

Program Evaluation in Reproductive Health: Prospective and Retrospective Applications

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A dissertation

submitted in partial fulfillment of the
requirements for the degree of

Doctor of Philosophy

University of Washington

2012

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Abstract

Program Evaluation in Reproductive Health: Prospective and Retrospective Applications

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This dissertation includes 2 projects: a prospective evaluation of the Residency Training Initiative in Miscarriage Management (RTI-MM) and a retrospective evaluation of a conditional cash transfer program in Mexico, *Oportunidades*, and pregnancy and contraceptive use among young women.

We conducted a pre-test/post-test impact evaluation to assess impacts of the RTI-MM on knowledge, attitudes, and practice of office-based miscarriage management using manual vacuum aspiration (MVA). We report that the RTI-MM is independently associated with self-report management of miscarriage using MVA at follow-up compared with baseline, controlling for other factors that may influence practice, and find evidence that support staff knowledge of MVA may impact physician practice. Our qualitative process evaluation describes the implementation process, focusing on facilitators and barriers to implementation, and revealed

that perceived characteristics of the innovation must be explicitly addressed in dissemination strategies, support staff should be included in practice change initiatives, and raised questions about how to best support champions and influence perceptions of the innovation. Integrating MVA into family medicine settings has implications for access to evidence-based, comprehensive care for women.

In Mexico, we used several years of data (1992, 2006, 2009) to 1) describe trends in contraceptive use, education, and fertility outcomes among young women in Mexico and 2) to assess the relationship of *Oportunidades* conditional cash transfer program exposure with these outcomes. We developed a matched sample from the 2006 survey, used multivariable logistic regression, and calculated predicted probabilities to estimate program impacts. We find no evidence that *Oportunidades* reduced the probability of pregnancy among poor, rural adolescents or increased the probability of using a modern contraceptive method among women 15-24. Education was associated with an increased probability of contraceptive use and decreased probability of reporting a pregnancy among adolescents; *Oportunidades* may delay fertility among younger adolescents via the schooling component of the program. Health insurance had a significant impact on contraceptive use in our sample, but the overall level of contraceptive use remains very low compared to national averages. Mexico should focus on increasing the rate of contraceptive use among rural women 15-24 overall, especially nulliparous women, regardless of *Oportunidades* enrollment.

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Introduction

Program evaluation in reproductive health: Prospective and retrospective applications

This dissertation focuses on the evaluation of programs that aim to impact women's reproductive health services and behaviors. The motivation behind this work is to produce evidence about clinical education and training, health service delivery, social policy, and other interventions in reproductive health, with the ultimate goal of improving reproductive health service delivery and health outcomes. The dissertation includes 2 projects: a prospective evaluation of an intervention to improve services—office-based uterine aspiration for management of miscarriage, and a retrospective evaluation focused on reproductive health behaviors and outcomes—pregnancy and contraceptive among young participants of a conditional cash transfer program in rural Mexico.

Services: miscarriage management. Evidence supports the management of miscarriage in the office setting, but operating-room based management remains common. Manual vacuum aspiration (MVA) is a technique to empty the uterus that can be performed in an office setting and is as safe as operating room-based management in stable patients. However, influencing physician practice patterns has proven challenging; a body of literature on the diffusion of innovations and implementation science suggest that multifaceted approaches hold promise. The Residency Training Initiative in Miscarriage Management (RTI-MM) is designed to facilitate implementation of office-based miscarriage management, with a focus on manual vacuum aspiration, in family medicine residency settings. This impact and process evaluation study addresses improving access to and the quality of women's health care by moving miscarriage

management out of the operating room and into office-based family medicine settings when appropriate.

Behaviors: fertility outcomes among young women in rural Mexico. *Oportunidades* is a conditional cash transfer program that aims to reduce poverty and improve health outcomes by providing incentives for families in rural Mexico to keep children, especially girls, in school and to utilize of a package of primary health care services. This analysis triangulates available data to strengthen our ability to make causal inference about observed results among *Oportunidades* beneficiaries. *Oportunidades* has been in existence for 10 years, yet the impacts of *Oportunidades* on key reproductive health behaviors and outcomes among young women who grew up under the program are unknown. This study helps us to understand the relationship between *Oportunidades*, education, contraceptive use and pregnancy among young Mexican women, which will contribute to the body of evidence about the impacts of the largest conditional cash transfer in existence.

The long-term goal of this work is to contribute to the evidence base for programs designed to improve women's reproductive health services and outcomes. The **specific aims** of this dissertation project were:

Paper 1: The Family Medicine Residency Training Initiative in Miscarriage Management (RTI-MM): Impact on Practice in Washington State

This pre-test/post-test quasi-experimental impact evaluation employs primary quantitative data to assess impacts on knowledge, attitudes, and practice of office-based miscarriage management using MVA among family medicine physicians and support staff. *Hypothesis: The RTI-MM is significantly associated with increased odds of self-reported practice of MVA for miscarriage among participants.*

Paper 2: “One of those areas that people avoid”: A qualitative study of implementation in miscarriage management

This qualitative process evaluation study assesses feasibility and identify facilitators and barriers to implementing office-based miscarriage management using MVA at intervention sites. *We will describe the implementation process, and identify barriers and facilitators to implementation. Qualitative research does not test hypotheses; results from this study will be generalizable via contributions to the theory of practice change, will generate hypotheses for future research , and will contribute to refining the intervention.*

Paper 3: The Oportunidades conditional cash transfer program: Impacts on pregnancy and contraceptive use in young rural women in Mexico

This analysis utilizes several data sources to 1) describe trends in contraceptive use, education, and fertility outcomes among young women in Mexico and 2) to assess the relationship of *Oportunidades* conditional cash transfer program exposure with these outcomes. *Hypothesis: Oportunidades exposure is positively associated with contraceptive use and negatively associated with age at first birth and total number of births.*

The Family Medicine Residency Training Initiative in

Miscarriage Management (RTI-MM):

Impact on Practice in Washington State

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Support: This study was supported by Washington State Dept of Health maternal and infant health program (contract #N17270); the Abortion Access Project; ARHQ T32 predoctoral training grant (HS013853); The Ryan Residency Training Program; ITHS predoctoral training grant (TL1 RR025016)

Acknowledgements: The authors wish to thank Emmanuela Gakidou for her review of earlier drafts of this study and Paul Ford for assistance with data collection.

Conflict of Interest: The authors have no conflicts of interest to declare

Prior Presentations: Portions of this work have been presented at the Association for Reproductive Health Professionals (ARHP) annual meeting Sept 2009, the American Public Health Association (APHA) annual meeting, Nov 2009, and the North American Forum on Family Planning annual meeting, Oct 2011.

Word count: 2963

Number of tables: 3

Abstract

Purpose Non-complicated spontaneous abortion cases should be counseled about the full range of management approaches, including uterine evacuation using manual vacuum aspiration (MVA). The Residency Training Initiative in Miscarriage Management (RTI-MM) is an intensive, multidimensional intervention designed to facilitate implementation of office-based management of spontaneous abortion using MVA in family medicine residency settings. The purpose of this study was to test the impact of the RTI-MM on self-reported use of MVA for management of spontaneous abortion.

Methods We used a pre/post one group study design and a web-based, anonymous survey to collect data on knowledge, attitudes, perceived barriers, and practice of office-based management of spontaneous abortion. We used multivariable models to estimate incident relative risks and accounted for data clustering at the residency site level.

Results Our sample included 441 residents and faculty from 10 family medicine residency sites. Our findings show a positive association between the RTI-MM and self-reported use of MVA for management of spontaneous abortion (adjusted RR = 9.11 [CI 4.20-19.78]) and robust to model specification. Male gender, doing any type of management of spontaneous abortion (e.g. expectant, medication), other on-site reproductive health training interventions, and support staff knowledge scores were also significant correlates of physician practice of MVA.

Conclusions Our findings suggest that the RTI-MM was successful in influencing the practice of management of spontaneous abortion using MVA in this population, and that support staff knowledge may impact physician practice. Integrating MVA into family medicine settings would potentially improve access to evidence-based, comprehensive care for women.

Keywords: spontaneous abortion, MVA, miscarriage, clinical education methods, health services research

Abbreviations: MVA: manual vacuum aspiration; SAB: spontaneous abortion

INTRODUCTION

About 15% of recognized pregnancies end in miscarriage, or spontaneous abortion^{1,2}; the proportion increases with the sensitivity of pregnancy diagnosis to a range of 20%-62%. Using a conservative incidence estimate of 10%, there may be half a million spontaneous abortions each year in the US³. Comprehensive women's health care includes access to office-based uterine evacuation for spontaneous abortion⁴. Integrating office-based management of spontaneous abortion using manual vacuum aspiration (MVA) into family medicine settings has the potential to improve access to comprehensive women's health care and the quality of and satisfaction with care that women receive from their primary care providers⁵.

