The *Oportunidades* conditional cash transfer program:

Impacts on pregnancy and contraceptive use in young rural women in Mexico

Blair G Darney, PhD, MPH[1]

Marcia R Weaver, PhD [2, 3]

Sandra G. Sosa-Rubi, PhD[4]

Dilys Walker, MD [3, 4,5]

Edson Servan-Mori, MS [4]

Sarah Prager, MD, MAS [2,5]

Emmanuela Gakidou, PhD [2, 3, 6]

[1] Department of Medical Informatics and Clinical Epidemiology, Oregon Health & Science University, Portland, OR

[2]Department of Health Services, University of Washington, Seattle, WA

[3]Department of Global Health, University of Washington, Seattle, WA

[4] Instituto Nacional de Salud Publica (INSP), Cuernavaca, Mexico

[5] Department of OB/Gyn, University of Washington, Seattle, WA

[6] Institute for Health Metrics and Evaluation, Seattle, WA

Dr Darney was a Doctoral student, Department of Health Services, University of Washington, at the time of this analysis

corresponding author: darneyb@ohsu.edu

key words: Conditional Cash Transfer, adolescent pregnancy, contraceptive use, Mexico, evaluation, Oportunidades

Abstract

Background *Oportunidades* is a large conditional cash transfer (CCT) program in Mexico. This analysis sought to measure program effects on pregnancy and contraceptive use among young rural women beyond the documented effects of education.

Methods We used three waves of the ENADID, a population-based survey, to describe trends in outcomes and education among women 15 to 24 years of age. We developed a matched sample from the 2006 survey, used multivariable logistic regression, calculated predicted probabilities, and estimated indirect effects to estimate program impacts.

Results The proportion of rural young women 15-24 reporting any pregnancy stayed flat, while contraceptive use increased steadily (13.2% in 1992 to 18.9% in 2009), but remained low. School attendance by young rural Mexican women increased dramatically. In multivariable analyses, exposure to *Oportunidades* is not independently significantly associated with reduced odds of reporting any pregnancy among young women 15-19 (OR = .74; CI = .53, 1.04) after controlling for education.Being in school has a strong direct negative effect (OR = 0.53; CI = .35, .80), and school appears to be a mediator; *Oportunidades* has a small indirect effect on pregnancy via school. Education, marriage, previous pregnancy, and access to health insurance are significantly associated with increased odds of contraceptive use, exposure to *Oportunidades* is not.

Conclusion We do not find evidence that *Oportunidades* has impacts on adolescent pregnancy and young women's contraceptive use above and beyond the impacts of education and other covariates. Education was associated with a decreased probability of reporting a pregnancy among adolescents and an increased probability of contraceptive

use. Through its effect on education, *Oportunidades* indirectly impacts fertility among adolescents. It is important for Mexico to focus on policies that will increase the use of contraception among women aged 15-24 years, regardless of whether they are enrolled in *Oportunidades*.

Background

Much of Latin America has experienced drastic declines in fertility over the past 3 decades; total fertility rates [1] have dropped from 5.1 children in the mid-1970s to 2.5 children in 2005 [2]. Mexico has followed this trend, and has had an explicit population policy since the 1970s [3]. Despite progress at the national level, disparities persist with poor, rural and indigenous women having lower rates of contraceptive use and higher fertility rates. Further, adolescent fertility has not declined at the same pace [4]. Sixteen percent of all births were among adolescents (women 15-19) in 2006, with a greater burden of early fertility (under 18 years) among rural adolescents[5]. Early pregnancy is associated with adverse health outcomes for women and children[6], increased total fertility [7], and poverty [8].

Conditional cash transfer (CCT) programs are one approach to poverty reduction [9]. CCTs have been implemented in several countries in Latin America [10,11] and sub-Saharan Africa [12], and in India [13], Bangladesh, Nepal, and the United States [14,15]. CCTs have been shown to increase utilization of conditionalities, [9,16,17] but evidence about their effect on health outcomes has been mixed. In Mexico, the *Oportunidades* cash transfer program has been shown to have a positive impacts on infant and child mortality, [18] child growth, health[19] and cognition [20,21], and schooling [20] .

The *Oportunidades* program (formerly called *PROGRESA*), which aims to reduce poverty [20] and develop human capital[19] in poor households via improvements in child nutrition, health, and education, was established in 1997 by the Mexican government and is the largest CCT of its kind [11]. *Oportundiades* transfers cash to female household heads/wives of household heads, called *titulares,* on the condition that families comply with gender and age-specific health services utilization, nutrition, and

education requirements [20,22]. The program now covers five million families in all 32 Mexican states, [23] 86% of whom reside in rural areas, and has the largest budget of any federal human development program in Mexico [24] . Details of the program, the cash transfer [25], and the experimental phase (1998-2000) have been published elsewhere [11,22].

