Cash and in-Kind Transfers Lead to Excess Weight Gain in a Population of Women with a High Prevalence of Overweight in Rural Mexico

Jef L. Leroy, Paola Gadsden, Teresa González de Cossío, and Paul Gertler

Abstract

There is a growing concern that food or cash transfer programs may contribute to overweight and obesity in adults. We studied the impact of Mexico’s Programa de Apoyo Alimentario (PAL), which provided very poor rural households with cash or in-kind transfers, on women’s body weight. A random sample of 208 rural communities in southern Mexico was randomly assigned to 1 of 4 groups: food basket with or without health and nutrition education, cash with education, or control. The impact on women’s weight was estimated in a cohort of 3010 women using a difference-in-difference model. We compared the impact between the food basket and cash groups and evaluated whether the impact was modified by women’s BMI status at baseline. With respect to the control group, the program increased women’s weight in the food basket (550 ± 210 g; P = 0.004) and the cash group (420 ± 230 g; P = 0.032); this was equivalent to 70 and 53% increases in weight gain, respectively, over that observed in the control group in a 23-mo time period. The greatest impact was found in already obese women: 980 ± 290 g in the food basket group (P = 0.001) and 670 ± 320 g in the cash group (P = 0.019). Impact was marginally significant in women with a preprogram BMI between 25 and 30 kg/m²: 490 ± 310 g (P = 0.055) and 540 ± 360 g (P = 0.067), respectively. No program impact was found in women with a BMI <25 kg/m². Providing households with a considerable amount of unrestricted resources led to excess weight gain in an already overweight population. Research is needed to develop cost-effective behavior change communication strategies to complement cash and in-kind transfer programs such as PAL and to help beneficiaries choose healthy diets that improve the nutritional status of all family members.

Introdution

The decline in the prevalence of child malnutrition in most regions of the world (1,2) has been accompanied by a rapid increase in adult overweight and obesity (3,4). The coexistence of child undernutrition and adult obesity in numerous countries represents an important challenge to poverty and public health interventions. Based on the belief that undernutrition is caused by poverty, many interventions aimed at lowering undernutrition provide households with (often relatively substantial) direct cash or in-kind transfers. The underlying assumption is that relieving resource constraints will allow households to acquire the nutrients necessary to improve nutritional status. A growing concern, however, is that poverty alleviation programs involving food or cash transfers may contribute to overweight and obesity (5,6). The evidence, nevertheless, is sparse (7,8).

Like many other countries, Mexico has seen a steep increase in the prevalence of overweight and obesity in adults in recent years. From 1988 to 1999, the nationwide prevalence of obesity in women almost doubled from 33 to 60% (9). In 2006, 71.9% of adult women were overweight or obese (10). The same trend is found in Mexico’s southern states, which constitute the poorest part of the country; between 1999 and 2006, the prevalence of overweight and obesity in women rose from 58 to 67% (10,11).

For this study, we took advantage of the community randomized, controlled evaluation of the Programa de Apoyo Alimentario (PAL). The objectives of this program were to lower poverty, increase the daily food intake and nutritional status of
beneficiary households, and improve households’ dietary and health practices (12). PAL provided poor households living in Mexico’s remote rural communities with either cash or in-kind transfers. The program had a very limited impact on child linear growth, notwithstanding a baseline prevalence of stunting of ~20% (12). Our previous work showed that PAL had a positive effect on fruit and vegetable consumption and increased the consumption of vitamins A and C, fiber, iron, and zinc. A concerning finding was that the program also caused a significant increase in household energy consumption, even though households were not energy deficient at baseline (13). Given the program’s impact on energy consumption and the high prevalence of overweight and obesity in the study population, the objective of this study was to estimate the impact of PAL on women’s body weight. We tested whether the program had a differential impact in the in-kind and cash groups and evaluated whether the impact differed by women’s baseline BMI status.