Concerns about hemorrhage and infection, which can both occur with spontaneous abortion, have driven current practice for management of spontaneous abortion in the operating room^{4,6}. Physician preference⁴ may also play a role⁴. Available data^{7, 8, 9, 10} indicate that operating-room based surgery is still the default management strategy, although population-based data are lacking. Alternative management strategies are expectant (wait and see), medication (misoprostol), and office-based management via manual vacuum aspiration (MVA)¹¹. MVA is as safe as operating room-based care in samples of women presenting with spontaneous abortion² and seeking induced abortion,^{12, 13} may improve patient satisfaction with care^{1,4}, and avoids overtreatment, including the risks associated with general anesthesia. Office-based MVA results in significant time and cost savings compared to operating room-based management^{1,3, 14}. Clinical evidence clearly indicates that non-complicated spontaneous abortion cases should be counseled about the full range of treatment approaches, including expectant, medication, office-based MVA and operating room management.^{4 15, 16}

Family medicine residents are not routinely trained in office-based uterine aspiration for spontaneous abortion⁵, despite recommendations that residents who plan to practice in areas without easy access to obstetrician/gynecologists learn this skill¹⁷. In Washington State, family medicine physicians are more likely to practice in areas that are rural, have a large proportion of minority and poor residents, or are experiencing health professions shortages.¹⁸ Office-based management of spontaneous abortion is within the scope of family medicine practice¹⁹, allows family medicine physicians to provide comprehensive care to female patients, and requires intrauterine procedural skills many family medicine physicians already have¹⁷. The skills learned for MVA management of spontaneous abortion can be translated to other procedures: uterine hemorrhage, IUD insertion, endometrial biopsies, and induced abortion. Training family medicine physicians to perform MVA in an office setting has the potential to expand access to this procedure, especially for underserved women, and reduce costs.

The Residency Training Initiative in Miscarriage Management (RTI-MM) intervention was aimed at family medicine residents, faculty, and key clinical and administrative support staff at all 10 non-military family medicine residency programs in the State of Washington. The RTI-MM is designed to facilitate implementation of office-based management of spontaneous abortion, with a focus on manual vacuum aspiration, in family medicine residency settings. The extensive literature on practice change suggests that passive approaches are ineffective^{20,21}, but highlight that interactive and mixed (passive and interactive) and multi-level (individual and team) approaches can impact practice^{20,22}. Clinical evidence is necessary but not sufficient for practice change to occur²³, and interventions must also address barriers and facilitators to change²². Research to date points to the importance of tailored interventions^{22,24}, attention to context^{23,24}, and commitment to change from the target population, opinion leaders, and the

organization^{23,25}. Systems change approaches²⁶ explicitly acknowledge the need for comprehensive strategies to target multiple levels within a system to achieve change²² have also demonstrated success. Development of the RTI-MM was guided by the practice change literature; it combines passive and interactive sessions and outreach visits, adopts individual and team approaches, addresses barriers and facilitators to change through participant feedback and stakeholder input, is tailored to family medicine practices, and seeks commitment from opinion leaders and champions²³.

Individual residency sites recruited training intervention participants; sites were encouraged to invite as many faculty, residents, and support staff as possible. Some sites selected a core team who would be involved in miscarriage procedures while other sites chose to include as many people as possible. The RTI-MM intervention includes a didactic session, a hands-on papaya workshop²⁷, and participatory discussion. . The didactic session is a comprehensive treatment of miscarriage management (medication and office-based surgical management using manual vacuum aspiration (MVA)); the hands-on session includes a “papaya workshop” to practice MVA technique. Participants use MVA equipment on a ripe papaya, which mimics the uterus and allows participants to practice uterine aspiration. The papaya model has the advantages of being low-tech and relatively easy to implement, and permits participants to empty the contents of the uterus (papaya seeds and fruit), which plastic pelvic models do not²⁷; the participatory discussion session is focused on systems change and includes values clarification and “hopes & hesitations” where participants are invited to share hopes and hesitations or perceived barriers to implementing miscarriage management with MVA in their settings.

This pre-/post-test one group evaluation study²⁸ assessed the association of the Residency Training Initiative in Miscarriage Management (RTI-MM) with changes in self-reported use of MVA for management of spontaneous abortion.

METHODS

The Family Medicine Residency Network (FMRN), a coordinating organization of the family medicine residency sites in Washington State, provided the sample denominator and contacted potential study participants at both baseline and follow-up. An email cover letter explained the purpose of the research and contained a link to a web-based survey. All survey data were fully anonymous; baseline and follow-up surveys were not linked. Baseline data were collected at one time point for all individuals at all sites prior to the RTI-MM training intervention. The RTI-MM was implemented over two years; follow-up email recruitment targeted program participants at each site six months after the intervention at the site.

Measures include demographics and an investigator-developed Knowledge, Attitudes, and Practice (KAP) survey and demographics. At the time of this study, no measure existed to measure knowledge, attitudes, and practice of spontaneous abortion management in family medicine settings. The KAP survey was developed by the study team and is based upon the literature in management of spontaneous abortion,¹⁰ contraceptive technologies,²⁹ and women's health in family medicine.^{30,31} The KAP survey was refined to improve face validity after expert input from OB/Gyn and family medicine physicians and pilot-testing with 1 physician and 5 non-physicians. Additional site-level variables come from the FMRN (e.g. religious affiliations of hospital sites, other training activities currently in place). This study was approved by the University of Washington Human Subjects Division.

Our primary outcome is self reported practice of management of spontaneous abortion using MVA, a binary response to the question “Do you currently offer outpatient miscarriage management using MVA?” The key independent variable is the RTI-MM intervention. We assessed intervention effect as a binary (baseline vs follow-up) and as a categorical (baseline vs. follow-up reported attending a training vs. follow-up did not attend) variable. The categorical treatment variable captures RTI-MM dose and allows us to see site-level or diffusion effects versus individual-level changes associated with the RTI-MM.

Other covariates include role (resident/faculty), gender, doing any management of spontaneous abortion (e.g. expectant or medication), knowledge, attitudes, and perceived barriers scores of both physicians and support staff at the physician’s residency site, and whether the site participates in the RHEDI program (Reproductive Health EDucation In Family Medicine, a program that includes MVA training for induced abortion). The doing any miscarriage variable is intended to isolate change in MVA practice by controlling for predisposition to manage spontaneous abortion at all and other management patterns. Knowledge is measured using a summary score that includes a set of true/false and multiple choice items and nine patient scenarios, where respondents are asked to indicate if MVA and/or medication management would be appropriate for a given type of patient. We assigned individual physicians the site level mean clinical and administrative support staff knowledge, attitudes and perceived barriers scores at follow-up to test the impact of support staff views about implementing MVA for miscarriage on physician practice. We controlled for testing effects with a dummy indicator of whether at follow-up a respondent reported completing the baseline survey.

We used descriptive statistics to characterize the sample and examined bivariate relationships between our outcome and key variables. We used t-tests to assess differences

between baseline and follow-up sample characteristics, and summary knowledge, attitudes, and perceived barriers scores and individual items. We used a multivariable “modified Poisson”³² generalized linear model (GLM) to test the association of the RTI-MM and self-reported use of MVA among physicians. A modified Poisson approach for binary outcomes allows us to estimate relative risks (RR) instead of odds ratios (OR)^{32,33} and produces reliable RRs and confidence intervals.³⁴ Observations from the same site may be correlated; we accounted for data clustering at the site level³⁵. We estimated two models for the intervention effect: 1) binary and 2) dose-response. We performed sensitivity analyses by varying model specifications, tested for interactions and assessed model fits by examining residuals. All analyses were conducted using stata10 (Version 10.0. College Station, TX: StataCorp LP; 2010).

RESULTS

Our sample included 441 residents and faculty from the 10 family medicine residency sites. At follow-up, the sample was significantly more likely to be from a RHEDI site (2 of the 10 sites were RHEDI sites), report doing any miscarriage management, and report using MVA for miscarriage management. We do not have individual-level linked data and therefore cannot assess loss to follow-up, but the follow-up sample is smaller than the baseline sample and we can determine overlap at follow-up. Some loss to follow-up occurred through resident graduation (third year residents at the time of the baseline survey were lost to follow-up). We had a very good response rate at both baseline (75%) and follow-up (69%), especially in a clinician sample^{36,37}. Table 1 describes the sample characteristics.

Table 2 depicts summary knowledge, attitudes and perceived barriers scores and highlights individual items that showed significant change over time. Overall, knowledge and

attitudes scores increased slightly post-RTI-MM, and perceived barriers to implementing MVA for SAB decreased slightly. However, significant change was not observed on all scale items.