The *Oportunidades* program design reflects a belief that a comprehensive approach to building human capital by investing in mothers and children has broad social returns [25]; among these returns may be impacts on fertility [10]. Research on reproductive behaviors and outcomes has focused on improvements in antenatal care [22,23], [26] and deliveries attended by a doctor or nurse [27] associated with exposure to *Oportunidades* and also documented disparities within the program [23,28] . *Oportunidades* increased contraceptive use among female heads of household compared to controls in the experimental period (1998-2000) [2,10], with potentially larger impacts among the poorest women [29], but did not affect birth spacing between 1998-2003 [2]. One study reports a negative but non-significant impact on pregnancy and childbirth among younger women (under 20 years) during the short-term follow-up experimental period (1998-2000) after controlling for education [10]. In 2007, *Oportunidades* program data suggested that 57% of exposed women of reproductive age (15-49) reported using contraceptives, and there is evidence that the proportion of women 15-19 who were cohabiting or already had a child and reported using contraceptives increased over time [23] .

Oportunidades could impact fertility behaviors by at least three mechanisms, including increased education, access to health services and health information, and

income levels[11]. Increases in female education have consistently been shown to have an independent association with decreased fertility [30]. *Oportunidades* explicitly encourages female children to remain in school via a higher cash transfer for girls and for secondary school versus primary school [22]' and the program has shown a positive impact on grade level achieved [31] with a greater impact for girls than for boys and among indigenous children [32]. Improved access to health care and increased knowledge about contraception may also lower pregnancy among adolescents or increase contraceptive use among young women. *Oportunidades* requires adolescents as well as adults to have a medical check-up every six months, which would be an opportunity to discuss reproductive health and learn about contraceptives,[11][25] but payment is not conditional on it. Finally, a benefit such as the *Oportunidades* program may create perverse incentives: a cash transfer may encourage fertility through higher payments for more children [33] or reductions in male migration [11], but there is no evidence of higher fertility among female heads of household [10,25].

Research on reproductive outcomes to date has focused exclusively on female heads of household of all reproductive ages (15-49) and has relied on *Oportunidades* program data. This analysis includes uses population-based data from women aged 15-24 to examine the direct effect of *Oportunidades* on pregnancy and contraceptive use among young rural women in Mexico.

Methods

We used three waves (1992, 2006, 2009) of a nationally representative demographic survey to describe trends in pregnancy and contraceptive use; the 1992 wave occurred

before the start of *Oportunidades*. We used the 2006 wave to test associations of exposure to *Oportunidades* and reproductive outcomes among rural women aged 15-24.

The ENADID (Encuesta Nacional de la Dinámica Demográfica/National Demographic Survey), fielded by INEGI (Instituto Nacional de Estadística y Geografía), is a 2-stage stratified probability sample from all 32 Mexican states, stratified by locality size and representative at the state level [34]. All three waves of ENADID include household and individual-level data and a reproductive health module for women 15-54. We used the ENADID 1992, 2006, and 2009 to describe trends in our two outcomes among rural women aged 15-24. We used the 2006 survey, which includes 142,961 individuals, to estimate the association of exposure to *Oportunidades* and ever having a pregnancy and current contraceptive use. ENADID was also fielded in 1997, but we were unable to use the 1997 wave due to poor data quality of the variables of interest. The ENADID 2009 is the most recent demographic survey, but does not contain an *Oportunidades* exposure variable.

Sample

We restricted all three datasets to women aged 15-24 residing in rural areas (defined in all waves as <2500 inhabitants). We split the samples into adolescents (15-19) and young women (20-24). We restricted our multivariable model of pregnancy to women 15-19 to exclude pregnancies that could have predated exposure to *Oportunidades*.

Dependent variables

Our two outcomes are pregnancy and current contraceptive use. All women 15-54 were asked "Have you ever been pregnant?" Women were also asked if they were currently pregnant. Our measure of pregnancy includes both of these items to capture ongoing and

previous pregnancy. All women 15-54 were asked about knowledge of contraceptive methods. For any methods they reported knowing about, they were asked if they had ever used the method. All women who reported ever using at least one method were then asked whether they currently used any method. Method includes male and female sterilization and "natural" methods as well as barrier, hormonal, and long-acting modern contraceptive methods. In our analysis, women who reported not ever using any method and therefore not asked about current use were coded as not currently using a method. In our multivariable analyses, we used responses about each type of method to construct an indicator of current use of a modern contraceptive method, excluding "natural" methods. We also describe age at first birth and total number of live births although numbers were too small among adolescents to allow for multivariable examination of these outcomes.

