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A Food Transfer Program without a Formal Education Component Modifies Complementary Feeding Practices in Poor Rural Mexican Communities[1,2]

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Abstract

Background: Inadequate complementary feeding partially explains micronutrient deficiencies in the first 2 y of life. To prevent malnutrition, the Mexican government implemented the Programa de Apoyo Alimentario (PAL), which transferred either food baskets containing micronutrient-fortified milk and animal food products or cash to beneficiary families along with educational sessions.

Objective: This study evaluated the impact of PAL on 2 indicators of complementary feeding: minimum dietary diversity and consumption of iron-rich or iron-fortified foods in children aged 6–23 mo.

Methods: A secondary analysis of the original PAL evaluation design was conducted through a randomized community trial implemented with 3 intervention groups (food basket with education, food basket without education, and cash transfer with education) and a control. The impact of PAL after 14 mo of exposure was estimated in 2 cross-sectional groups of children aged 6–23 mo at baseline and at follow-up in a panel of 145 communities by using difference-in-difference models. Only children who lived in households and communities that were similar between treatment groups at baseline were included in the analysis. These children were identified by using a propensity score.

Results: Of the 3 intervention groups, when compared with the control, only the food basket without education group component increased the consumption of iron-rich or iron-fortified foods by 31.2 percentage points (PP) ($P < 0.01$) and the prevalence of minimum dietary diversity by 21.6 PP ($P < 0.01$).

Conclusion: These findings suggest that in order to improve dietary quality in children, food baskets that include fortified complementary foods may be more effective than cash transfers. The fact that the 2 food basket groups differed in the observed impact does not allow for more convincing conclusions to be made about the education component of the program. This trial was registered at clinicaltrials.gov as NCT01304888. *J Nutr* 2016;146:107–13.

Keywords: complementary feeding, food transfers, Mexico, dietary diversity, iron intake

Introduction

Micronutrient deficiencies in the first 2 y of life increase neonatal and infant death rate, delay growth, deteriorate cognitive function, and alter the immune response (1–4). An important aspect of research on micronutrient deficiencies has been timely and appropriate complementary feeding practices (CFPs)[4] in children aged 6–23 mo (5, 6). CFP is defined as the feeding process that should start at 6 mo when breast milk alone is no longer sufficient to cover an infant's energy and nutrient requirements. In medium- and low-income countries, it is common for complementary foods to be of low nutritional quality and administered too early or too late and in very small quantities (7). Worldwide data indicate that less than one-third of children aged 6–23 mo met the minimum criteria for dietary diversity and less than half received the minimal frequency of meals recommended for their age (8). In Mexico, CFPs are also inadequate; foods are introduced too early (before 6 mo) and include infant formulas, nutritional and nonnutritional liquids, fruits, and vegetables. Foods introduced later are of non-dairy animal origin such as meat, eggs, and fortified foods (9). The most recent NHANES revealed that in rural areas, only half of children between 6 and 11 mo consume iron-rich or iron-fortified

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[4] Abbreviations used: CE, cash transfer with education; CFP, complementary feeding practice; FB, food basket without education; FBE, food basket with education; PAL, Programa de Apoyo Alimentario; 24h-DR, 24-hour dietary recall.
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foods (46.6%) and 59.1% met the minimum criteria for dietary diversity (10).

Nutritional interventions directed at promoting adequate CFPs are one of the most effective strategies for preventing malnutrition and decreasing childhood morbidity and mortality (11). Mexico has implemented policies and programs for improving preschool nutrition (12, 13). In 2003 the federal government of Mexico created a food support program called Programa de Apoyo Alimentario (PAL) for isolated poor communities. Those communities with PAL were not eligible for the larger national conditional transfer program Oportunidades, now called Prospera, due to the lack of health centers and schools, which are institutions through which Prospera delivers its benefits and services to target families. PAL has been found to have an effect on reducing poverty (14) and improving the quality of the household diet, as shown by the increase in the consumption of fruits, vegetables, and animal-source foods (15). However, its effect on CFPs in children aged 6–23 mo has not been documented. The objective of this study was to evaluate the impact of PAL in its classic delivery package—food basket with education (FBE)—as well as in 2 alternative modalities— food basket without education (FB) and cash transfer with education (CE)—on 2 CFP indicators adapted from those proposed by WHO: minimum dietary diversity and consumption of iron-rich and iron-fortified foods in children aged 6–23 mo (16, 17). The second objective was to estimate the differential impact between cash transfers and food baskets with or without education.