In bivariate analyses (not shown), RTI-MM training was strongly associated with reporting use of MVA for SAB management (RR = 17.88; CI 7.5-42.44), accounting for data clustering at the site level. In the fully adjusted model (table 3), the relative risk remained large and significant (RR = 9.11; CI 4.20-19.78). Significant covariates positively associated with MVA practice include male gender, doing any type of spontaneous abortion management, being at a RHEDI site, physician attitudes, and support staff knowledge, attitudes and perceived barriers. Higher perceived barriers among physicians were negatively correlated with the outcome and statistically significant in one model but the effect was small. RHEDI site status appears to modify the effects of gender; male gender is positively associated with using MVA for SAB, as is being from a RHEDI site, but the interaction of gender and RHEDI site is negatively associated with the outcome, indicating that the difference between genders does not exist at RHEDI sites. Physician knowledge was not associated with self-reported MVA practice.

There is evidence to suggest a dose-response or diffusion effect (model 2): those who reported attending a training were most likely to report MVA practice compared to baseline (RR = 9.62 (4.52-20.48), but those who reported not attending a training were still more likely to report MVA practice than those at baseline (RR = 6.72; CI 2.31-19.55).

We stratified by RHEDI site status to assess differences in RTI-MM intervention effects (model not shown). The RTI-MM effect was stronger in the subsample of RHEDI observations (n=78; RR = 11.6; CI 2.75-49.22) than in the sample of non-RHEDI observations (n=363; RR= 7.3; CI 2.77-19.34), and the effect of gender disappeared among the RHEDI observations,

consistent with our gender and RHEDI interaction results, above. Support staff at RHEDI sites have higher knowledge and perceive fewer barriers to implementation than at other sites.

Individual residency site does not appear to be an independent driver of implementing MVA; in a model where we directly modeled individual site dummy variables or site fixed effects (data not shown), we used the median outcome as the referent group (each site compared to the site with the median proportion of self-reported MVA practice), and only one site was an independent correlate of MVA practice.

DISCUSSION

We report a positive, robust association of the RTI-MM intervention with self-reported use of MVA to manage spontaneous abortion. Our findings suggest that the RTI-MM was successful in influencing practice patterns for management of spontaneous abortion using MVA in this population of family medicine faculty and residents. Further, we were able to isolate impacts on use of MVA from a proclivity to manage spontaneous abortion using any technique; other technique was a strong correlate of use of MVA, but the RTI-MM retained an independent impact. We also have evidence that diffusion³⁸ is occurring; we modeled impacts on those who reported attending an RTI-MM session and those who reported not attending a session and found positive associations for both groups relative to baseline.

In our sample, physician barriers score was not a strong correlate of practice, although overall, perceived barriers decreased. Our barriers scale focused on systems or organizational-level barriers and the social context in which implementation occurs (e.g. residency policy, support from hospital administration), which the practice change literature suggests may be more important than individual-level attitudes or barriers²². The RTI-MM was designed to impact systems within a residency clinic, but addressing larger systemic barriers was beyond the scope

of the intervention. Physician attitudes score, which measured individual-level concepts, had a small association with self-reported practice. Physician knowledge was not correlated with self-reported practice of MVA in our sample. Knowledge was quite high at baseline and there may not be enough variation in knowledge to see effects. Knowledge is also recognized to be necessary but not sufficient to implementing practice change^{21, 22, 39}; our results appear to support this conclusion.

Our results provide empirical evidence for the relationship of support staff knowledge, attitudes, and perceived barriers and physician self-reported practice. Our findings support previous qualitative work in reproductive health service implementation that has identified the importance of including clinical and administrative support staff in practice change initiatives⁴⁰.⁴¹ Residency site level mean clinical and administrative support staff knowledge, attitudes, and barriers at follow-up were all independently associated with physician self-reported use of MVA. However, the positive direction of the barriers score was unexpected; we expected higher perceived barriers to be negatively associated with practice of MVA. Although site level mean support staff barriers scores decreased at follow-up overall, 2 sites had larger barriers scores following the RTI-MM intervention. Support staff may be familiar with logistical and systems barriers to implementing new services; it is possible that following the RTI-MM, these types of barriers became more apparent.

In our sample, residents and faculty from sites participating in an ongoing training program in induced abortion (RHEDI sites) were more likely to implement MVA for spontaneous abortion. This is not surprising – physician and support staff RHEDI trainees are learning the same skills the RTI-MM is designed to teach and have familiarity and probably a comfort level with uterine evacuation beyond that of the other residency sites. Our results support recent

findings about office management of spontaneous abortion among obstetrician-gynecologists⁴² and may indicate comfort with the MVA procedure due to prior experience in induced abortion.

Our results should be interpreted with the following limitations in mind. First, we have a limited ability to make causal inference given our one-group study design. However, our findings were robust to several multivariable modeling approaches that allowed us to control for other potential influences of practice change. Second, our outcome is self-reported practice of MVA. This outcome may in fact more accurately measure intent to use MVA than actual practice. It is possible that not all RTI-MM participants have had the opportunity to use MVA for miscarriage management, but would if given the opportunity. The RTI-MM was not designed to train residents and faculty to competency in MVA for spontaneous abortion and our survey data do not capture actual implementation. Common challenges to procedural training in family medicine, such as sufficient volume and scheduling difficulties⁴³ likely apply to MVA, and competence using MVA must be measured by faculty in the same way other procedural skills are. Future research should examine ways to measure MVA skills.

Third, as with all anonymous pre/post survey data, we do not have individual level linked data. The results are potentially subject to bias when there is a turnover across time periods, although we maintained a credible response rate. It is possible that individuals most motivated to implement MVA for miscarriage responded to the post survey and not the pre survey and those least motivated responded to the presurvey and not to the postsurvey, which would overestimate intervention effects. Our effect size is large, however, and even under these circumstances would be substantial. It is also possible that the non-response reflects normal turnover and was unrelated to motivation to perform MVA.

Finally, it is possible that 6 months is not enough time to see practice change. With a longer follow-up period, we might see the effect of the RTI-MM disappear, or we might see a larger effect as diffusion occurs.

In conclusion, this study reports a positive, robust association between the Residency Training Initiative in Miscarriage Management (RTI-MM) and use of MVA for management of spontaneous abortion. Non-complicated spontaneous abortion cases should be counseled about the full range of management options, including uterine evacuation using MVA. Integrating MVA into family medicine settings would potentially improve access to evidence-based, quality care for women.

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Table 1. Sample characteristics: Physician residents and faculty (N=443)		
n (%)	Baseline (n=277)	Follow-up (n=166)
Residents	183 (66)	103 (62)
Female	157 (57)	96 (58)
At a RHEDI site?*	40 (14)	38 (23)
Doing any miscarriage management***	119 (43)	101 (60)
Using MVA for miscarriage management***	7 (3)	76 (46)
Reported completing baseline survey	—	106 (63)
Reported attending RTI-MM session	—	144 (86)
Notes. *p<.05, ***p<.001 for 2 sample t-test difference between baseline and follow-up; RHEDI = Reproductive Health EDucation In Family Medicine; RTI-MM = Residency Training Initiative in Miscarriage Management		

Table 2. Knowledge, Attitudes and Barriers: Summary scores and select individual items		
	Mean scores (SD)	
<i>Summary scores</i>	baseline	follow-up
Knowledge		
T/F, multiple choice items (9 possible)	7.7 (1.1)	8.2 (0.9)***
Patient scenario score (27 possible)	23.4 (1.8)	22.9 (3.1) *
Attitudes (15 items, 75 possible; higher score indicates more positive attitude)	56.2 (6.6)	60.4 (7.7) ***
Barriers (19 items; 95 possible; higher score indicates more perceived barriers)	58.0 (9.7)	55.0 (11.8) **
<i>Select individual items that showed significant change</i>		
Knowledge; proportion answering correctly		
Patient satisfaction is highest when women are offered all treatment options	.80	.99***
I am aware of an oral pain regimen for miscarriage management	.73	.95***
Attitudes: likert scale, 5=strongly agree		
MVA is appropriate for MM	4.0	4.4***
Nursing staff support MM via MVA	3.4	3.8***
MVA will save time for me and my patients	3.7	4.0***
Women experiencing SAB can tolerate MVA with local anesthesia	3.9	4.2***
MVA requires skills similar to those I already have	3.5	4.1***
Barriers: likert scale, 5=strongly agree		

Equipment not available	3.6	3.1***
Lack of residency policy/philosophy on office-based MM	3.1	2.7***
Notes. *p<.05, **p< .01, ***p <.001 for difference between baseline and follow-up; SAB= spontaneous abortion; MM=miscarriage management; MVA= manual vacuum aspiration		

