proceeded through several steps.

First, following the work of Berg and colleagues [19], we implemented a regression-based subgroup approach to identify respondents with high levels of baseline disadvantage. The technique is akin to propensity score matching, expect that we did not identify a 'matched' control group for comparison purposes but used the propensity score to develop a multivariate baseline disadvantage index. The added value of this approach is to take into account that Family Rewards is a complex intervention, with rewards potentially earned through a range of health-, education- and employment-related activities. It is consequently uniquely that a single individual characteristic (*e.g.* level of education or health status at baseline) would be a good measure of baseline disadvantage. A multivariate approach, combining demographic, socioeconomic, work- and health-related characteristics, may yield a closer proxy for multi-faceted baseline disadvantage. The variables used to build the baseline disadvantage score are detailed in **Table 2**.
Logistic regressions were used to generate estimates of the relationship between these baseline characteristics and the likelihood of earning employment rewards over the duration of the trial. We selected employment rewards as outcome as only 53% of participants earned a reward in that domain, as opposed to 97% of the sample for education or health rewards. Based on these models, participants in both the control and treated group get a propensity score of earning employment rewards. Baseline disadvantage is defined as being in the bottom quartile of the score.

Second, we estimated regression models for each health outcome, with controls for gender, race/ethnicity, educational attainment, marital status, employment status, number of children and primary language spoken at home. These baseline covariates were added to improve the precision of our estimates. To assess whether the effects of the program differed for respondents with high baseline disadvantage, we added an interaction term between eligibility to the treatment and being in the bottom quartile of the propensity score estimated at step 1. All standard errors are clustered at the individual level.

Results

Table 3 displays the demographic, socio-economic and health characteristics of the sample at randomization. Most participating households were headed by a single parent (80.90%), most often a woman (94.57%). The majority of recruited families were Hispanic (47.13%) or Black (50.53%). Existing public assistance included food stamps (59.40%), housing assistance (53.35%), and Temporary Assistance for Needy Families (24.01%). Just over half of the sample (51.14%) was working at baseline; out of those, 38.63% were working more than 30 hours per week. Only 5.76% of parents and 2.70% of children had no medical insurance coverage in the previous 12 months at the start of the program. Most participating families had used preventive care services in the past year, in the form of a medical check-up (81.69% for parents) or dental check-up (64.83% for parents) but only 43.46% of adult respondents rated their health as excellent or very good.

Table 4 presents the association between selected baseline characteristics and the likelihood of earning a reward in the area of employment over the duration of the program. Not having an educational degree, working part-time and rating one's health as poor at baseline were key predictors of lower odds of earning a reward in employment. On the basis of these estimates, all respondents are attributed a propensity score, which is used as a proxy for baseline disadvantage.

Table 5 displays the effects of Family Rewards on health outcomes at 18 and 42 months after the program started, with an interaction term between eligibility to Family Rewards and the bottom quartile of the propensity score. For each outcome of interest and at the two evaluation time points, we report the main effect of the program, the effect of being in the bottom quartile

of baseline disadvantage, and the interaction between eligibility to the program and baseline disadvantage. As expected, high baseline disadvantage is associated with poorer health outcomes, including higher BMI at 18 months (ß=1.494, 95% CI 0.519 to 2.468) and lower self-rated health at 42 months (ß=-0.238, 95% CI -0.432, -0.044). The interaction terms indicate that the effect of Family Rewards on health differed for those who reported higher levels of disadvantage. For these respondents, the program was associated at 18 months with a significant reduction in BMI and in the likelihood of reporting high cholesterol or blood pressure. The positive effect on BMI for this sub-group persisted post-program at 42 months (ß=-2.719, 95% CI -4.583, -0.856). Family Rewards also had long-term positive effects on these respondents' levels of hope (ß=0.661, 95% CI 0.013, 1.337).

These results indicate that Family Rewards had positive effects on the health of the most vulnerable families in the sample that were not been fully captured by average treatment effects in previous analyses. They also point to the potential of an intervention like Family Rewards to break the negative feedback loops between poverty and health.