Methods

PAL operation. The overall PAL objective was to improve the food consumption and nutritional status of its beneficiaries. Every 2 mo, the program provided food baskets with a monetary value of 14.00 US$ per month ($150 Mexican pesos/mo) from the federal government from 2003 through 2008. When communities were located far from the distribution center, an equivalent value in cash (14.00 US$/mo) was provided instead of the in-kind transfer (18). Food baskets included Liconsa powdered milk, which was fortified with Zn, Fe, vitamin C, and folic acid. The energy, nutritional composition, and impact on child nutritional status of Liconsa milk has been described in other publications (19, 20). The basket also contained other iron-rich foods of animal origin (**Table 1**). Program benefits for the CE and FBE communities were distributed on the condition that beneficiaries attend community-based health and nutrition educational sessions.

TABLE 1 Food basket composition

Food item	Quantity, kg or L
Powdered fortified milk[1]	1.92
Beans	2.00
Rice	2.00
Corn flour	3.00
Pasta	1.20
Vegetable oil	1.00
Cookies	1.00
Powdered chocolate	0.40
Corn starch	0.10
Cereal (ready to eat)	0.20
One of these foods	
Sardines/tuna	0.24
Dried meat	0.10
Lentils	0.50

[1] Energy and nutrient content in 48 g of fortified powder (400 mL reconstituted) milk is 236.8 kcal, 12.4 g protein, 12.4 g fat, 18.6 g carbohydrate, 178 mg sodium, 5.28 mg iron, 5.28 mg zinc, 216 μg Vitamin A RAE, 1.8 μg Vitamin D (D_2 + D_3), 48 mg Vitamin C, 0.44 μg Vitamin B-12, 32.1 μg folic acid, and 0.52 mg riboflavin.

Study design. Given that CFPs are relevant for children aged between 6 and 23 mo of age, for the secondary analysis we evaluated a cross-sectional group of children of this age at baseline (before the intervention) and a group of children of the same age who lived in the same communities during the follow-up survey, thereby creating a community longitudinal data set. It was not possible to create household panel data because the number of homes with children aged between 6 and 23 mo in both phases was very small (n = 14), lacking statistical power to test the impact. Complete data were obtained for 1,062 children aged 6–23 mo (**Figure 1**).

Because CFPs are assessed according to data reported by mothers, this study evaluated the effect PAL had on the mothers' behavior with regards to CFPs. This evaluation was based on a secondary analysis of the original PAL evaluation design, which was carried out within the context of a randomized community trial, where households within communities were selected through 2-stage random cluster sampling (18). In the first stage, a random sample of 359 rural communities was drawn from the pool of eligible communities in 8 of the poorest south-central states in Mexico (Chiapas, Guerrero, Oaxaca, Quintana Roo, Tabasco, Campeche, Yucatán, and Veracruz). Baseline information was collected from 235 communities; 124 were not eligible because they had already started PAL (n = 47), received the Oportunidades Program previously (n = 39), had both PAL and Oportunidades programs (n = 6), refused to participate (n = 8), were not found, or had a repeated census number (n = 24). In the second stage, 27 communities were eliminated because they received the Oportunidades Program (n = 26) or received PAL (n = 1). A constant number of households were chosen (n = 33) from within each community (n = 208) by systematic random sampling. Staff from the Secretary of Social Development (SEDESOL), who were the contracting officers, selected the study sample. The 208 selected communities were randomly allocated to 1 of the 4 study groups after baseline data collection: FB (n = 52), FBE (n = 52), CE (n = 53), and control (n = 51). The control communities did not receive any benefits during the evaluation phase. All the treatment communities (n = 157) and all eligible households received the intervention regardless of the presence of children in the household. Sample sizes were calculated with a 5% type I error and ≥80% statistical power with 2-tailed tests to identify significant differences between the treatment groups and the control group. A sample size of 33 households in each of the 208 treatment and control communities were selected. The minimum detectable mean differences in economic and nutrition variables between treatment and control groups from baseline to follow-up are given in parentheses: household food expenditure (3.36 US$), individual consumption of calories (110 kcal), energy adequacy rate (9%), number of foods and food groups consumed (3 and 0.3, respectively), total iron (0.9 mg), bioavailable iron (0.1 mg), total zinc (0.8 mg), and hemoglobin in children 6–59 mo of age (0.4 g/dL). The minimal detectable differences for the proportion of children who consumed foods rich in iron were 21% in FB, 20% in FBE, and 14% in CE. For the proportion of children who consumed ≥3 food groups the day before the survey, the minimal detectable differences were 17% in FB, 18% in FBE, and 18% in CE. The calculations accounted for the community level intra-cluster correlation. For the original PAL evaluation, baseline data were collected from October 2003 to April 2004 before the program was implemented. The same communities, households, and individuals were visited for the follow-up survey from October to December 2005, thus creating a longitudinal data set. For the reasons already described, only a cross-sectional sample of children between 6 and 23 mo of age were considered for this analysis. Mean exposure time to the program in those who received benefits was 14 ± 4.7 mo. The original plan was for the FBE and CE groups to participate in monthly educational sessions on nutrition and hygiene. Nevertheless, during the follow-up phase, the communities assigned to FB organized themselves to receive educational sessions on nutrition and hygiene, a process that was carried out independent of PAL and was not documented.