Independent variables

***Oportunidades* exposure** was measured in the ENADID 2006 by asking " are you or anyone in the household currently a beneficiary of *Oportunidades*?" We used three different education variables in the analyses: 1) completed **education** level grouped into three categories: primary school or lower, *secundaria* (US eighth grade equivalent), and greater than *secundaria* (high school and beyond, technical school, etc); 2) indicator of whether the woman was attending school at the time of the survey and; 3) completed education level of the head of the household grouped into four categories (none/primary, 8th grade equivalent, high school equivalent, above high school). **Marital** status is a binary variable measuring any exposure to marriage or cohabitation (ever married, widowed, divorced, living in a "free union", etc). Divorce and widowhood were not common in our young sample. Exposure to marriage is one of the proximate determinants

of fertility [35], and is used as a proxy for sexual activity. **Indigenous** status is measured by asking if the respondent speaks any indigenous language(s). We also created a variable to assign whether the head of household spoke any indigenous language – the Mexican government's preferred definition of indigenous status [36]. We measured access to health **insurance** and exposure to any **other social programs**. Household composition could affect fertility decisions [10] and is part of *Oportunidades* selection criteria and the calculation of cash payments to enrolled families. We measured **household composition** with the total number of individuals in the household, number over 60, and number of women aged 15-49, a proxy for the fertility potential of a household. Finally, we constructed an **asset-based wealth index** using factor analysis [37] and household-level data from the full sample (N=142, 961) based on five household characteristics (floor and roof materials, water source, electricity, fuel type used for cooking) and 12 items of personal property (radio, TV, DVD player, refrigerator, blender, washing machine, heater, water heater, car, telephone, cell phone, computer). We divided the index into deciles, then collapsed the deciles into three categories (deciles 1 and 2, 3 and 4, 5 and above) to capture variation in our rural, poor sample. We collapsed the 32 Mexican states into 6 **regions** by wealth [5]. We dropped the richest region, which included only Mexico City, D.F., since it is not rural.

Matching

We preprocessed the ENADID 2006 data prior to multivariable analysis using the coarsened exact matching technique[38,39] to render the exposed and non-exposed samples as similar as possible, balancing key covariates. Matching can improve causal inference in observational studies by reducing model dependence [38]. Coarsened exact

matching does not require specifying a model like propensity score matching. We selected matching variables by examining covariate imbalance in the full sample and considering inclusion criteria for the *Oportunidades* program. We aimed to achieve a sample that retained as many treated observations as possible while also improving balance on covariates. We matched on age (by year), education level (3 levels), head of household education level (3 levels), currently in school, marital status, speak an indigenous language, exposure to other social programs, number of reproductive aged women in the household, and wealth index. After matching, the L1 multivariate distance, an indicator of the overlap of the variable distributions of the two samples with 1 indicating no overlap and zero complete overlap [40], was .73, improved from .99 prior to matching; 95.8% of the sample matched. Thirty-one out of 1,892 exposed observations (1.6%) did not match and 129 of 1922 (6.7%) unexposed observations did not match; the final analytic sample of rural women 15-24 was 3,654. (See Table 2 for characteristics of the matched sample)

Analysis

We used proportions and means to characterize trends in outcomes and education over time (1992, 2006, 2009) among all rural women 15-19 and 20-24. We restricted the pregnancy model to adolescents (15-19) and included a measure of whether the adolescent was currently in school as many adolescents have not completed their education. In the contraceptive use model, we included level of education completed. We used multivariable logistic models to test the association of exposure to *Oporunidades* with reporting pregnancy and current use of a modern contraceptive method or sterilization that are not measured by its effects on education and other covariates. We

transformed odds ratios into predicted probabilities using Clarify [41] to ease interpretation of absolute and relative impacts [42]. We performed five sensitivity analyses including estimates with: 1) region as a fixed and as a random effect, 2) an interaction of *Oportunidades* and education level, 3) an indicator of head of household or wife of head of household status (vs child or other relation to the head of household), 4) wealth index decile categories, and 5) replacing individual-level indigenous language with head of household indigenous language. Our models were robust to these sensitivity analyses; we present only the main models below. To further explore the relationship of *Oportunidades*, school attendance, and adolescent pregnancy, we also estimated indirect effects of *Oportunidades* on pregnancy mediated by schooling, with a structural equation model [43] and found that our results are not sensitive to the choice of model. All analyses were done using STATA version 12 [44].

Results

The proportion of rural young women 15-24 reporting any pregnancy appeared to decrease between 1992 and 2006 (36.1% to 32.5%), then rise again in 2009 (35.7%)(figure 1 and table 1). Age at first birth has remained flat at about 18 years over the 17 year period, while contraceptive use (current use of any method, including sterilization) is steadily increasing (13.2% in 1992 to 18.9% in 2009), but remains extremely low. We see disparities in pregnancy between rural young women and those living in large urban areas (100,000+ inhabitants), but not in contraceptive use (fig 1). By contrast, between 1992 and 2009 school attendance by young rural Mexican women has increased dramatically; 46.2% of young women completed 8th grade (*secundaria*) in

2009, compared with 28% in 1992 (Figure 2 and table 1). Disparities in education among women residing in rural areas and large urban areas persist, however (fig 2).