Materials and Methods

The PAL. In 1997, Mexico started the implementation of PROGRESA (now called Oportunidades), a conditional cash transfer program. Due to the program’s health and education requirements, it was only available to communities with a nearby school and health clinic and thus excluded a number of poor rural communities without access to these services (14). Attending to the needs of these communities, the Mexican government launched PAL in 2003. The majority of PAL beneficiary households received in-kind transfers; households in some communities received the benefits in the form of a cash transfer. The program was designed as a conditional program, implying that receiving the benefits would be conditional on attending nutrition and health education sessions as well as participating in program-related logistic activities. These program conditionalities, however, were never strictly enforced.

The program was targeted at communities not receiving benefits from other federal food aid programs, having <2500 inhabitants, and with a high level of marginalization. Marginalization is a term used in Mexico for multidimensional poverty assessment at the community level. It takes into account housing quality (including the percent of households without piped water, sewage, and electricity), income (proportion of household <2 times the minimum wage), education (including illiteracy), and urbanization (15). Households were eligible if they fell below the “needs” poverty line as defined by the Mexican Ministry of Social Development. This needs line corresponds to an income level sufficient to cover basic needs in food consumption, health, and education (16).

Beneficiary households received either a cash transfer of 150 Mexican pesos/mo or a monthly food basket with a cost to the government of 150 pesos (equivalent to ~14 USD at the time of the evaluation). No adjustments for family size or composition were made. Households received the transfer once every 2 mo. The basket contained a number of staple and basic food products and powdered whole milk (Licensa), which is fortified with Zn, Fe, vitamin C, and folate. The composition of the food basket and the energy and nutrition composition of the fortified milk were reported elsewhere (13,17). The basket conformed to the Mexican norm for food aid programs (NOM-169-SSA1-1998), stipulating that food transfers need to provide at least 20% of the recommended daily energy and protein requirements (18). The basket was thus designed to contribute 450 kcal/d per adult in an average-sized household.

Randomization. A community (cluster) randomized, controlled intervention trial was used to evaluate the impact of the intervention and estimate the differential impact of the cash and in-kind transfers. A random sample of 235 rural communities was drawn from the pool of eligible communities in the southern and eastern regions of Mexico. After baseline data collection, the Ministry of Social Development randomly assigned 208 communities that were not receiving benefits from other federal food aid programs to 1 of 4 study groups (food basket without education, food basket with education, cash transfer with education, or control) and started program implementation in the treatment communities. Control communities were put on the waiting list for later incorporation into the program.

Minimum sample sizes were determined on the basis of power calculations to be able to observe a 17% increase in household food consumption. The calculations accounted for the community level intra-cluster correlation.

Using the number of observations and the SD of body weight specific to the study presented here, a program impact of 0.434 and 0.495 kg could be detected with 80% power and 5% level of significance (1-sided) in the food basket and cash group, respectively. For the BMI group-specific analyses, the minimal detectable differences were 0.082 kg (food basket) and 0.412 kg (cash) for women with a BMI ≥25 kg/m², 0.354 and 0.406 kg in the group with a BMI 25–30 kg/m², and 0.607 and 0.674 kg in the group of women with a BMI >30 kg/m².

Data sources and measurement. Within each community, a random sample of 33 households was drawn. The baseline survey was conducted from October 2003 to April 2004, before the program was implemented. The same communities and households were visited for the follow-up survey from October to December 2005, thus creating a longitudinal data set. Mean program exposure was 14 mo. Socio-demographic data were collected by experienced fieldworkers who were extensively trained. To minimize interviewer bias, fieldworkers were unaware of the program’s objectives and the group assignment to the extent possible. Height and weight measurements were obtained from all women 18–49 y of age by fieldworkers who were carefully standardized in taking anthropometric measurements (19).

Written informed consent for participation was obtained from the mother or the self-identified decision maker in each household. The study was approved by the Research, Biosafety and Ethics Commissions of the National Institute of Public Health in Mexico.

Statistical analyses. The impact of PAL on body weight was estimated in women 18–49 y of age who were not pregnant or lactating. All reported outcomes pertain to the individual level.