Data collection. Socioeconomic, demographic, and food consumption variables were collected by experienced and standardized fieldworkers. Dietary information was not collected with the same methodology at each stage of the study. At baseline, dietary information for children <2 y was collected with a 24-h dietary recall (24h-DR). At follow-up, data on

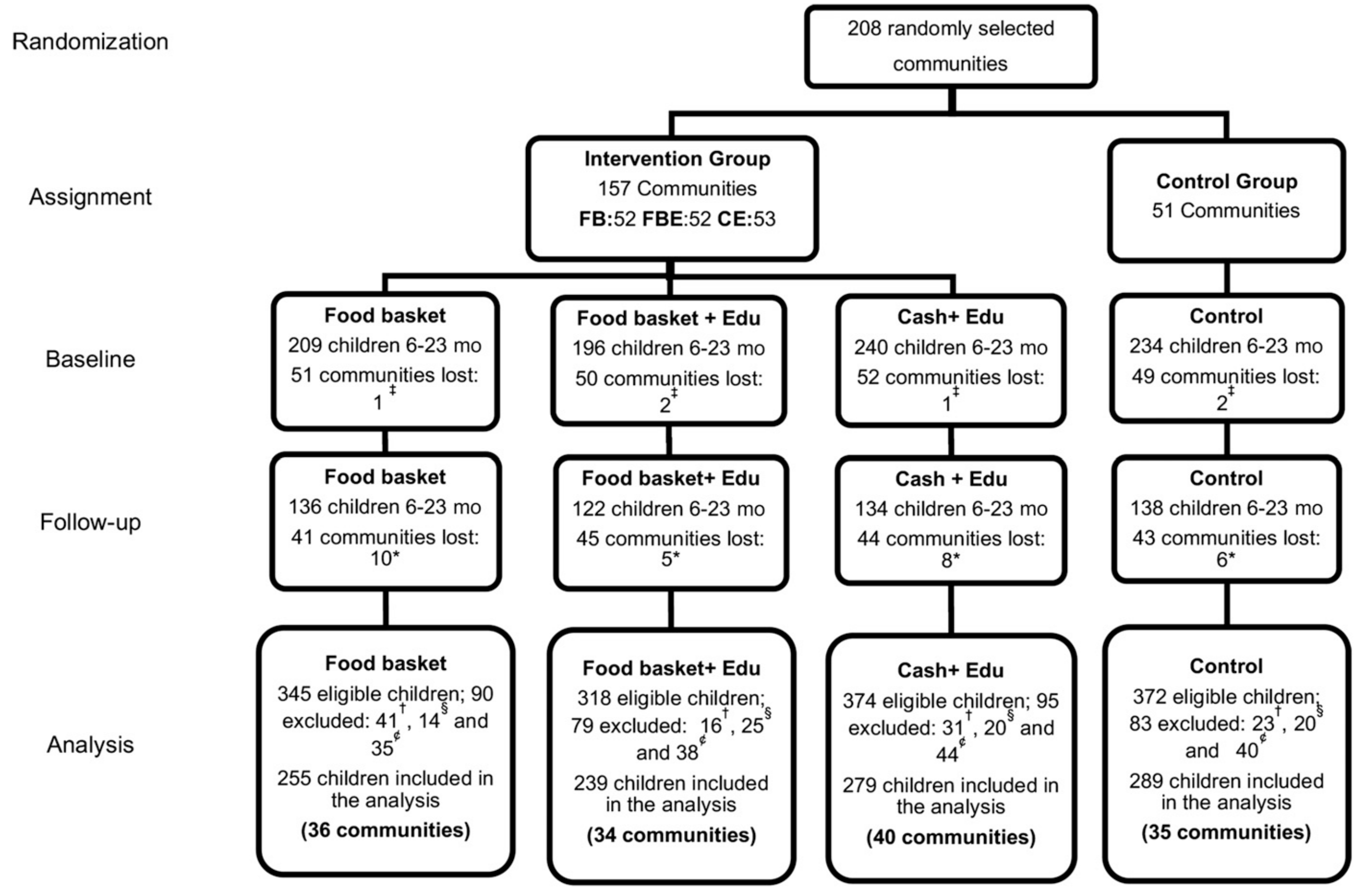

FIGURE 1 Flow diagram showing participant enrollment throughout the evaluation. ‡Communities without households with children aged 6–23 mo, and 2 communities refused to participate after randomization; *Communities without households with children aged 6–23 mo; †Children from nonpanel communities; §Children with propensity scores outside of the region of common support; ¢Children with missing data. CE, cash transfer with education; Edu, education; FB, food basket without education; FBE, food basket with education.

CFPs were collected through a specifically designed infant and young child feeding format consisting of a food list–based questionnaire to ascertain dietary consumption. The food items included on the food list–based questionnaire were those that covered 90% of children's energy consumption using dietary data collected from the Second National Nutrition Survey 1999 (21). The food list–based questionnaire was similar to the Food Frequency Questionnaire that was validated for the NHANES carried out in 2006 (22). In both cases, the interview was applied to the person in charge of the food preparation at home, which in most cases (>95%) was the mother of the child under study (18).

Construction of CFP indicators. Minimum dietary diversity and consumption of iron-rich or iron-fortified food indicators (17) were constructed and validated from 2 similar formats as follows: at baseline these indicators were derived from a quantitative 24h-DR and at follow-up from a qualitative food list–based questionnaire. The validity of this strategy was analyzed and is discussed.