Tables 3 and 4 show the results of the logistic regressions. Exposure to *Oportunidades* is not significantly associated with reduced odds of reporting any pregnancy among young women 15-19 (OR = .74; CI = .53, 1.04) above and beyond the effect of being in school (Table 3). Adolescents who report being married or cohabiting have greatly increased odds of pregnancy (OR = 48.76; CI = 33.95, 70.02), while the number of reproductive age women in the household is associated with lower odds of pregnancy (OR = .69; CI = .55, .86). An adolescent exposed to *Oportunidades* and currently in school has a predicted probability of pregnancy of .05 (CI = .04, .08), holding all other covariates at the mean, while an adolescent in school but not exposed to Oportunidades has a probability of .07 (.05, .10). Adolescents in *Oportunidades* who are not in school have a .10 (CI = .07, .12) probability of pregnancy while those with neither have a .13 (CI = .10, .16) probability. The structural equation model (not shown) confirmed the strong, direct negative association of being in school on pregnancy, and also supports the findings of the predicted probabilities; we see a small indirect negative effect (p=.05) of *Oportunidades* on pregnancy via school; the proportion of the total *Oportunidades* effect mediated by school is 9.3%.

Contraceptive use tells a similar story; current use among the entire rural sample is about 16%, but very different by age; overall, just 6% of adolescents report current use, while nearly 29% of women 20-24 do (Table 1). A smaller proportion of young women 15-24 exposed to *Oportunidades* report using any modern contraceptive method (including sterilization) (9.3% vs 16.8% among the not exposed) in the matched sample

(Table 2). In multivariable analyses, *Oportunidades* has no direct effect on contraceptive use among adolescents (15-19) or young women (20-24) beyond its effect through other potential pathways such as education, marriage, prior pregnancy, or access to health insurance (Table 4). Our findings reveal that having health insurance is strongly associated with a higher probability of using modern contraception. Predicted probabilities were higher for married women who reported a pregnancy (.41 among those with health insurance and *Oportunidades*; .34 among those with neither), consistent with the relationship between marriage, any pregnancy, and contraceptive use in the logistic model. In models stratified by marital status, health insurance was not independently associated with use of modern contraception among unmarried women, but previous pregnancy had an even stronger effect (data not shown). Speaking an indigenous language was not independently associated with either outcome.

Discussion

In this analysis we sought to capture the effect of enrollment in *Oportunidades* on young women's reproductive behaviors beyond the effect of the program on education and other key covariates. We find no evidence of such effects on pregnancy among adolescents (15-19) or contraceptive use among women 15-24. We also find no evidence that *Oportunidades* increases pregnancy among young beneficiaries. Our findings suggest that school partially mediates the impact of *Oportunidades* on adolescent pregnancy. Our measures of education—being currently in school and level of education completed—are associated with both a reduction in risk of pregnancy and increased odds of contraceptive use, respectively.

We found lower a prevalence of contraceptive use in our matched sample than previously reported among *Oportunidades* beneficiaries [23]. This is likely partially due to our younger sample; contraceptive use among women in the 15-24 year age groups was comparable among rural and urban women in the 2009 data. Previous reports suggested increases in contraceptive use over 10 years among married *Oportunidades* beneficiaries aged 15-19 with at least one child [23]. We also find that marriage/cohabitation or reporting a pregnancy are strong correlates of using a modern contraceptive method, but we find no evidence of an additional impact of *Oportunidades*.

An effect of *Oportunidades* beyond its effect on education might have been expected because of the required biannual check-ups for adolescents and adults. These visits many not have occurred, because cash payments were not conditional on them. Or the visits may have occurred, but the visits did not address reproductive health and contraception because the program did not dictate the content of the visits. Finally, the visits may have occurred and addressed these issues, and access health care and better information were simply ineffective.

Speaking an indigenous language was not significantly correlated with either pregnancy or contraceptive use, although results suggest that women who report speaking an indigenous language may be less likely to report a pregnancy and to use a contraceptive method; our samples may be too small to detect significant differences. Previous work using *Oportunidades* program data has found disparities in antenatal and obstetric care by indigenous status [27,28], and disparities in health outcomes by indigenous status certainly remains of pressing concern in Mexico.

Health insurance affiliation was associated with contraceptive use in this population of rural, poor women. Our measure of health insurance may be a proxy for access to and supply of services. *Oportunidades* beneficiaries are automatically eligible to enroll in *Seguro Popular* [45], a large-scale social welfare policy reform initiated in 2002 to provide universal health insurance in Mexico, which covers family planning services [46]. In contrast, *Oportuniudades* provides family planning services only in the context of antenatal or postpartum care [47]; in our sample marriage and previous pregnancy were associated with contraceptive use, consistent with this scenario. Some unmarried young women in our sample are sexually active, and among these women, health insurance was not associated with contraceptive use, but previous pregnancy was, further highlighting the role of fertility in uptake of contraceptive services. Supply of services or a proxy of supply has been found to be correlated with increased contraceptive use among the poor [48]. Latin America has the largest inequalities in contraceptive use by wealth compared with Sub-Saharan Africa and South and Southeast Asia ,[48] with additional disparities in access and utilization by age; married adolescents (15-19) report more unmet need for contraceptive services than married women 20-24[5]. Supply and access, via health insurance, may be the key to increasing contraceptive use in this young, poor population. Services must be accessible, good quality [6], and targeted at poor young women to increase utilization.