Table 3: Associations with self-reported MVA practice. Multivariable regression results (N=441 for all models)		
	GLM Modified Poisson models (RR; CI)	
	model 1	model 2
<i>Intervention: RTI-MM</i>		
binary: Follow-up	9.11 (4.20-19.78); p<.001	-----
Categorical (baseline is referent group)		
Follow-up, reported not attending a RTI-MM training	-----	6.72 (2.31-19.55); p<.001
Follow-up, reported attending a RTI-MM training	-----	9.62 (4.52-20.48); p<.001
<i>Covariates</i>		
Resident (vs faculty)	1.06 (.67-1.66)	1.04 (.68-1.60)
Male gender	1.44 (1.15-1.81); p=.001	1.44 (1.16-1.80);p=.001
RHEDI site?	1.87 (1.58-2.23); p<.001	1.91 (1.57-2.34); p<.001
Gender RHEDI interaction	0.77 (.59-1.00); p=.05	0.73 (.51-1.03); p=.08
Follow-up respondent completed baseline survey	1.59 (1.00 – 2.54); p=.05	1.57 (1.01-2.46); p=.05
Doing any type of MM	3.16 (1.85-5.38); p<.001	3.11 (1.83-5.30); p<.001

knowledge score	.99 (.98-1.01)	.99 (.98-1.00)
attitudes score	1.03 (1.00-1.06); p=.03	1.03 (1.00-1.06); p=.04
barriers score	0.99 (.98-1.0); p=.03	0.99 (.98-1.0); p=.06
Support staff knowledge (site mean at follow-up)	1.60 (1.36-1.88);p<.001	1.63 (1.39-1.91); p<.001
Support staff attitudes (site mean at follow-up)	1.03 (1.01-1.06);p=.01	1.03 (1.01-1.06); p=.004
Support staff barriers (site mean at follow up)	1.14 (1.10-1.18); p<.001	1.14 (1.10-1.18); p<.001
Notes. MVA = manual vacuum aspiration; MM = miscarriage management; T/F= true false items		

“One of those areas that people avoid”

A qualitative study of implementation in miscarriage management

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Acknowledgements: This study was supported by Washington State Dept of Health maternal and infant health program (contract #N17270); the Abortion Access Project; ARHQ T32 predoctoral training grant (HS013853); The Ryan Residency Training Program; University of Washington ITHS predoctoral training grant (TL1 RR025016)

“One of those areas that people avoid”

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ABSTRACT

Background Miscarriage is common and often managed by specialists in the operating room despite evidence that office-based manual vacuum aspiration (MVA) is safe, effective, and saves time and money. Family Medicine residents are not routinely trained to manage miscarriages using MVA, but have the potential to increase access to this procedure. This process evaluation sought to identify barriers and facilitators to implementation of office-based MVA for miscarriage in Family Medicine residency sites in Washington State.

Methods The Residency Training Initiative in Miscarriage Management (RTI-MM) is a theory-based, multidimensional practice change initiative. We used qualitative methods to identify barriers and facilitators to successful implementation of the RTI-MM.

Results Thirty-six RTI-MM participants completed an interview. We found that the common major barriers to implementation were low volume and a perception of miscarriage as emotional and/or like abortion, while the inclusion of support staff in training and effective champions facilitated successful implementation of MVA services.

Conclusion Perceived characteristics of the innovation must be explicitly addressed in dissemination strategies and support staff should be included in practice change initiatives. Questions remain about how to best support champions and influence perceptions of the innovation. Our study findings contribute programmatically, to improve and adapt the RTI-MM, and to broader theoretical knowledge about practice change and the implementation of innovation in health services.

KEYWORDS: 3-10 keywords

miscarriage, reproductive health services, family medicine, practice change, interprofessional training, dissemination, process evaluation

BACKGROUND

About 15% of recognized pregnancies end in miscarriage, or spontaneous abortion (Dalton et al., 2006; Edwards et al., 2007); the proportion increases with the sensitivity of pregnancy diagnosis to a range of 20%-62% (Rocconi, Chiang, Richter, & Straughn, 2005). Miscarriage management strategies are expectant (wait and see), medication (misoprostol), office-based management via manual vacuum aspiration (MVA), and operating room based management under general anesthesia. MVA is as safe as operating room-based care in samples of women presenting with miscarriage (Edwards et al., 2007) and seeking induced abortion (Bird et al., 2003; Goldberg, Dean, Kang, Youssouf, & Darney, 2004), may improve patient satisfaction with care (Dalton et al., 2006; Harris, Dalton, & Johnson, 2007), and results in significant time and cost savings compared to operating room-based management (Blumenthal & Remsburg, 1994; Dalton et al., 2006; Rocconi et al., 2005). However, operating room-based management has remained usual practice for decades. The literature suggests that non-complicated miscarriage cases (e.g. <12 weeks) should be counseled about the full range of management approaches (Harris et al., 2007). Patient preferences have been shown to play a role in choice of management and in post-procedure satisfaction, (Dalton et al., 2006; Harvey, Beckman, & Satre, 2001; Wieringa-de Waard et al., 2002) regardless of which management approach was chosen (Wieringa-de Waard et al., 2002).

Family medicine residents are not routinely trained in office-based uterine aspiration for miscarriage (Nothnagle, Prine, & Goodman, 2008) despite recommendations (Nothnagle, Sicilia et al., 2008). However, training family medicine residents to perform MVA in an office setting can improve continuity of care and expand access to this procedure, especially in rural settings served solely by a generalist (Barr, 2005; Nothnagle, Prine et al., 2008). Experience with MVA

for miscarriage management is also a skill that can be translated to other common procedures: management of uterine hemorrhage, endometrial biopsies, and induced abortion.

The safety and efficacy of office-based uterine aspiration using MVA is known (Dalton et al., 2006; Goldberg et al., 2004; Harris et al., 2007); less well understood is how to successfully integrate the service into family medicine settings. Our impact evaluation (Darney, Weaver, Stevens, Kimball, & Prager, In press) showed a positive association with physician intent to practice MVA following a training intervention; this process evaluation sought to understand the implementation process more comprehensively at participating sites.

Figure 1 depicts the conceptual model for this study, based upon Greenhalgh et al.'s (Greenhalgh, Robert, Macfarlane, Bate, & Kyriakidou, 2004) review of the determinants of dissemination and implementation of innovations in health service organizations. The innovation in this project is office-based miscarriage management via MVA in family medicine residency settings, the Residency Training Initiative in Miscarriage Management (RTI-MM) is the dissemination strategy, and the user systems are the family medicine residency sites.

Dissemination, communication, and influence strategies employed by the RTI-MM (described in more detail below) include many identified by Greenhalgh et al. (Greenhalgh et al., 2004) and others (Davis et al., 1999; Dopson, FitzGerald, Ferlie, Gabbay, & Locock, 2002; Foster-Fishman & Behrens, 2007; Grimshaw et al., 2001; Rogers, 2003; Ruhe et al., 2005) as positively associated with successful implementation: interactive strategies and outreach visits, use of champions, expert opinion, homophily, stakeholder input and social networks, participant feedback, tailoring, and an explicit focus on systems change. The RTI-MM also incorporated strategies to address characteristics of the innovation such as trialability and observability, and to influence perceptions such as relative advantage, compatibility, complexity, and risk

(Greenhalgh et al., 2004) which have been linked to diffusion (Berwick, 2003) and active dissemination. The RTI-MM team had less information about the user systems, but hypothesized that residency programs would have good absorptive capacity for new knowledge (Greenhalgh et al., 2004), including a “learning organization culture,” and be open to interprofessional teamwork.

RTI-MM Program characteristics

The RTI-MM was aimed at family medicine residents, faculty, and clinical and administrative support staff at the 10 diverse, non-military family medicine residency sites in the State of Washington. The first step of the RTI-MM was to involve residency faculty as site “champions,” key individuals in the social network who support the innovation (Rogers, 2003). We held a workshop with representatives of all family medicine residency sites who indicated interest in promoting the success of the RTI-MM. Following the champions workshop, the training team traveled to each of the 10 residency sites. The standard RTI-MM on-site, half-day intervention package for faculty and residents included:

- 1) A didactic session on office-based miscarriage management (expectant, medication and MVA): “*Do nothing, do something, do surgery,*” with an explicit focus on patient-centered care (patient choice in miscarriage management options).

- 2) A hands-on “papaya workshop” to practice MVA technique. The papaya model has the advantages of being low-tech and relatively easy to implement, and permits participants to practice emptying the contents of the uterus (papaya seeds and fruit) with the MVA device, which plastic pelvic models do not (Paul & Nobel, 2005).

3) Participatory discussion sessions focused on systems change, values clarification (Goodman et al., 2009), patient centered care, and hesitations or perceived barriers to integrating office-based miscarriage management.

Key support staff (clinical and administrative) were encouraged to participate in the initial training described above and also received two additional on-site sessions tailored to their roles and clinical sites. Training content was tailored based on participant feedback at the stakeholder meeting and trainer experience during the initial didactic session. Support staff training typically included basic didactic information on miscarriage management in the office setting and a focus on systems change to address site-specific barriers such as patient flow, triage, billing, and blood products management. All sites received the standard didactic and two support staff trainings.