The 24h-DR collects information on any food consumed, and the food list contained a specified list of food items, potentially under-estimating food diversity. Thus, to address the potential bias of using 2 different methodologies (23), we constructed adapted and nonadapted CFP indicators and used them as outcomes in this study. For comparability reasons, the adapted indicators were created by coding only those foods from the 24h-DR data that appear on the food list used during follow-up. The nonadapted indicators were created by coding all food items consumed by the child and reported in the 24h-DR without any consideration as to whether these foods appeared on the food list applied at follow-up.

Construction of the minimum food diversity indicator requires differentiation between fruits and vegetables rich in Vitamin A and those that are not. Given that our follow-up questionnaire did not differentiate fruits and vegetables according to their Vitamin A content, we collapsed this information into 1 indicator. Thus, the minimum food diversity indicator used in this study was constructed taking into account 6 and not 7 food groups as proposed by WHO (17). Consequently, the cutoff to declare diversity was established as consumption of at least 3 of 6 food groups, and not at least 4 of 7 food groups, during the day before the interview. Food groups used for the construction of this indicator were *1*) cereals, roots, and tubers; *2*) legumes and nuts; *3*) flesh foods (meat and alike); *4*) yogurt, cheese, and milk; *5*) eggs; and *6*) fruits and vegetables.

The indicator for consumption of iron-rich or iron-fortified foods was created as the proportion of children who received at least 1 of the following food items during the day before the interview: 1 iron-rich food or 1 food especially designed for infants and young children that was fortified with iron.