Education levels have improved markedly since 1992 among rural women 15-24, and contraceptive use has increased. However, we do not see a consistent decline in reporting a pregnancy in our descriptive analysis while we do see a strong correlation between being in school and reduced odds of pregnancy in our multivariable cross-

sectional analysis. These results suggest that being in school, rather than a threshold level of education, delays pregnancy. *Oportunidades* provides an incentive for adolescents to remain in school and living at home—the cash transfer to the head of household is conditional upon school attendance. Enrollment in *Oportunidades* is capped; when families leave the program, new ones can enter, but there is not a broad incentive for young women to establish their own households to receive benefits, which has been one explanation for why fertility has not increased under the program [10].

It is important to evaluate large-scale social policies like *Oportunidades* rigorously and thoroughly and on an ongoing basis; Mexico invests 100 million pesos per year (about 8 million USD) [24]in the program and assessment of program impacts is hindered by lack of population-based longitudinal data with the necessary information on program exposure. In our analysis we have used data from 2006, which represents the most recent population-based dataset to assess the effects of the program.

Our results suggest that access to contraceptive services, which is one strategy to delay early fertility, needs to be expanded to nulliparous women, because the current *Oportunidades* benefits are only associated with prenatal care. Our results further indicate that access to health insurance plays a role in contraceptive use. *Oportunidades* enrollment may facilitate enrollment in *Seguro Popular*, and newer data sources from the *Seguro Popular* program may allow us to examine impacts on contraceptive use among *Oportunidades* beneficiaries in the future.

Our results should be interpreted with the following limitations in mind. First, we are able to assess the impact of *Oportunidades* at only one timepoint (2006) and we may not have sufficient power to detect true differences, because some of our results are based

on small numbers of women within a subsample. Other available datasets (e.g. ENSA 2000, ENED 2002, ENSAR 2003, ENADID 2009) do not contain an *Oportunidades* exposure variable, or had too much missing data on reproductive outcomes (ENSA 2000, ENSANut 2005). Second, our dataset does not include information on the length of exposure to *Oportunidades* and our measure of exposure is self-reported. Further, our exposure variable asks about current exposure but may not capture those who were previously exposed but left the program. Previous research among beneficiaries of the program has found mixed results by length of exposure [23,29]. We restricted our pregnancy models to women aged 15-19 to avoid including any pregnancies that could have occurred prior to program inclusion in 1998 or 2000. Third, our variables of interest are all self-reported. If there is systematic variation in responses by exposure to *Oportunidades*, it would introduce bias. However, the population-based data we use is likely less biased than the program data used by previous analyses. Finally, we are inferring causal relationship from an observational study; this analysis is subject to the limitations of all observational studies, such as potential omitted variables bias. We used a matched sample to reduce model dependence and performed sensitivity analyses to assess the robustness of our results.

In conclusion, we do not find evidence that *Oportunidades* has had an effect on adolescent pregnancy and young women's contraceptive use above and beyond the program's impacts of education. Education was associated with an increased probability of contraceptive use and decreased probability of reporting a pregnancy among adolescents, and our findings suggest that *Oportunidades* may indirectly impact fertility among adolescents by keeping young girls enrolled in schools, which is a

requirement of the program. The overall level of contraceptive use remains very low throughout the country, and especially among younger women. Regardless of *Oportunidades* enrollment, Mexico should explicitly target policies to reduce fertility among nulliparous young women.