The correlation between the baseline and follow-up was sufficiently high (≥0.5) to warrant the use of a difference-in-difference model (20). This model compares the change in body weight from baseline to follow-up between study groups. The following model was estimated using Stata 12.0 (StataCorp):

$$\text{bodyweight} = \alpha_0 + \alpha_1 \cdot \text{time} + \alpha_2 \cdot \text{treatment} + \alpha_3 \cdot \text{age} \times \text{treatment} + \alpha_4 \cdot \text{individual} + \alpha_5 \cdot \text{agegroup} \times \text{time} + \alpha_6 \cdot \text{adult equivalent} + \epsilon$$

where time is baseline or follow-up, treatment is the type of treatment received, individual is the individual fixed effect, agegroup × time is the interaction term between the women’s age group and time, adult equivalent is the number of adult equivalents in the household.

The coefficient $\alpha_3$ represents the estimated treatment effect of the program. The fixed effects control for unobserved and time-invariant characteristics that may influence the outcome variable. We included the age × time interaction to control for changes in weight that vary by age group over time; the adult equivalent variable was added to control for changes in the number of adult equivalents in the household between baseline and follow-up. The data are presented as means and SE adjusted for clustering at the locality level using the Huber-White sandwich estimator. The model was estimated for all women and then separately by BMI group. The difference in impact between BMI groups was determined using a t test.

Based on information that a number of communities in the treatment arm without education set up education sessions themselves (21), the 2 food basket treatment arms were pooled in the analyses. An additional reason for pooling was that the PAL education component was delivered irregularly and was of low quality (22). Previous analyses showed that the impact on food consumption in the 2 food basket groups did not differ, confirming the similarity of both intervention groups (13). The impact of PAL on women’s weight was significant in both groups ($P < 0.05$) but did not significantly differ between the groups.

Cash and in-kind transfers increase body weight 379
Of the 208 communities randomly assigned to the 4 study groups after the baseline survey, 2 communities (corresponding to 66 households) refused to participate in the follow-up survey. A total of 749 women were excluded from the analysis because of missing or incomplete data. Full data were thus available for 3010 women (control: 53 communities, 721 women; food basket: 103 communities, 1503 women; cash: 53 communities, 786 women).

The program’s previously documented, large positive impact on household energy consumption provided a clear a priori direction for hypothesis testing. Given the hypothesis that the program would lead to a net increase in body weight, statistical theory dictated the use of 1-sided tests (23). Thus, 1-sided tests were reported for the double difference impact estimates. Two-sided tests were used for all other tests (i.e., comparison of the effect in the food basket and cash groups and comparisons of the effect across BMI groups). P < 0.05 was considered significant.

Results

Full data were available for 3010 women or 80% of the eligible sample (Fig. 1). This percentage was somewhat lower in the control group (76.2%) than in the food basket (81.0%) and cash groups (82.0%). Women excluded from the analyses were somewhat younger (2.3 y) and their mean weight was higher (2.7 kg), but they did not differ in other relevant characteristics. The total expenditure at baseline was <$2 USD/adult equivalent (Table 1). Well over 60% of the women were overweight or obese. About one-half had completed primary education. The mean time between baseline and follow-up was 22–23 mo. The study groups were well balanced at baseline.

At baseline, body weight did not significantly differ among study groups (Table 2). From baseline to follow-up, women’s body weight increased significantly in all 3 study groups. Weight

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Control</th>
<th>Food basket</th>
<th>Cash</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of adult equivalents</td>
<td>4.3 ± 0.1</td>
<td>4.3 ± 0.1</td>
<td>4.1 ± 0.1</td>
</tr>
<tr>
<td>Monthly total per adult equivalent expenditure, pesos</td>
<td>558 ± 28</td>
<td>524 ± 20</td>
<td>517 ± 21</td>
</tr>
<tr>
<td>Women</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age, y</td>
<td>34.1 ± 0.3</td>
<td>33.5 ± 0.2</td>
<td>33.6 ± 0.4</td>
</tr>
<tr>
<td>Height, m</td>
<td>150.9 ± 0.5</td>
<td>150.8 ± 0.3</td>
<td>151.4 ± 0.4</td>
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<tr>
<td>BMI groups</td>
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<td></td>
</tr>
<tr>
<td>&lt;18.5 kg/m², %</td>
<td>1.4</td>
<td>2.4</td>
<td>1.4</td>
</tr>
<tr>
<td>18.5–&lt;25 kg/m², %</td>
<td>34.4</td>
<td>33.3</td>
<td>32.7</td>
</tr>
<tr>
<td>25–30 kg/m², %</td>
<td>33.8</td>
<td>37.7</td>
<td>37.0</td>
</tr>
<tr>
<td>&gt;30 kg/m², %</td>
<td>30.4</td>
<td>26.6</td>
<td>28.9</td>
</tr>
<tr>
<td>Completed primary education, %</td>
<td>50.1</td>
<td>52.9</td>
<td>50.2</td>
</tr>
<tr>
<td>Time from baseline to follow-up, mo</td>
<td>22.7 ± 0.3</td>
<td>22.4 ± 0.2</td>
<td>22.5 ± 0.3</td>
</tr>
</tbody>
</table>