METHODS

This process evaluation is part of a mixed-methods evaluation of the RTI-MM (Darney et al., In press). In this study, we used purposive sampling and qualitative methods to identify barriers and facilitators to successful implementation of the RTI-MM.

Data collection took place between 6 and 18 months after the initial training session and after all training sessions were completed; timelines were different for each site based on scheduling all three training sessions. We oversampled the two sites selected to participate in additional follow-up training after data collection for this study was complete. We employed purposive, maximum variation sampling (Patton, 2002) (p. 243). Semi-structured interviews with RTI-MM participants followed a general interview guide approach (Patton, 2002)(p. 343). That is, the interview guide contained all possible questions, but not all participants were asked the same questions in the same order; flexibility was built into the data collection process. All

individuals who attended an RTI-MM training session received a recruitment email from the Family Medicine Residency Network (FMRN), a co-coordinating body of family medicine residency sites. Potential participants contacted the evaluator (BGD) to learn more about the study, review the consent process, and schedule an interview. All interviews took place after receipt of written informed consent and were conducted over the phone to provide participants with maximum flexibility in scheduling. Phone interviews were recorded as password-protected electronic computer files. This study was approved by the University of Washington Human Subjects Division.

The evaluator (BGD) transcribed each interview into a case summary organized by interview question as a first stage of data reduction and synthesis. We used thematic analysis, which allow for concepts not identified *a priori* by the researcher to emerge (Morse & Field, 1995), and developed our coding scheme through an iterative process: a short initial code list was developed and n=10 case summaries coded. Next, we refined the code list to include emergent themes (Morse & Field, 1995). Finally, after all case summaries were coded, we refined the code list a final time, collapsing overlapping codes, renaming, and deleting codes. Following data coding, we developed matrices (Miles & Huberman, 1994) to display summarized data by key themes across and within subjects (Ayres, Kavanaugh, & Knafel, 2003) and stratified by role and site (Patton, 2002) to facilitate comparative analyses (Bradley, Curry, & Devers, 2007) and examination of themes in the context of our conceptual framework.

RESULTS

Thirty-six RTI-MM participants completed an interview. The 10 sites contributed a range of one to 10 interview participants, with a modal value of three. Miscarriage management varied at the 10 sites prior to the training. No sites offered office-based aspiration miscarriage management

services using MVA prior to the RTI-MM training, but half offered medication management and all did expectant management. Prior to the RTI-MM, all patients selecting aspiration management were referred out to be managed in an operating room setting. At the time of interviews, 6 of the 10 sites had implemented MVA services; 3 additional sites were eventually able to implement but had not at the time of interviews. Table 1 describes interview participant characteristics. We classified themes guided by the conceptual framework as related to the innovation, the dissemination strategy, and the user systems.

The innovation: Perceptions of miscarriage and MVA

Perceptions of miscarriage and of the MVA device or procedure were barriers to implementation of MVA services for miscarriage. Miscarriage was perceived as emotional and as like induced abortion; achieving clarity on the difference between miscarriage and abortion was important to user systems and facilitated implementation. Low volume and thus lack of opportunity to train using the MVA was also a barrier for sites.

“It is a very emotional sort of thing”

Participants focused on perceptions of the diagnosis and treatment of miscarriage as highly emotional and thus a barrier to implementing the service.

“For residents and for trainees it’s the emotional content and sort of the technical content and trying to manage them both at once...In other procedures that we’ve introduced in recent years, the emotional content isn’t as high. I think it’s hard for people to balance that when you’re working so hard to learn a technical skill, then it’s hard to learn about caring for the patient at the same time, balancing those two things is really hard, but it’s what you have to learn.” (MD faculty and site champion)

“...And this is an area that people, you know, it’s like I don’t want to deal with this it’s bloody and it’s emotional and get me out of here. And their default was just to send them somewhere else so they didn’t have to deal with it.” (Faculty MD and site champion)

Some of the emotional nature of miscarriage was described as linked to providers’ circumstances and discomfort, not patient emotions.

“I guess, you know, it’s hard for [staff] to talk about, it’s the what if, it’s the death concept, it’s just one of those areas that people kind of go all around to avoid sometimes.” (Support Staff, LPN team leader)

“...it’s different but it’s done like an abortion”

Much of the perception of miscarriage as emotional stemmed from the proximity of miscarriage and induced abortion services. Participants spoke about how miscarriage management was like abortion while also clearly articulating the difference. In addition, resistance to MVA services due to concerns about abortion often originated with support staff. “...the idea that this procedure started with elective abortions...and it was now coming over to miscarriage management [and] just being able to emotionally disconnect those two because I have such strong feelings about abortion.” (Support staff, Nurse manager)

Others described how the MVA equipment or procedure itself was a barrier for support staff: “The [RTI-MM was] enriching of training we already did for support staff [who identify as anti-abortion], they were able to think about the procedure itself in a more positive light” (Faculty MD and site champion)

“Knowing the distinction and how to tell the difference”

Achieving clarity on the difference between miscarriage management and abortion services during the RTI-MM training sessions facilitated implementation.

“ Many of the people that I talked with...[said] we’re not doing an abortion are we? So once they understood where in the process patients would be, they realized we were not doing abortion...then they were happy to be supportive and be a part of it.” (Support staff, Nurse clinic manager)

Some participants, mostly but not exclusively physicians, self-identified during interviews as pro-choice. These participants had a different perspective on the similarity of abortion and miscarriage services. Some expressed that focusing on emotions or abortion either in training or within a site was problematic: “And then having in the miscarriage management [training] a whole lot of talk about the procedure being upsetting and all that I think it really emphasized the connection of miscarriage management to therapeutic abortion instead of normalizing the procedure.” (Faculty MD and site champion).

For some a connection between miscarriage and abortion services was positive: “I think we have to acknowledge that this is a way of teaching abortion skills to family medicine doctors who otherwise don’t get this in clinics where abortion is not provided, right.” (Faculty MD)

“every time it’s the first time.”

Low case volume of miscarriage patients in general and of patients who choose MVA in particular emerged as a major perceived barrier to implementation. “I think one of the big challenges is that it’s so rarely needed that every time you do you’re reinventing the wheel. And although we have a pretty good volume, we don’t have the volume that one would need to do enough procedures to make everybody feel comfortable.” (Faculty MD and site champion)

“If we don’t do something regularly, it makes people nervous when it does come up.” (Support staff, MA)

“It’s pretty simple...”

In contrast, some attributes of MVA for miscarriage management were identified by participants as facilitators to implementation: that it was easy to use, would lower patient and health care system costs, or could improve quality and or continuity of care.

“Being able to do this in our clinic is a cost saver for patients...our patients are more likely to follow through and I think patients appreciate the procedure ...” (Faculty MD)

“I think people appreciate[d]...how simple a procedure and how quick it is, and...[patients] can avoid anesthesia, they can do it right there in my office, I can schedule at the end of the day and just get it over with, I do think there’s value in that.” (Resident MD)

Speaking about a miscarriage case managed using MVA, one participant talked about how the MVA permitted better continuity of care: “She was able to have her husband in the room, she had her regular physician, she had the interpreter in the room whom she knew, I think it was a very comfortable mentally for her to have it done in our clinic in familiar surroundings.” (Support Staff, LPN)

The RTI-MM dissemination strategy: Champions, hands-on practice, and team training

Champions—what they do and how to support them—were central to implementation of MVA services. In addition, a positive or negative initial user system experience with MVA, often managed by the champion, was important to implementation. Other components of the RTI-MM dissemination strategy cited as helpful to implementation were the hands-on papaya workshop, inclusion of support staff in training, and a focus on clinic systems.

“more of a reminder that it is an option”

Champions and other participants described what champions did or did not do, and the challenges they faced. One faculty member provided a detailed description of the role of the champion at her site:

“[the champion] said this is important, we need to start doing this, you can’t wait until you have a perfect protocol and the perfect patient walks in to start doing things, or you’ll never do anything...and I think [she] was right, if we could start doing this and be successful, then it wouldn’t feel so daunting...she kept bringing it up and that kind of got us over that initial hump. And it does really need someone to champion it in an ongoing fashion...who really says this is really good, is anybody thinking about this for these patients, how has this gone, is there anything we can do to make it go better, check in with the nurse...sort of how can we make sure that everyone feels like this is a success.” (Faculty MD)

As this participant highlights, initial experience with MVA was important to successful implementation; effective champions worked to identify patients who were candidates for the MVA procedure to promote a smooth and successful experience for the team.