References

1. Preston SH, Heuveline P, Guillot M (2001) Fertility and reproduction (chapter 5). In: Preston SH, Heuveline P, Guillot M, editors. Demography. Malden, MA: Blackwell.
2. Feldman BS, Zaslavsky AM, Ezzati M, Peterson KE, Mitchell M (2009) Contraceptive use, birth spacing, and autonomy: An analysis of the Oportunidades program in rural Mexico. Studies in Family Planning 40: 51-62.
3. Potter JE (1999) The persistence of outmoded contraceptive regimes: The cases of Mexico and Brazil. Population and Development Review 25: 703-739.
4. Florez Nieto CE, Nunez J (2001) Teenage childbearing in Latin American countries. In: Andes Udl, editor: Inter-American Development Bank.
5. Juarez F, Luis Palma J, Singh S, Bankole A (2010) Las necesidades de salud sexual y reproductiva de las adolescentes en Mexico: Retos y oportunidades. New York: Guttmacher Institute.
6. Cleland J, Bernstein S, Ezeh A, Faundes A, Glasier A, et al. (2006) Family Planning: The unfinished agenda. Lancet 368: 18-24.
7. World Health Organization (2011) WHO guidelines on preventing early pregnancy and poor reproductive health outcomes among adolescents in developing countries. Geneva: World Health Organization.
8. United Nations Population Fund (2005) Reducing poverty and acheiving the Millenium Development Goals: Arguments for investing in reproductive health and rights. New York: United Nations Poulation Fund (UNFPA).
9. Lagarde M, Haines A, Palmer N (2007) Conditional cash transfers for improving uptake of health interventions in low- and middle-income countries. A systematic review. JAMA 298: 1900-1910.
10. Stecklov G, Winters P, Todd J, Regalia F (2007) Unintended effects of poverty programmes on childbearing in less developed countries: Experimental evidence from Latin America. Population Studies 61: 125-140.
11. Fernald LC, Gertler PJ, Neufeld LM (2008) Role of cash in conditional cash transfer programmes for child health, growth, and development: An analysis of Mexico's Oportunidades. Lancet 371: 828-837.
12. Baird SJ, Garfein RS, McIntosh CT, Ozler B (2012) Effectof a csah transfer programme for schooling on prevalence of HIV and herpes simplex type 2 in Malawi: a cluster randomised trial. Lancet published online Feb 15, 2012.
13. Lim SS, Dandona L, Hoisington JA, James SL, Hogan MC, et al. (2010) India's Janani Suraksha Yojana, a conditional cash transfer programme to increase births in health facilities: An impact evaluation. Lancet 375: 2009-2023.
14. Riccio J, Dechausay N, Greenberg D, Miller C, Rucks Z, et al. (2010) Towards reduced poverty across generations. Early findings from New York City's conditional cash transfer program. Oakland, CA: mdrc.
15. Bosman J (2010) City will stop paying the poor for good behavior. New York Times. New York. pp. 1.
16. Gaarder MM, Glassman A, Todd JE (2010) Conditional cash transfers and health: Unpacking the causal chain. Journal of Development Effectiveness 2: 6-50.

17. Lagarde M, Haines A, Palmer N (2009) The impact of conditional cash transfers on health outcomes and use of health services in low and middle income countries. Cochrane Database of Systematic Reviews.
18. Barber SL, Gertler PJ (2008) The impact of Mexico's conditional cash transfer programme, Oportunidades, on birthweight. Tropical Medicine and International Health 13: 1405-1414.
19. Rivera JA, Sotres-Alvarez D, Habicht J-P, Shamah T, Villalpando S (2004) Impact of the Mexican program for education, health, and nutrition (PROGRESA) on rates of growth and anemia in infants and young children. A randomized effectiveness study. JAMA 291: 2563-2570.
20. Behrman JR, Fernald LC, Gertler P, Neufeld LM, Parker S (2009) Long-term effects of Oportunidades on rural infant and toddler development, education, and nutrition after almost a decade of exposure to the program. Chapter 1, Vol III. External evaluation of Oportunidades 2008 1997-2007: 10 years of Intervention in rural areas Volume II, The challenge of services quality: Health and nutrition outcomes
. Mexico DF: Secretaria de Desarrollo Social.
21. Fernald LC, Gertler PJ, Neufeld LM (2009) 10-year effect of Oportunidades, Mexico's conditional cash transfer programme, on child growth, cognition, language, and behaviour: a longitudinal follow-up study. Lancet 374: 1997-2005.
22. Gertler P (2000) The impact of PROGRESA on health. Washington, DC: International Food Policy Research Institute.
23. Bautista Arredondo S, Bertozzi SM, Leroy J, Lopez Ridaura R, Manrique Espinoza B, et al. (2009) Ten years of Oportunidades in rural areas: Effects on health services utilization and health status. Chapter III. External evaluation of Oportunidades 2008 1997-2007: 10 years of Intervention in rural areas Volume II, The challenge of services quality: Health and nutrition outcomes. Mexico DF: Secretaria de Desarollo Social.
24. SEDESOL (2010) Oportunidades.
25. Skoufias E (2005) PROGRESA and its impact on the welfare of rural households in Mexico. Research report 139. In: Institute IFPR, editor. Washington DC: IFPRI.
26. Barber SL, Gertler PJ (2009) Empowering women to obtain high quality care: Evidence from an evaluation of Mexico's conditional cash transfer programme. Health Policy and Planning 24: 18-25.
27. Sosa-Rubi SG, Walker D, Servan Mori E, Bautista Arredondo S (2011) Learning effect of a conditional cash transfer programme on poor rural women's selection of delivery care in Mexico. Health Policy and Planning 26: 496-507.
28. Barber SL, Bertozzi SM, Gertler PJ (2007) Variations in prental care quality for the rural poor in Mexico. Health Affairs 26: w310-w323.
29. Lamidrad-Figueroa H, Angeles G, Mroz T, Urquieta-Salomon J, Hernandez-Prado B, et al. (2010) Heterogeneous impact of the social programme Oportunidades on use of contraceptive methods by young adult women living in rural areas. Journal of Development Effectiveness 2: 74-86.
30. Bongaarts J (2003) Completing the fertility transition in the developing world: The role of educational differences and fertility preferences. Population Studies 57: 321-335.