Data analysis. Demographic characteristics between treatment groups were compared using regression models adjusted for clustering on a community level. Preliminary analysis revealed that the follow-up study sample had a lower proportion of baseline basic services at the community level and a lower socioeconomic level than the study sample of households at baseline. For this reason, a propensity score (PS) for being in the follow-up was estimated in order to find a region of common support where the PS density distributions overlap. PS was estimated to identify households outside the region of common support and exclude them from the analysis. No matching method was used. The region of common support was estimated using the pscore command (STATA version 12) (24) considering the range of minimum and maximum PS that satisfies the balancing property. This allows for balanced distribution of baseline covariates to improve comparability between the groups at baseline and follow-up (25). We estimated the PS with a probit model considering baseline variables that could explain differences in the outcome variables of interest and that should be similarly distributed between groups in order to estimate the impact of the program. The individual level included child sex and age. The household level included ethnicity, mother's education, sex, age, and education of the head of household and socioeconomic status (SES). SES was estimated using an index generated with the first factor of the principal component factor analysis, which explained ~70% of total variance. The estimation included the standard deviation of the number of possessions including appliances, motor vehicles, floor, ceiling and wall materials, availability of electricity and water in the home, telephone, computer, and possession of real property. SES levels were defined as tertiles of the index and classified into high, medium, and low. The community level included percentage of homes in the community with dirt floors, overcrowding, lack of indoor plumbing, lack of electricity, lack of bathroom facilities, and percentage of communities with a population >15 y without complete primary school or those who were illiterate. Seventy-nine out of 1409 children from 26 communities were excluded from the analysis (from 8 communities at baseline and 18 at follow-up) because they had PS outside of the region of common support.

To evaluate the impact of the program on the 2 CFP indicators, difference-in-differences models, with fixed or random effects at the community level, were used (26, 27). Analysis was by intention-to-treat in the region of common support. The following model was fitted:

$$Y_{i,t} = \beta_0 + \sum_{j=1}^{3}\beta^J P_{i,j,t} + \beta_4 T_i + \sum_{j=1}^{3}\gamma^J\left(P_{i,j,t}{}^{*}T_i\right) + X_{i,t}^{K}\mu + v_i + u_{i,t} \qquad (1)$$

where *i* is individual, *j* is treatment group (1 FB, 2 FBE, and 3 CE and control group is the reference), and *t* is time (0 baseline and 1 follow-up).

$Y_{i,t}$ is the dependent variable of interest for the individual *i* and time *t* (minimum dietary diversity or consumption of iron-rich or iron-fortified foods). β_0 indicates the difference in control group from baseline to follow-up.

β^J and γ^J are the parameters to be estimated where J is the number of treatment groups. β^1, β^2, and β^3 indicate baseline difference for each treatment group with respect to control group. $P_{i,j,t}$ is a binary variable that indicates whether the individual *i* in time *t* is in a community with treatment *j* and 0 if not. The binary variable T_i takes on a value of 0 for the baseline phase and 1 for the follow-up phase for individual *i*. The model was adjusted for $X_{i,t}$ where *K* is the number of relevant baseline variables at the individual (sex, age, and mothers' education) and household level (socioeconomic status, ethnicity, head of household's sex, age and education, and the presence of children <5 y living in the household and receiving other programs such as Oportunidades or food baskets from Sistema Nacional para el Desarrollo Integral de la Familia). The parameters γ^1, γ^2, and γ^3 estimate the effect of the program in each treatment group *j*. The effect of PAL corresponds to the interaction term between time (T_i) and treatment groups ($P_{i,j,t}$). Impact is expressed in percentage points (PP), and it is the change (follow-up – baseline) in the indicator in each treatment group relative to the change in the control group adjusted for the covariates. The term $u_{i,t}$ is a random error representing unobserved factors that change over time, and v_i represent unobserved factors that do not change over time. Models considered clustering at the community level and robust standard errors were used to ensure efficiency in the error estimators. A Hausman specification test was performed to determine whether random effects estimators are efficient and consistent estimators ($P > 0.05$) compared with fixed effects models (28). The difference-in-differences method allows for elimination of invariant unobserved effects at the community level during the intervention period. These unobserved effects could bias the estimators due to correlation with the explanatory variables assuming that the randomization alone was not able to distribute all the variables (observed and nonobserved) randomly.

In addition to the comparisons made between each treatment group and the control, we estimated the differential impact between treatment groups using linear combinations with Bonferroni correction for 3 comparisons, with significance defined as $P < 0.016$. Also, as a sensitivity analysis, we estimated models considering all children (inside and outside the region of common support), adjusting for the PS instead of the baseline characteristics. The results and statistical significance (not shown) were very similar to those estimated with Equation *1*. The statistical analysis was carried out using STATA version 12 (29).