Strong champions also commanded respect from peers. Support staff who took on a champion role could be especially effective: “...but most importantly one of our LPN champions was very positive about it...he has a lot of respect from the MAs and the staff.” (Faculty MD and site champion)

Champions faced many challenges such as competing priorities and unsupportive clinic or institutional environments. The challenge of championing alone was cited by several participants: “we have you know one doctor...this has really been [in] her heart to...get

miscarriage management here...she is amazing, [but] she's involved in so many other things,"
(Support staff, LPN team leader)

One participant offered advice on how to support champions: "When somebody feels like they are championing alone, having someone...outside of the clinic, who says 'we do this, we've been successful doing this, how else can we help you?' would be great." (Faculty MD)

"just getting comfortable...which buttons to push and just getting used to it"

Many participants cited the hand-on simulation exercise with the papaya model as the most beneficial part of the training because it allowed them to practice aspiration technique in a realistic way. "The papaya it's nice for people to get their hands on the syringe and just get a sense of what the suction feels like. It's nice to have something appear in the syringe and I think gave people a little more confidence..." (Faculty MD and site champion)

"ideas how other clinics rolled out the service"

In addition to the inclusion of support staff to enhance clinic-level practice change, participants spoke about other aspects of their systems such as protocols, patient education materials, and hearing how other sites had implemented MVA. This content was necessary for implementation, and also often necessary to convince organizational (e.g. hospital level) leaders to endorse the practice change initiative. "[During the RTI-MM,] we discussed scenarios and options and questions and got some ideas how other clinics rolled out the service and used it and we got some [protocols, education materials]...that we could incorporate into our practice."

(Support staff, LPN office co-ordinator)

"I mean I had MVAs and stuff, but we hadn't quite gotten to the point of having protocols and using them in the clinic" (Faculty MD and site champion)

The user systems: Teamwork and scope of practice

Each residency site was a unique user system, but common themes emerged, especially about the value of team, or interprofessional, training and scope of practice or institutional barriers.

“hearing the same messages”

The inclusion of support staff in didactic training and focus on values and systems within the support staff training were cited as unique and useful characteristics of the RTI-MM and participants acknowledged that support staff involvement is necessary to successful implementation: “critical to having it happen is...support staff who want to make it happen.” (Resident MD)

And support staff spoke of their role in service provision and training: “I’m kind of the...resource person for so much of what happens in the clinic. So although I might not ever be involved in one of the procedures (although I’d like to be just so I can be more tuned into what happens), I definitely need to know what’s going on.” (Support staff, Nurse supervisor)

“interesting...since we are in a teaching situation to have the hands on experience with the papaya and you know be able to really see what the doctors are doing because that helps us in training with the doctors.” (Support staff, MA)

“Scope of practice for family practitioners is a battle here.”

Perceptions of scope of practice within each site varied and depended on several factors including relationships with obstetrician-gynecologist colleagues, patient population, and geographic location. However, these factors were not deterministic and operated differently across sites, indicating that local culture is central to scope of practice controversies.

“it’s a little bit political...we still end being a little more on the defensive and that’s part of the problem...as opposed to if I was a rural doc and I was the only

one who offered this procedure, then everybody would be delighted I did it and nobody would give me a hard time about it, but in the urban setting, when there's maybe a little bit different community standard and our OB backup isn't doing miscarriage management in the clinic setting, then that feels a little bit trickier."

(Faculty MD)

Obstetrician-gynecologists were perceived as having influence over family medicine clinic policies: "I've talked with him [staff Ob/Gyn] about it and his bias is that patients have a preference to just do it in the OR rather than doing in the clinic. So that could be it too, because I imagine he has an influential role around our clinic policies and that sort of thing." (Resident MD)

Scope of practice was also an issue at the organizational or hospital level, whose approval is needed to implement new office procedures: "[I was] unsure if the powers that be... would be OK with us providing that service or if it would be deemed oh, that's only something that OB/Gyns can do." (Resident MD)

DISCUSSION

Our data about the implementation of MVA for miscarriage management in Family Medicine residency settings in Washington State support the importance of previously identified constructs in the implementation process (Damschroder et al., 2009; Greenhalgh et al., 2004). We found that perceptions of the innovation, the dissemination strategies, and the user system all played a role in the implementation process. We identified common barriers to implementation such as low volume and a perception of miscarriage as emotional and/or like abortion, as well as facilitators, such as the inclusion of support staff in training, hands on experience, and effective champions. Our findings also raise questions for further study, such as the best way to support

champions and the interaction between champions and their systems, and identification of the best strategies to positively influence perceptions of MVA.

The innovation

Our results strongly support previous work that states that user perceptions of the innovation are central to implementation (Berwick, 2003; Damschroder et al., 2009; Greenhalgh et al., 2004; Rogers, 2003). In our sample, perceived characteristics of the innovation were about both the device and procedure (MVA) and about the diagnosis (miscarriage). No practice change initiative is neutral, but miscarriage, with its proximity to death, reproduction, and induced abortion, may be especially challenging. Perceived characteristics of the innovation (like abortion, too emotional) and perceived compatibility of the innovation with individual users and systems due to these perceptions must be explicitly addressed in dissemination strategies. There was overlap and feedback between the innovation and users and their systems, highlighting that these categories or constructs do not have clear boundaries (Damschroder et al., 2009).

Previous literature suggests that individuals or sites with a focus on patient centered care are more successful at implementing innovations (Damschroder et al., 2009). We found that patient centered care, especially the concept of continuity of care, was a value shared by users that enhanced compatibility and facilitated implementation of MVA, and that for some users, the MVA itself had attributes that enhanced patient centered care – simple, quick to use, and inexpensive.

Dissemination strategies

It is well understood that compelling evidence is necessary but not sufficient for practice change to occur; evidence must be supported with additional strategies (Berwick, 2003; Davis et al., 1999; Grimshaw et al., 2001; Grol, 1997). The use of champions, interactive approaches,

and a systems approach to team training were all important to the RTI-MM dissemination strategy. Our results point to the importance of effective champions and provide detail about how champions operate. Effective champions were those leaders who maintained a focus on integrating MVA into practice, who engaged in training the entire team, who leveraged existing networks, such as supporting support staff leaders, and who were able to encourage change in clinic norms or expectations. Experience—a positive or negative experience with MVA and how that feeds back into implementation—was a key role of champions at participating sites. Reliance on a single site champion can lead to burnout, however, given that champions have many competing responsibilities and priorities (Bodenheimer, 2007). Our experience suggests that supporting champions is a key component of success and our findings point to ways to develop and support effective champions, such as providing content for protocols and presentations to colleagues or hospital administration about MVA and checking in frequently to share new information and provide support.

Our results support using values clarification in practice change interventions to address barriers related to value-laden perceptions about the innovation. Values clarification has been widely used as part of patient decision-making tools (Branstetter-Rost, Cushing, & Douleh, 2009; Stacey et al., 2011), but used less frequently to examine provider behavior. A key exception to this is in the literature on implementing induced abortion services (Goodman et al., 2009; Leeman & Espey, 2005; Turner, Hyman, & Gabriel, 2008). Future research should explore whether exposure to values clarification shifts physician and support staff attitudes about miscarriage and whether exposure to miscarriage can shift attitudes about the MVA procedure or induced abortion services.

The user system

The inclusion of clinical and administrative support staff in RTI-MM training facilitated implementation of MVA services. The RTI-MM explicitly acknowledged the important roles of support staff in patient care and in working with faculty to train residents. Even in these teaching sites, training did not routinely include support staff, and some sites were not initially enthusiastic about the inclusion of support staff in training. Interprofessional and/or team training is an innovation in medical (Brashers, Peterson, Tullman, & Schmitt, 2012; Ho et al., 2008) and continuing (Wilcock, Janes, & Chambers, 2009) education, facilitates implementation (Grol & Grimshaw, 2003), and has been associated with better clinical preparedness by physicians (Bandali, Craig, & Ziv, 2012). However, it is challenging to implement (Rees & Johnson, 2007) and does not yet have strong evidence to support impacts on professional practice or health outcomes (Hammick, Freeth, Koppel, Reeves, & Barr, 2007; Reeves et al., 2010; Zwarenstein & Reeves, 2006). User systems that successfully implemented MVA were generally those sites where study participants articulated their role as learning and training centers, acknowledged the role of support staff in implementation and patient care, and “bought into” the team (interprofessional) training component of the RTI-MM.

Our results should be interpreted with the following limitations in mind. We oversampled at sites selected for further follow-up, which may limit generalizability to all sites. However, our findings across sites support findings at our oversampled sites and our use of maximum variation sampling ensured that a variety of roles and sites provided data. As with all non-experimental research designs, it is likely that study participants had more interest in our topic than non-participants; it is also possible that non-participants experienced different barriers and facilitators than study participants. However, our data represent a range of opinion about implementation of miscarriage management services. Finally, we collected data from individuals and look for

common themes at the site level. Sites are made up of individuals, and organizational change begins with individuals, but we do not understand how they interact (Damschroder et al., 2009).