31. Parker S, Behrman JR (2009) Following Young Adults who Benefitted from Oportunidades for Nearly a Decade: Impact of the Program on Rural Education and Achievement. External Evaluation of Oportunidades 2008 1997-2007: 10 Years of Intervention in Rural Areas Volume I, Impacts of Oportunidades after 10 Years of Operation in Rural Mexico. Mexico,DF: Secretaría de Desarrollo Social
.
32. Mancera Corcuera C, Serna Hernandez L, A PS (2009) Learning gaps among oportunidades scholarship recipients in primary and junior high school: Associaiton with education modality and multi-grade organization. External Evaluation of Oportunidades 2008 1997-2007: 10 Years of Intervention in Rural Areas Volume III, The Quality Challenge: Educational Outcomes of Oportunidades. Mexico,DF: Secretaría de Desarrollo Social.
33. Loewenberg S (2010) The plight of Mexico's indigenous women. Lancet 375: 1680-1682.
34. INEGI (2008) Encuesta Nacional de la Dinamica Demografica 2006. Informe final. Mexico, DF: Instituto Nacional de Estadistica, Geografica e Informatica.
35. Bongaarts J (1978) A framework for analyzing the proximate determinants of fertility. Population and Development Review 4: 105-132.
36. Comision Nacional para el Desarrollo de los Pueblos Indigenas (2012) Indicadores y estadisticas. In: Indigenas CNpeDdlP, editor. Mexico, DF.
37. DeVillis RF (1991) Factor analysis strategies. In: DeVillis RF, editor. Scale development Theory and applications. Newbury Park: Sage.
38. Ho DE, Imai K, King G, Stuart EA (2007) Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference. Political Analysis 15: 199-236.
39. King G, Nielsen R, Coberley C, Pope JE, Wells A (2011) Comparitive effectiveness of matching methods for causal inference. White paper.
40. Iacus S, King G, Porro G (2011) Causal inference without balance checking: Coarsened exact matching. Political Analysis.
41. Tomz M, Wittenberg J, King G (2011) CLARIFY: Software for interpreting and presenting statistical results. . 2.0 ed. Cambridge, MA: Harvard University.
42. King G, Tomz M, Wittenberg J (2000) Making the Most of Statistical Analyses: Improving Interpretation and Presentation. American Journal Of Political Science 44: 341-355.
43. VanderWeele TJ (2012) Structural equation models and epidemiologic analysis. American Journal of Epidemiology 176: 608-612.
44. StataCorp (2011) Stata. 12.0 ed. College Station, TX: StataCorp LP.
45. King G, Gakidou E, Ravishankar N, Moore RT, Lakin J, et al. (2007) A "politically robust" experimental design for public policy evaluation, with application to the Mexican universal health insurance program. Journal of Policy Analysis and Management 26: 479-506.
46. Comision Nacional de Proteccion Social en Salud (2009) Seguro Popular. Carta de derechos y obligaciones de los afiliados. In: Mexico Gfd, editor. Mexico, DF.
47. Saunders M, Sharma S (2008) Mobilizing political support and resources for family planning in a decentralized setting: Guidelines for Latin American and Carribean countries. Washington DC: USAID.

48. Gakidou E, Vayena E (2007) Use of modern contraception by the poor is falling behind. PLoS Medicine 4: e31.

Competing interests
No authors have any competing interests

Financial disclosure
Dr Darney was supported by a Student Award from the Society of Family Planning (#SFP5-2; www.societyfp.org), AHRQ T32 postdoctoral award (OHSU; HS017582); AHRQ T32 predoctoral award (UW; HS013853); CTSA TL1 (NCRR025016). No funding source had any role in the design, writing, or decision to publish this manuscript and the views and opinions expressed are those of the author, or authors, and do not necessarily represent the views and opinions of SFP or NIH.

Ethics statement
An ethics statement was not required for this work

Fig 1. Mexican women 15-24 reporting any pregnancy and contraceptive use, by age group, year, and residence

Fig 2. Mexican women 15-24. Education levels by year and residence

Table 1. Sample descriptive statistics and trends in outcomes: Rural women aged 15-24 in Mexico 1992-2009

	1992			2006			2009		
	all	15-19	20-24	all	15-19	20-24	all	15-19	20-24
sample n (%)	11,138	6460	4678	3832	2199	1633	6363	3648	2715
		0.58	0.42		0.57	0.43		0.57	0.43
Education level									
none/primary	66.5	65.1	68.5	29.2	22.7	38	22.8	18.8	28.2
jr high/secundaria	28	29.3	26.2	42.3	48.3	34.1	46.2	51	39.9
above secundaria (HS, tech school, post-grad)	5.4	5.5	5.3	28.5	29	27.9	30.8	30	31.9
Speak an indigenous language	*not available*	------	------	10.8	11	10.4	12.3	13	11.3
Ever married/cohabitating	38.5	21	62.7	32.4	15.6	55.1	35.5	19.6	56.7
Has access to health insurance	*not available*	---	----	39.6	40.2	38.8	58.2	60.3	55.4
Ever pregnant?	36.1	18.1	60.9	32.5	16.3	54.3	35.7	18.5	58.8
Currently using a contraceptive method or sterilized	13.2	5.1	24.4	15.8	6.1	28.8	18.9	9.4	31.8
Age at 1st birth mean(SD)	18.1(2.2)	16.8 (1.3)	18.6 (2.2)	18.3 (2.3)	16.9 (1.4)	18.7 (2.3)	18.0 (2.2)	16.5 (1.2)	18.5 (2.2)
Total number of live births mean(SD)	1.8 (1.1)	1.2 (0.7)	2.0 (1.1)	1.4 (0.9)	.86 (0.6)	1.6 (0.9)	1.3 (0.9)	0.83 (0.6)	1.5 (0.9)