1 Based on information that a number of communities in the treatment arm without education set up education sessions themselves and that the PAL education component was delivered irregularly and was of low quality, the 2 food basket treatment arms were pooled in the analyses. Data are mean ± SEM (adjusted for clustering at the locality level using the Huber-White sandwich estimator) unless otherwise specified. PAL, Programa de Apoyo Alimentario.

2 None of the means significantly differed between study groups.
TABLE 2

<table>
<thead>
<tr>
<th>Variable</th>
<th>Baseline1,2</th>
<th>Follow-up1</th>
<th>Simple difference baseline to follow-up3</th>
<th>Difference-in-difference impact estimates4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Food basket</td>
<td>Control</td>
<td>Food basket vs. control</td>
</tr>
<tr>
<td></td>
<td>Cash</td>
<td></td>
<td>Cash</td>
<td>Cash vs. control</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Food basket vs. cash</td>
<td>Food basket vs. cash</td>
</tr>
<tr>
<td>All women</td>
<td>62.6</td>
<td>61.7</td>
<td>0.9</td>
<td>0.7</td>
</tr>
<tr>
<td>BMI &lt;25 kg/m²</td>
<td>62.7</td>
<td>62.2</td>
<td>0.5</td>
<td>0.6</td>
</tr>
<tr>
<td>BMI ≥25 kg/m²</td>
<td>63.0</td>
<td>63.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
<tr>
<td>By BMI group</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;25 kg/m²</td>
<td>62.7</td>
<td>62.2</td>
<td>0.5</td>
<td>0.6</td>
</tr>
<tr>
<td>≥25 kg/m²</td>
<td>63.0</td>
<td>63.0</td>
<td>0.0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

1 Baseline and follow-up values are mean group (which did not receive an intervention).
2 None of the means significantly differed between study groups.
3 Standard error of the mean (SEM) (adjusted for clustering at the locality level using the Huber-White sandwich estimator) from baseline to follow-up. *Different from 0, P < 0.05.*
4 Difference-in-difference impact estimates were estimated using individual fixed effects models. Covariates included the interaction between the individual's age group and the time of the survey and the number of adult equivalents in the household. *Different from 0, P < 0.05; **different from 0, P < 0.10; ***different from 0, P < 0.01.

Discussion

The first objective of this study was to estimate the impact of PAL on women's body weight. We showed that PAL led to excess weight gain in a population of already-overweight women. We also tested whether the program had a differential impact in the in-kind and cash groups. Relative to the control group, both the cash and in-kind transfer led to a significant increase in body weight. The difference in impact between the cash and in-kind groups was not significant. Finally, we analyzed program impact by baseline BMI and found that the greatest program impact was found in women who were obese at baseline.

We are not aware of similar published intervention studies that would allow us to compare the magnitude of the impact on women's weight found here. A calculation based on reported statistics from Mexico's National Nutrition Surveys indicates that the body weight of women living in Mexico's southern states increased by 280 g/y between 1999 and 2006 (24). The estimated annual increase in the control group was 423 g (or 800 g during the 22.7 mo between baseline and follow-up). The additional weight gain attributable to the program (295 g in the food basket and 224 g in the cash group, or an increase of 70 and 53%, respectively) is thus large compared with this already-steady secular trend.