Results

Complete information was available for 145 communities (1062 children), corresponding to 70% of the original sample. Sixty-one communities were not included in the analysis because they had households without children aged 6–23 mo, they were nonpanel communities or had missing data, or they had PS outside the region of common support (Figure 1). In these excluded communities, mothers and heads of household had higher levels of education and there were a greater proportion of households with cement floors (nondirt floors), indoor plumbing, electricity, and sewage as than the communities that participated in the present analysis. **Table 2** describes characteristics of the 1062 children and their households included in the analysis after selection by propensity score. At baseline, there were statistically significant differences between the FBE and control groups for age and sex of the head of household. In addition, the percentage of girls in the FBE and FB groups was significantly greater than that of the control group. **Table 3** shows the program impact on the CFP indicators, with the use of difference-in-differences models. Results show that when compared with the control group, children aged 6–23 mo in the FB group increased their consumption of iron-rich and iron-fortified foods by 31.2 PP ($P < 0.01$) and their dietary diversity by 21.6 PP ($P < 0.01$). Children in the FBE and CE groups did not improve their CFP indicators relative to the control group. When comparing the effects among the 3 treatment groups, the FB group was significantly different than the FBE (Bonferroni adjusted; $P < 0.016$). No other differences among treatment groups were identified.

Similar results were found with nonadapted indicators. PAL in its FB modality increased the prevalence of consumption of iron-rich or iron-fortified food by 27.7 PP ($P < 0.01$) and the prevalence of minimum food diversity by 18.5 PP ($P < 0.05$) compared with the control group. No impact was observed on the FBE and CE groups for the nonadapted indicators analyzed.

Discussion

We evaluated the impact of 3 different modalities (FBE, FB, and CE) of the federal food aid program PAL on 2 unbiased CFP indicators in children aged 6–23 mo selected using a propensity score to ensure comparability. We documented that the FB communities organized themselves to provide for unofficial nutrition and health education sessions, rendering ambiguous the educational component.

Our results show that PAL, in its FB group, improved the nutritional quality of diets of beneficiary children; a larger percentage of children in this group consumed a minimum diverse diet and iron-rich and iron-fortified foods as compared with the control group. Children in the other 2 treatment groups (FBE and CE) received the formal educational component and did not improve their dietary quality, based on the 2 WHO complementary feeding indicators analyzed. When treatment groups were compared, FB was better than FBE; no other differences were found. Dietary diversity and consumption of iron-rich foods are both associated with a decreased risk of anemia and micronutrient deficiencies in several countries, including Mexico (30, 31). It has also been documented that social programs that include iron-rich or micronutrient-fortified complementary

TABLE 2 Sociodemographic characteristics of study subjects by treatment group and study phase after the propensity score[1]

	Baseline				Follow-up			
Variables	FB (n = 147)	FBE (n = 139)	CE (n = 171)	C (n = 172)	FB (n = 108)	FBE (n = 100)	CE (n = 108)	C (n = 117)
Child's characteristics								
Age,[2] mo	15.8 ± 5.1	15.1 ± 4.9	15.3 ± 4.6	14.9 ± 4.8	14.9 ± 4.9	15.0 ± 5.1	15.1 ± 5.1	14.7 ± 5.4
Women, %	44.2*	51.8*	49.1	41.9	46.3	45	51.9	61.5#
Household characteristics								
Mother's education,[2,3] y	5.4 ± 3.7	5.3 ± 3.5	5.2 ± 3.3	5.5 ± 3.7	5.4 ± 3.7	4.8 ± 3.1	5.0 ± 3.4	5.5 ± 3.7
Head of household age,[2] y	36.6 ± 13.3	33.6 ± 10.5*	36.3 ± 13.5	36.6 ± 13.8	36.1 ± 11.8	34.7 ± 10.7	35.2 ± 12.9	37.6 ± 13.6
Head of household education,[2] y	4.8 ± 3.8	4.9 ± 3.8	4.2 ± 3.7	4.5 ± 4.0	4.8 ± 3.7	4.3 ± 3.4	4.4 ± 3.9	4.1 ± 3.7
Indigenous ethnicity, %	32.0	17.3**	33.4	38.4	35.2	18.0	34.3	36.8
Socioeconomic level, %								
Low	41.5	48.2	48.0	50.6	44.4	48.0	52.8	53.8
Medium	32.6	28.8	28.6	25.0	31.5	38.0	25.9	23.9
High	25.9	23.0	23.4	24.4	24.1	14.0	21.3	22.2
Head of household gender, % men	94.6**	97.1*	94.2**	87.8	94.4	92.0	98.2*#	90.6
Receives complementary fortified food from Oportunidades, % yes	4.1	2.2	4.7	2.9	3.7	7.0#	4.6	9.4#
Receives cash from Oportunidades, % yes	10.2	6.5**	7.6**	19.2	7.4	8.0	7.4**	18.8
Receives scholarship from Oportunidades, % yes	2.0	6.5	2.9	4.7	0.9	5.0	1.8	5.1
Receives food basket from DIF, % yes	5.4	2.9	6.4	6.4	3.7	3.0	3.7#	5.1
Community characteristics								
Households without sewage or toilet, %	25.7	33.7	35.6	34.4	28.5	37.9	37.2	37.1
Households without electricity, %	16.6	27.8	27.3	23.1	22.6	34.7	32.0	25.3
Households without indoor plumbing, %	50.9	40.7	53.8	52.2	46.3	49.5	58.6	56.9
Households with dirt floor, %	44.0	45.3	50.5	51.6	47.0	52.4	51.7	54.8
Dependent variables								
Consumption of iron-rich or iron-fortified foods, %	32.0	36.0	31.6	33.1	56.5*#	48.0#	42.6	36.8
Minimum dietary diversity, %	62.6	72.7	69.6	72.7	67.6	58.0#	66.7	59.9#