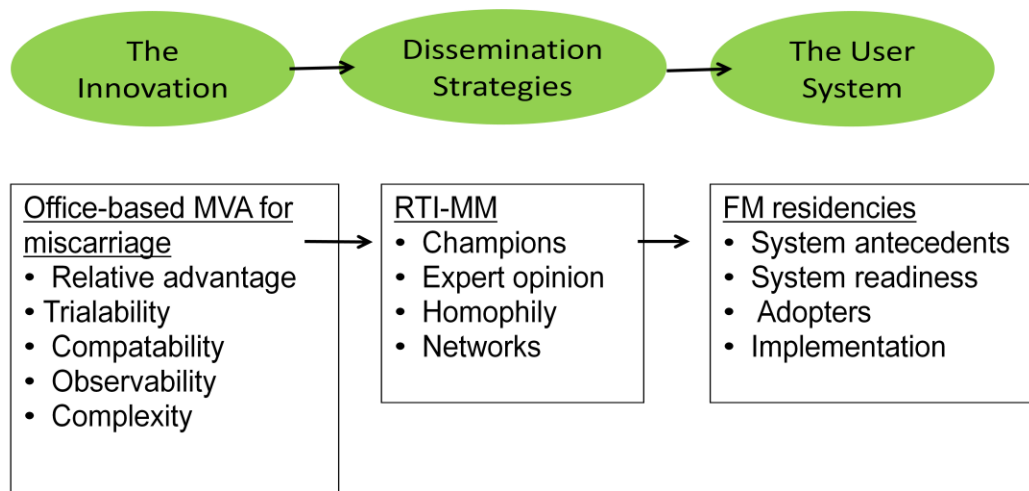
IMPLICATIONS FOR PRACTICE AND POLICY

Our study of implementation of miscarriage management services using MVA provides concrete strategies for clinical sites seeking to successfully implement similar services. We found much that overlaps with the broader health services, practice change, and implementation science literature, and also identified elements that may be specific to reproductive health care services. Perceived characteristics of the innovation and perceived compatibility of the innovation with individual users and systems must be explicitly addressed in dissemination strategies; supporting champions is a key component of success; and support staff should be explicitly included in practice change interventions. While these components support existing literature, perceived characteristics of the innovation may be a larger barrier in reproductive health services than other primary care services.

CONCLUSION

Perceived characteristics of the innovation (too emotional, like abortion) must be explicitly addressed in dissemination strategies and support staff should be explicitly included in practice change initiatives. Questions remain about how to best support champions and influence perceptions of the innovation, and which components of the RTI-MM were most important. Our study findings contribute programmatically, to improve and adapt the RTI-MM, and to broader theoretical knowledge about practice change and the implementation of innovation in health services.

Figure 1. Characteristics that support or impede practice change. Adapted from Greenhalgh
(Greenhalgh et al., 2004)



Greenhalgh, T., Robert, G., Macfarlane, F., Bate, P., & Kyriakidou, O. (2004). Diffusion of innovations in service organisations: Systematic review and recommendations. *Milbank Quarterly*, 82(4), 581-629.

Table 1. Participant characteristics, N=36	
	<i>n</i>
Role	
Resident	10
Faculty	12
Clinical support staff (e.g. MA, RN)	8
Administrative support staff (e.g. clinical manager, scheduler)	6
Site champions (MD or support staff)	7
Female gender	27
White, non-Hispanic race/ethnicity (n = 5 missing)	26
At a site that implemented MVA services by the time of interviews (n=6 sites)	28
At a site that was selected for follow-up training following this study	17
At a site that provides induced abortion services (n=2 sites)	5
At a site that provides any induced abortion training (including off-site opt-in training; n=3 sites)	8

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**The *Oportunidades* conditional cash transfer program:
Impacts on pregnancy and contraceptive use in young rural women in Mexico**

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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 includes women aged 15-24 to examine the impact of *Oportunidades* program on pregnancy and contraceptive use among young rural women in Mexico.

Methods We used three waves of the ENADID, a population-based survey, to describe trends in outcomes. We developed a matched sample from the 2006 survey, used multivariable logistic regression, and calculated predicted probabilities to estimate program impacts.

Results The proportion of rural young women 15-24 reporting any pregnancy stayed flat, while contraceptive use is steadily increasing (13.2% in 1992 to 18.9% in 2009), but remains low.

School attendance by young rural Mexican women has 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).

Married adolescents have greatly increased odds of pregnancy (OR = 48.76; CI = 33.95, 70.02).

Marriage, previous pregnancy, and access to health insurance are significantly associated with increased odds of contraceptive use, exposure to *Oportunidades* is not.

Conclusion We find no statistically significant evidence that *Oportunidades* reduced the probability of pregnancy among adolescents or increased the probability of using a modern contraceptive method. Education was associated with decreased probability of reporting a pregnancy among adolescents and increased probability of contraceptive use. *Oportunidades* may indirectly delay fertility among younger adolescents via components of the program that encourage schooling and discourage adolescents from forming their own households Health insurance had a significant impact on contraceptive use in our sample, but the overall level of contraceptive use remains very low. Mexico should focus on increasing the rate of contraceptive

use among rural women 15-24 overall, especially nulliparous women, regardless of *Oportunidades* enrollment.

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.

Countrywide contraceptive use is estimated to be 70% ². 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 adolescents⁵. Early pregnancy is associated with adverse health outcomes for women and children⁶, 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, health¹⁹ and cognition ^{20, 21}, and schooling ²⁰.

The *Oportunidades* program (formerly called *PROGRESA*), which aims to reduce poverty ²⁰ and develop human capital¹⁹ 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} .

Oportunidades targets women with children (*titulares*); it may therefore affect decisions about 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 *titulares* 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 experimental period (1998-2000) ¹⁰ . In 2007, *Oportunidades* program data suggested that 57% of exposed women of reproductive age 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 different mechanisms, including increased access to health services and health information, education, or 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 . Girls raised in *Oportunidades* households may remain in school longer, may have higher educational goals, and may delay first births and/or use modern contraception. However, a benefit such as the *Oportunidades* program may

create perverse incentives: a cash transfer may encourage fertility through higher payments for more children³³ or reductions in male migration¹¹, but there is not evidence of higher fertility among *titulares*^{10, 25}.

Research on reproductive outcomes to date has focused exclusively on female *titulares* of all reproductive ages (15-49) and has relied on *Oportunidades* program data. This analysis includes all women aged 15-24 (*titulares* or not), uses population-based data sources and descriptive and multivariable methods to examine the impact of *Oportunidades* program 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 level³⁴. 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 and therefore we could not use it to examine program impact.

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 if “you or anyone in the household is 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. This variable is particularly relevant for younger women who may not have completed their schooling yet; 3) education level of the head of the household. **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 fertility³⁵, 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 status³⁶. We measured access to health **insurance** and exposure to any **other social programs**. Household composition could affect fertility decisions¹⁰ 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 analysis³⁷ 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 and therefore not well-represented in the *Oportunidades* sample.

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 dependence³⁸. 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 overlap⁴⁰, 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.

Analysis

We used proportions and means to characterize trends in outcomes and covariates 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 our education variable 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 *Oportunidades* with reporting pregnancy and current use of a modern contraceptive method or sterilization. We transformed odds ratios into predicted probabilities using Clarify⁴¹ to ease interpretation of absolute and relative impacts⁴². We performed several sensitivity analyses: including region as a fixed and as a random effect, including an interaction of *Oportunidades* and education level, including an indicator of head of household or wife of head of household status (vs child or other relation to the head of household), wealth index decile categories, and 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. All analyses were done using STATA version 12⁴³

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). At the national level, we do not see an obvious impact of the large

Oportunidades program on young women's risk of pregnancy or contraceptive use. 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).

Table 2 shows that the matched sample is balanced on some covariates, but differences remain. A significantly larger proportion of women exposed to *Oportunidades* were younger, more likely to speak an indigenous language, still be in school, exposed to another social program, and poorer. Women exposed to *Oportunidades* are less likely to be married, be the head of household or wife of the head of household, use a modern contraceptive method, or report a pregnancy.

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) (Table 3). 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. However, an adolescent in school but not exposed to *Oportunidades* has a predicted probability of .07 (.05, .10). Those in *Oportunidades* who are not in school have a .10 (CI = .07, .12) probability of pregnancy, while those without either *Oportunidades* or school have a .13 (CI = .10, .16) probability of pregnancy. 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). Some of our subsample categories are small; we may not have the power to detect true differences and some of our results are based on small numbers of women.