The weight effect in women is most likely a consequence of excess energy consumption. Previous evaluation research on PAL showed that the program's food basket was associated with a 9.1% increase in energy consumption [equivalent to 227 kcal/adult equivalent · d]. The impact in the cash group (a 5.0% increase or 127 kcal/adult equivalent · d) was significantly smaller (13). Although not different from a statistical point of view, the larger magnitude of the weight impact in the in-kind group is consistent with the larger effect on energy consumption previously documented in this group. The larger impact in the cash group is in line with earlier evidence that in-kind transfers increase food consumption by more than receiving the equivalent amount in cash. The smaller marginal propensity to purchase food out of cash income than out of food has been shown in both nonexperimental [see, for instance, Senauer and Young (25)] and experimental studies [see, for instance, Fraker (26)]. Comparisons between the cash and in-kind transfers, however, must be interpreted with caution. A recent study showed that the local value of the food basket was an estimated 37% higher than the cost to the program (206 instead of 206).
evaluate the impact on household consumption by women cash group as well. Unfortunately, the study was not powered to the use of the additional resources might have occurred in the or nonfood items. A similar difference between BMI groups in consumption might have been different across BMI groups. In the food basket group, obese women might have simply added the food basket as a means to relieve household consumption might have had a greater weight impact in the obese than in the more physically active women with a lower BMI. A third possibility is related to the (presumably) more sedentary lifestyle of the obese women. A similar increase in energy consumption might have had a greater weight impact in the obese than in the more physically active women with a lower BMI. Finally, previous research suggests that the response to visual food cues depends on body weight [see, for instance (28)]. Unfortunately, the hypothesized pathways and their relative importance cannot be examined with the available data.

The randomized, controlled, longitudinal design and the use of difference-in-difference estimation are important strengths of our study, allowing us to attribute the observed effects to the intervention. A potential source of selection bias was the women (20%) excluded from the analyses due to missing values or because they did not participate in the follow-up survey. Given that the excluded women were heavier and that the greatest effect was found in women with the highest BMI, the exclusion most likely led to an underestimation of the program’s impact.

Our results have important policy implications. A key objective of the PAL program was to improve households’ dietary intake and nutritional status. The implicit assumption underlying PAL was that households provided with in-kind or cash transfers would then make the right healthy choices, resulting in better nutritional status of all family members. Our results show that this is not the case. Simply relieving household budget constraints is not sufficient to have the desired impact on nutrition: the program had an adverse effect on women’s weight and the impact on child growth was small (12). Higher BMI has been found to be significantly associated with higher all-cause mortality; the association is considerably stronger in obese adults than in normal-weight or overweight individuals. Berrington de Gonzalez et al. (29) estimated that every 5-unit increase in BMI was associated with a 31% increase in mortality risk. Under the assumption that the program would continue to have the same effect over time, the estimated impact on BMI after 10 y would be 2.1 units in the food basket group and 1.6 units in the cash group. The effect in the obese women would be 3.7 and 2.5 units in the food basket and cash groups, respectively.

Taken together, these findings are of concern, especially in light of the international commitment to radically reduce global poverty. The first of the Millennium Development Goals relates to poverty eradication and specifically seeks to reduce by one-half the proportion of people living on <$1 US/d and the proportion of people who suffer from hunger. We do not challenge the importance of development interventions aimed at improving household income. The widespread conditional cash transfer programs, for instance, have had a positive impact on the wellbeing of the poor, including on outcomes such as child growth (30). Programs such as PAL that provide households with a considerable amount of resources without a strong and effective behavior change communication (BCC) component,
however, might lead to unwanted weight gain in an already overweight population. Whether an improved and well-implemented BCC component would effectively help beneficiaries choose diets that improve child nutritional status and prevent adults from gaining excess weight cannot be answered by our study. More work in this area is urgently needed, however, as the evidence on how to make BCC effective in the context of conditional cash transfer programs is scant (30).

Acknowledgments
T.G.d.C. was responsible for the design of the field study and the data collection; P.G. and J.L.L. analyzed the data; J.L.L. wrote the report and P.G., T.G.d.C., and P.G. revised it for important intellectual content; and J.L.L. had primary responsibility for final content. All authors read and approved the final manuscript.

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