Notes. Rural = <2500 inhabitants; age at first birth outliers excluded at 2%ile, 98%ile; total live births among women reporting any pregnancy

Table 2.
Sample characteristics. Matched sample of rural women 15-24, 2006, N=3654

	Oportunidades (n=1861)		No Oportunidades (n=1793)	
	15-19 (n=1232; 66.2%)	20-24 (n=629; 33.8%)	15-19 (n=914; 51.0%)***	20-24 (n=879; 49.0%)***
	%	%	%	%
Speak indigenous language	15.3	17.3	5.7***	6.6***
Currently in school	47.7	9.9	43.1***	10.7
Education level				
none/primary	21.2	46.0	25.5***	36.4**
secundaria/jr high	53.3	31.3	41.6	37.9
above secundaria	25.6	22.7	32.9	25.7
Married/cohabitating	11.4	49.9	20.9***	60.3***
Child of head or spouse of head of household	83.1	59.5	70.5***	42.3***
Other health insurance	41.1	38.3	38.2	37.0
Exposed to other social program	47.2	49.6	22.4***	25.7***
Total household size mean (SD)	6.6 (2.55)	6.4 (2.76)	5.5 (2.3)***	5.2 (2.6)***
Number of women 15-49 in household mean (SD)	2.4 (.94)	2.1(1.11)	2.2 (.92)***	1.7 (.98)***
Asset index deciles				
deciles 1 & 2 (poorest)	58.0	57.4	27.9***	29.6***
deciles 3 and 4	23.9	27.5	24.3	29.2
deciles 5-10	18.1	15.1	47.8	41.2
Any pregnancy or currently pregnant	12.3	50.9	21.2***	58.3*
Current use of modern contraceptive method	3.8	20.4	7.9***	26.9**
age at first birth mean (SD) (n=632 births)	16.8(1.4)	18.5 (2.4)	16.9 (1.4)	18.8 (2.2)*

Notes. * = p<.05; **p<.01; ***p<.001 for difference between exposed and non-exposed within age group. p values are t-test continuous vars, pr-test for binary vars, or chi-square for categorical vars. Pregnant and contraceptive variables are

missing n=202 (5.5%)

Table 3.
Association of Oportunidades and adolescent (15-19) pregnancy among rural women, 2006. N=2034

	OR (CI)
Oportunidades	0.74 (.53 - 1.04)
Currently in school	0.53 (.35 - .80)
Age	0.43 (.30-.61)
Ever married or cohabitated	48.76 (33.95-70.02)
Speak indigenous language	0.66 (.40-1.08)
Number of women 15-49 in household	0.69 (.55-.86)
Anyone in household affiliated with health insurance	0.9 (.62-1.3)
Anyone in household is exposed to other social programs	1.2 (.83-1.7)
Head of household education level	
none	ref
primary	1.00 (.67 - 1.51)
secondary	1.35 (.71 - 2.57)
above secondary	0.42 (.12 - 1.52)
Total household size	1.95 (.97 - 1.13)

Notes. Age is a binary variable: 15/16 vs 17/18/19.

Table 4.
Association of Oportunidades and and use of modern contraceptive method (15-24), rural Mexico, 2006. N=3452

	OR (CI)
Oportunidades and age interaction:	
Oportunidades and 15-19	1.05 (.67-1.64)
Oportunidades and 20-24	0.94 (.68-1.30)
Age	1.7 (1.22-2.45
Education level achieved	
none or primary school	ref
secundaria (jr high school)	1.58 (1.19-2.09)
Beyond secundaria (High School/technical college, etc)	1.15 (.78-1.70)
Ever married or cohabitated	14.8 (8.5-25.7)
Speak indigenous language	0.76 (.52- 1.11)
Number of women aged 15-49 in household	.92 (.77-1.10)
Anyone in household affiliated with health insurance	1.4 (1.05-1.88)
Anyone in household is exposed to other social programs	0.80 (.59-1.10)
Ever pregnant	4.9 (3.01-8.01)
Head of household education level	
none	ref
primary	1.17 (.83 - 1.64)
secondary	1.22 (.76 - 1.96)
above secondary	1.09 (.49 - 2.45)
Total household size	1.00 (.94- 1.06)

Notes. Age is a binary variable: 15-19 vs. 20-24.