[1] C, control; CE, cash transfer with education; DIF, System for Integral Family Development, a federally funded food subsidy program; FB, food basket without education; FBE, food basket with education. *,**Different from control: *$P < 0.05$, **$P < 0.10$. #Different from baseline within treatment group, $P < 0.05$.
[2] Values are means ± SDs.
[3] Excluding preschool education.

foods contribute to improving CFPs, especially in populations in which there is not adequate access to animal-source foods (5). PAL also distributed one such nutritive food, micronutrient-fortified Liconsa milk, in the food basket as well as sardines, tuna, or dried meat, so our results are consistent with other findings that show the positive effect of food distribution programs that contain nutritive-dense foods on the complementary feeding practices of young children. This finding is relevant, especially because the target communities were the poorest in the country, where the neediest populations are found and where social programs have the greatest potential benefit.

The fact that only the FB group improved their CFPs suggests that there might have been some unmeasured variant or unidentified factors, including the type and efficiency of the

TABLE 3 Impact of Programa de Apoyo Alimentario on consumption of iron-rich or iron-fortified foods and minimum dietary diversity in children between 6 and 23 mo of age of beneficiary communities

		Treatment groups[1]			
Outcome variables	Sample size, n	Food basket without education,[1] γ	Food basket with education,[2] γ	Cash transfer with education,[3] γ	Hausman test[2,3]
Adapted indicators, %					
Consumption of iron-rich or iron-fortified foods	1071	31.2 ± 10.1***,#	5.1 ± 8.6	4.9 ± 9.4	$P < 0.05$
Minimum dietary diversity	1062	21.6 ± 7.9***,#	−2.2 ± 9.3	10.6 ± 8.8	$P > 0.05$
Nonadapted indicators, %					
Consumption of iron-rich or iron-fortified foods	1071	27.7 ± 10.1***	6.5 ± 8.6	6.8 ± 9.4	$P < 0.05$
Minimum dietary diversity	1067	18.5 ± 8.0**	1.3 ± 9.1	10.5 ± 8.8	$P > 0.05$

[1] Values are regression coefficients ± SEs expressed as percentage points of change as compared with the control group. **,***Different from control: **$P < 0.05$; ***$P < 0.01$. #Different than the food basket with education group, Bonferroni correction, $P < 0.016$. Program impact is estimated by using difference-in-difference models with fixed or random effects adjusted for sex, age, mother's education, socioeconomic level, ethnicity, receiving the micronutrient fortified complementary food for children, cash, or scholarships from Oportunidades, food basket from the System for Integral Family Development (a federally funded food subsidy program), head of household's sex, age, and education and for the presence of children <5 y living in the household.
[2] Fixed effects, Hausman test, $P < 0.05$.
[3] Random effects, Hausman test, $P > 0.05$.