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Tables and Figures

Table 1. Amount and schedule of the cash transfers offered by Family Rewards

Domain	Amount
Education incentives	
Elementary and middle school students	
Attends 95% of scheduled school days[a]	$25 per month
Scores at proficiency level (or improvement) on annual math and English language arts (ELA) tests	$300 per math test; $300 per ELA test for elementary school students. $350 per math test; $350 per ELA test for middle school students
Parents reviews low-stakes interim test[b]	$25 for parents to download, print and review results (up to 5 times per year)
Parents discussed annual math and ELA test results with teachers[a]	$25 (up to 2 tests per year)
High school students	
Attends 95% of scheduled school days	$50 per month
Accumulates 11 course credits per year	$600
Passes Regents exams	$600 per exam passed (up to 5 exams)
Takes PSAT test	$50 for taking the test (up to 2 times)
Graduates from high school	$400
All grades	
Parent attends parent-teacher conferences	$25 per conference (up to 2 times per year)
Child obtains library card[a]	$50 once during the program
Health incentives	
Maintaining public or private insurance[a]	Per month: $20 (public); $50 (private) for each parent covered Per month: $20 (public); $50 (private) if all children are covered
Annual medical checkup	$200 per family member (once per year)
Doctor-recommended follow-up visit[a]	$100 per family member (once per year)
Early-intervention evaluation for child under 30 months old, if advised by the pediatrician	$200 per child (once per year)
Preventive dental care (cleaning/checkup)	$100 per family member (once per year for children 1-5 years old; twice per year for family members of 6 years of age or older)
Workforce incentives	
Sustained full-time employment[c]	$150 per month
Education and training while employed at least 10 hours per week[d]	Amount varied by length of course, up to a maximum of $3,000 over three years

Source: Adapted from Riccio et al, 2010. In an effort to simplify the experiment, a number of rewards were eliminated after the first year as noted in the table.

[a] Discontinued after Year 2 of the program.

[b] Discontinued after Year 1 of the program.

[c] Full-time employment is defined as working 30 hours per week.

[d] The employment condition was removed after Year 2 of the program.

Table 2. Baseline characteristics used to build the propensity score of earning rewards

Domains and associated variables	% baseline
Demographic characteristics	
Single-parent family	78.85%
Parent is Black	50.54%
Parent is Hispanic	47.13%
Parent is not a US citizen	17.21%
Number of children in household under 19	3.07 (SD 1.44)
Household economic disadvantage	
Receiving TANF[a]	26.46%
Receiving food stamps	63.66%
Earning of parent in the year prior to random assignment	
Weekly pay among those currently working	$390 (SD 221)
Work-related characteristics	
Parent has no educational degree	51.79%
Parent has mental or physical problem that limits ability to work	13.29%
Parent working less than 30 hours per week	61.37%
Health-related characteristics	
Household not covered by health insurance	5.76%
Poor parental self-rated health	19.14%

Source: Family Rewards baseline survey, 2007. [a] Temporary Assistance for Needy Families.

Table 3. Selected sample characteristics at randomization, overall and by assignment status

	Overall	Program	Control
One-parent family (%)	80.90	80.48	81.37
Primary language spoken is English (%)	77.24	77.46	77
Household earnings above 130% of poverty line (%)	11.85	12.50	11.17
Receiving TANF [a] (%)	24.01	24.81	23.21
Receiving food stamps (%)	59.40	60.80	58.02
Receiving housing assistance [b] (%)	53.35	52.14	54.56**
Gender (%)			
Female	94.57	94.96	94.17*
Male	5.43	5.04	5.83
Age (mean, SD)	38.85 (7.97)	38.85 (8.05)	38.85 (7.89)
Race/ethnicity (%)			
Hispanic/Latino	47.13	47.32	46.95
Black	50.53	50.74	50.34
Other	2.32	1.94	4.15
Education level (%)			
GED certificate [c]	11.20	9.95	12.45*
High school diploma	20.72	19.66	21.80
Associate's degree/2-year college	8.56	8.75	8.36
4-year college or beyond	7.73	7.89	7.57
None of the above	51.79	53.74	49.82
Currently working (%)	51.14	49.90	52.40
Working more than 30 hours (%)	38.63	38.50	38.76
Average weekly earnings of those currently working (mean, SD)	390.84 (221.25)	395.06 (219.4)	386.61 (223.06)
Health insurance coverage (%)			
Public health insurance	72.6	72.45	72.75
Employer health insurance	18.88	19.40	18.35
Other health insurance	2.77	2.75	2.79
Not covered	5.76	5.40	6.11
Had annual medical check-up when not sick			
Within the past year	81.69	81.98	81.30
1-2 years ago	14.53	14.07	14.99
More than 2 years ago	3.58	3.74	3.42
Never	0.25	0.21	0.29
Had preventive dental check-up			
Within the past year	64.83	64.96	64.70
1-2 years ago	23.50	23.89	23.10
More than 2 years ago	10.93	10.42	11.44
Never	0.74	0.73	0.76
Physical or mental health problem limiting work (%)	21.95	22.76	21.14
Self-rated health (%)			
Excellent or very good	43.46	43.26	43.67
Good	37.40	37.33	37.47

Fair or poor	19.14	19.41	18.86

Sources: Data are from Family Rewards baseline survey. Percentages may not add up due to rounding. To measure differences across treatment and control groups, chi-square tests were employed for categorical variables and t-tests were used for continuous variables. Statistical significance levels are reported as ***$p<0.001$; **$p<0.01$; *$p<0.05$. [a] Temporary Assistance for Needy Families. [b] This category includes living in public housing and receiving Section 8 rental assistance. [c] General Education Development.

Table 4. Association between selected baseline characteristics and likelihood of earning a reward in the area of employment over the duration of the program

	Odds ratios	95% CI
Structural and demographic characteristics		
Single parent family	0.740	0.531, 1.066
Parent is Black	0.328	0.094, 1.142
Parent is Hispanic	0.420	0.120, 1.465
Parent is no a US citizen	1.433**	1.021, 2.008
Number of children in the household under the age of 19	0.942	0.849, 1.046
Household economic disadvantage		
Receiving TANF[a]	0.761	0.518, 1.119
Receiving food stamps	0.826	0.600, 1.137
Weekly pay among those currently working	1.001***	1.0007, 1.002
Work-related characteristics		
Parent has no educational degree	0.445***	0.335, 0.591
Parent has mental or physical problem that limits ability to work	0.867	0.557, 1.339
Parent working less than 30 hours per week	0.435***	0.311, 0.608
Health-related characteristics		
Household not covered by health insurance	0.779	0.439, 1.381
Poor parental self-rated health	0.459***	0.315, 0.670

Sources: Data are from Family Rewards baseline survey. Statistical significance levels are reported as ***$p<0.001$; **$p<0.01$; *$p<0.05$. [a] Temporary Assistance for Needy Families. Robust standard errors are clustered at the household level.

Table 4. Effect of eligibility to Family Rewards on health outcomes at 18 and 42 months, by likelihood of earning employment rewards

	18 months		42 months	
	ß	95% CI	ß	95% CI
Self-reported health				
Eligibility to the program	0.212***	0.102, 0.321	0.250	-0.001, 0.383
Bottom quartile of propensity score	0.014	-0.148, 0.177	-0.238**	-0.4318, -0.044
Eligibility x bottom quartile	-0.395	-.612, 0.177	-0.298	-0.556, 0.004
BMI				
Eligibility to the program	0.116	-0.547, 0.780	0.531	-0.423, 1.485
Bottom quartile of propensity score	1.494***	0.519, 2.468	0.9100	-0.478, 2.298
Eligibility x bottom quartile	-1.607**	-2.904, -0.311	-2.719**	-4.583, -0.856
Asthma				
Eligibility to the program	-0.005	-0.059, 0.049	-0.028	-0.071, 0.014
Bottom quartile of propensity score	-0.003	-0.084, 0.0779	-0.0168	-0.079, 0.0454
Eligibility x bottom quartile	0.088	-0.031, 0.208	0.041	-0.041, 0.124
High blood pressure				
Eligibility to the program	0.067	-0.026, 0.108	0.012	-0.038, 0.063
Bottom quartile of propensity score	0.121**	0.059, 0.182	0.074	-0.0007, 0.149
Eligibility x bottom quartile	-0.100**	-0.182, -0.018	-0.084	-0.185, 0.0155
High cholesterol				

Eligibility to the program	0.0201	-0.005, 0.0455	0.033	-0.0035, 0.071
Bottom quartile of propensity score	0.077**	0.039, 0.115	0.019	-0.035, 0.0738
Eligibility x bottom quartile	-0.067***	-0.118, -0.017	-0.021	-0.094, 0.0520
Diabetes				
Eligibility to the program	0.011	-0.013, 0.036	0.002	-0.032, 0.037
Bottom quartile of propensity score	0.073***	0.036, 0.110	0.082***	0.032, 0.133
Eligibility x bottom quartile	0.025	-0.024, 0.0749	0.0406	-0.0271, 0.108
Smoking				
Eligibility to the program	0.002	-0.025, 0.029	0.0078	-0.0411, 0.056
Bottom quartile of propensity score	0.028	-0.012, 0.052	0.0401	-0.0316, 0.111
Eligibility x bottom quartile	0.024	-0.030, 0.079	0.072	-0.022, .0168
Scale of hope				
Eligibility to the program	0.102	-0.248, 0.453	0.278	-0.068, 0.625
Bottom quartile of propensity score	-0.099	-0.603, 0.405	-0.406	-0.916, 0.103
Eligibility x bottom quartile	0.341	-0.339, 1.022	0.661**	0.013, 1.337

Notes: All models control for the following baseline characteristics: age, gender, ethnic background, parental employment and marital status, household primary language and parental level of education. Statistical significance levels are reported as ***p<0.001; **p<0.01; *p<0.05. Robust standard errors are clustered at the household level.

Figure 1. Randomization and follow-up flow diagram of participants in the Opportunity NYC-Family Rewards experiment, 2007-2010