educational component, partially explaining the results. These unmeasured factors may be related to, or modify, food availability at the community or household level. During the evaluation and study period, a greater number of communities in the FB group had Diconsa stores (n = 23) compared with the other treatments (FBE = 15, CE = 15, and C = 9). Diconsa stores belong to staff from the Secretary of Social Development and supply basic food products at lower costs than local nongovernment-subsidized stores; food items in these Diconsa stores include micronutrient-fortified Liconsa milk. Information on the number of Diconsa stores in the study communities at baseline is unavailable, so the potential influence of availability of Diconsa stores on the quality of the child's diet cannot be tested. Another potential explanation for our findings includes the possibility that children in the FB group responded better to the overall available resources due to small, statistically nonsignificant but cumulative differences favoring this group; for example, they lived in households that were somewhat less poor (with fewer of low socioeconomic status; $P < 0.10$) and in communities with better basic services (sewage and electricity; $P < 0.10$) and tended to spend a bit more on food and on animal-food sources ($P < 0.10$) (18) than the rest of the treatment groups.

Our findings documenting a positive effect of PAL on the CFPs of children aged 6–23 mo are supported and strengthened by several study characteristics. First, we used data from a randomized community trial, which is the model for deriving causal inferences on observed associations. Second, the program distributed food items that explain their appearance in the child's diet. Given the age structure of the compared groups, it is impossible to evaluate the impact on the same children; i.e., measuring impact from a 14-mo intervention on the diet of children aged 6–23 mo must be done on different children. To address this challenge, similar comparison groups were identified using a propensity score, resulting in comparable groups on observed variables. Finally, evaluating the program impact through difference-in-differences models gives robustness to the analysis, improving the study's internal validity. On the other hand, the lack of information about the quality and type of education given, as well as the program adherence to the education sessions in the FB communities, is considered a limitation of this study. The use of 6 and not 7 food groups as the cutoff to assess minimum dietary diversity could also be considered a limitation of this study. Nevertheless, the objective of the study was to assess whether dietary diversity was modified by the effect of PAL, not to analyze the children's nutrient adequacy. Therefore, it is unlikely that this omission would have biased our results. A potential source of bias is the use of different measurement instruments between study phases. Nevertheless, similar results were found by using nonadapted indicators. Therefore, adaptation of the dietary instruments applied at baseline and follow-up affected the efficiency of the estimators but did not introduce bias into the impact estimation.

Our results have important policy implications. PAL currently provides monetary support of 20.60 US$/mo ($330 Mexican pesos/mo) to beneficiary families to contribute to their food costs. In addition, it provides a complementary monetary support of 8.75 US$/mo ($140 Mexican pesos/mo) to compensate families for the international increase in food costs (32). In the context of the National Crusade Against Hunger, PAL currently establishes that the amounts equivalent to the direct and complementary monetary support can be redirected to Diconsa stores.

The National Crusade Against Hunger is a strategy that was launched in 2013 by the federal government of Mexico to reduce hunger and poverty through social intervention (33).

If the results of this study are taken into account, it is important that the program administrators ensure the redirection of monetary support to acquire food in Diconsa stores in order to ensure that the money is used by beneficiaries to acquire food products such as Liconsa milk.

Taken together, the findings suggest that in order to improve dietary quality in children aged 6–23 mo, food baskets that include fortified complementary foods such as Liconsa milk or other animal food products such as sardines, tuna, or dried meat may be more effective than cash transfers in communities with similar characteristics to those of PAL. However, the fact that both food baskets groups differed on the observed impact, in addition to the lack of information about the unofficial education provided in the FB group, does not allow for more convincing conclusions to be made. Additionally, the contamination that existed between the treatment groups does not allow conclusions to be made about the effectiveness of the education component. Nevertheless, it is important to question the quality of education provided through social programs similar to PAL. A qualitative evaluation of PAL documented that education was provided by a member of the beneficiary committee chosen democratically. For many of these people, assuming this responsibility was an undesired burden (34). In addition, the qualitative evaluation concluded that despite willingness on the part of the facilitator, they often did not possess the resources and human talent to complete this function, resulting in situations that worsened the quality of the educational intervention (34). Social programs must make an effort to ensure that the education provided is of high quality and avoids adding an unnecessary burden at the operational level that wears down facilitators and beneficiaries.

Acknowledgments

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