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* is not significantly associated with contraceptive use among adolescents (15-19) or young women (20-24). Marriage, any pregnancy, education, and access to health insurance are all significantly associated with increased odds of contraceptive use (Table 4). We find no differences in predicted probabilities of contraceptive use by *Oportunidades* exposure, but our findings reveal the role of health insurance in contraceptive utilization. We find the same predicted probability of using a modern contraceptive method, .19 (CI = .11, .30), among married women with health insurance who are exposed or unexposed to the program, holding other covariates at the mean. Those without health insurance have a predicted probability of .15 (CI = .10,.20) of using a method among both the exposed and unexposed. That is, exposure to *Oportunidades* exposure makes no impact, and all variation is due to health insurance. 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 sample of young, poor, rural Mexican women, we find no statistically significant evidence that exposure to the *Oportunidades* conditional cash transfer program reduces the odds of a pregnancy among adolescents (15-19) or increases the odds of contraceptive use among women 15-24. However, we also find no evidence that *Oportunidades* increases pregnancy among young beneficiaries. 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* beneficiaries²³, and national averages in Mexico. This is likely partially due to our younger sample, and also highlights disparities within the rural population, and between the poor and the general population, consistent with findings within Mexico²⁹ and across the developing world⁴⁴. Previous reports suggested increases in contraceptive use over 10 years among married *Oportunidades* beneficiaries aged 15-19 with at least one child²³. 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 impact of *Oportunidades*.

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 services⁴⁶. In contrast, *Oportuniidades* provides very limited family planning services, offered in the context of antenatal or postpartum care⁴⁷; 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 (as evidenced by a pregnancy), 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 poor⁴⁴. Latin America has the largest inequalities in contraceptive use by wealth compared with Sub-Saharan Africa and South and Southeast Asia⁴⁴, with additional disparities in access and utilization by age; married adolescents (15-19) report more unmet need for contraceptive services than married women 20-24⁵. Supply and access, via health insurance, may be the key to increasing contraceptive use in this young, poor population. Services must be accessible, good quality⁶, 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. The discrepancy in our results suggests that it is being in school rather than a threshold level of

education that delays pregnancy. That is, although achieving an eighth-grade education has increased dramatically among rural young women, it is possible that being in school at age 15-19 is required to successfully delay adolescent pregnancy. Wealth and education are each consistently correlated with reduced fertility³⁰, but education was not independently correlated with contraceptive use among the poor in a recent analysis of 55 developing countries⁴⁴. This raises questions about the mechanisms for the impact of education on fertility. Education is thought to influence fertility levels via Bongaart's proximate determinants of fertility³⁵: age at marriage, postnatal fecundity (via breastfeeding and postnatal abstinence practices), and use of contraception^{30, 48-52}; but the pathway is not well understood. Education may operate at the cognitive level by imparting information, but some researchers have argued that the content of education may not be as important the socialization aspects of formal education^{51, 53, 54}. Quality and content of formal education may differ dramatically, but all formal education contains elements of Western culture (e.g. modern institutions) and ways of knowing (e.g. enumeration, written word), that is, socialization³⁰.

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. The program is closed to enrollment; young women do not have an incentive to establish their own households to receive benefits, which was identified as a strength of the program¹⁰. Although we see no direct impacts of *Oportunidades* on pregnancy in our model, the incentive to keep adolescents at home and in school may have indirect benefits.

Oportunidades has shown positive impacts on child health, cognition, and education, as well as family planning in the context of ante- and post-partum service utilization. The goal of the program is to reduce intergenerational poverty; fertility is an important part of achieving that

goal, and delaying pregnancy among adolescents has important implications for reducing total fertility as well as improving health, education, and economic outcomes⁶. We see no impact of *Oportunidades* on adolescent pregnancy or on contraceptive use among young women.

However, staying in school, a key component of *Oportunidades*, does appear to reduce the odds of pregnancy among adolescents and achieving a secondary education appears to positively influence use of a modern contraceptive method.

Countries investing in CCTs who aim to reduce poverty should focus explicitly on delaying early fertility, and access to contraceptive services, one strategy to delay early fertility, needs to be expanded beyond the context of already occurring fertility (*e.g.* prenatal care). It is important to evaluate large-scale social policies like *Oportunidades* rigorously and thoroughly; Mexico has invested a large amount of money in the program and assessment of program impacts is hindered by a lack of population-based longitudinal data with the necessary information on program exposure. Our results shed light on access to contraceptive services, which is one strategy to delay early fertility, and suggest that it needs to be expanded to nulliparous women, because the current *Oportunidades* benefits are only associated with prenatal care.

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). 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). In addition, we were unable to use the 1997 wave of ENADID; we replicated data in the full sample of rural women from published reports^{5,55} and concluded the data lacked face validity due to dramatic changes in outcomes that did not follow trends. Second, we are not

able to capture length of exposure to *Oportunidades* and our measure of exposure is self-reported. Our exposure variable asks about current exposure but may not capture those who were previously exposed but left the program, nor does it identify those who entered *Oportunidades* as it was scaled up (1998 vs 2000 vs 2003). Previous research in *titulares* 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-report. 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, but these methods are not perfect.

In conclusion, we find no statistically significant evidence that household-level exposure to *Oportunidades* reduced the probability of pregnancy among adolescents or increased the probability of using a modern contraceptive method. Education was associated with an increased probability of contraceptive use and decreased probability of reporting a pregnancy among adolescents; *Oportunidades* may indirectly impact fertility among adolescents via components of the program that encourage the schooling and discourage adolescents from forming their own household. Health insurance had a significant impact on contraceptive use in our sample, but the overall level of contraceptive use remains very low. Mexico should explicitly target fertility among young women by increasing the rate of contraceptive use among rural women 15-24 overall, especially nulliparous women, regardless of *Oportunidades* enrollment.

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Competing interests

No authors have any competing interests

Financial disclosure

Ms Darney was supported ARHQ T32 predoctoral training grant (HS013853); University of Washington CTSA predoctoral training grant (TL1 RR025016); and a Student Award from the Society for Family Planning. No funding source had any role in the design, writing, or decision to publish this manuscript.

Ethics statement

An ethics statement was not required for this work

Fig 1.

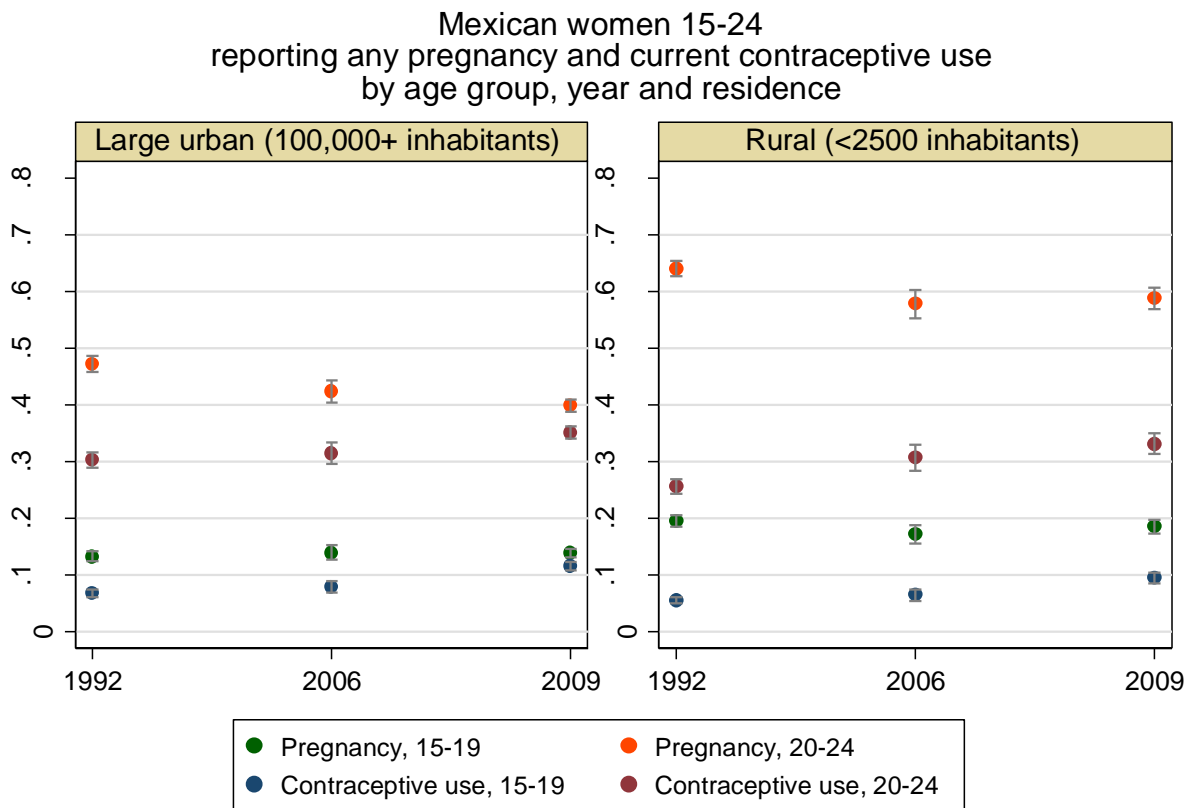
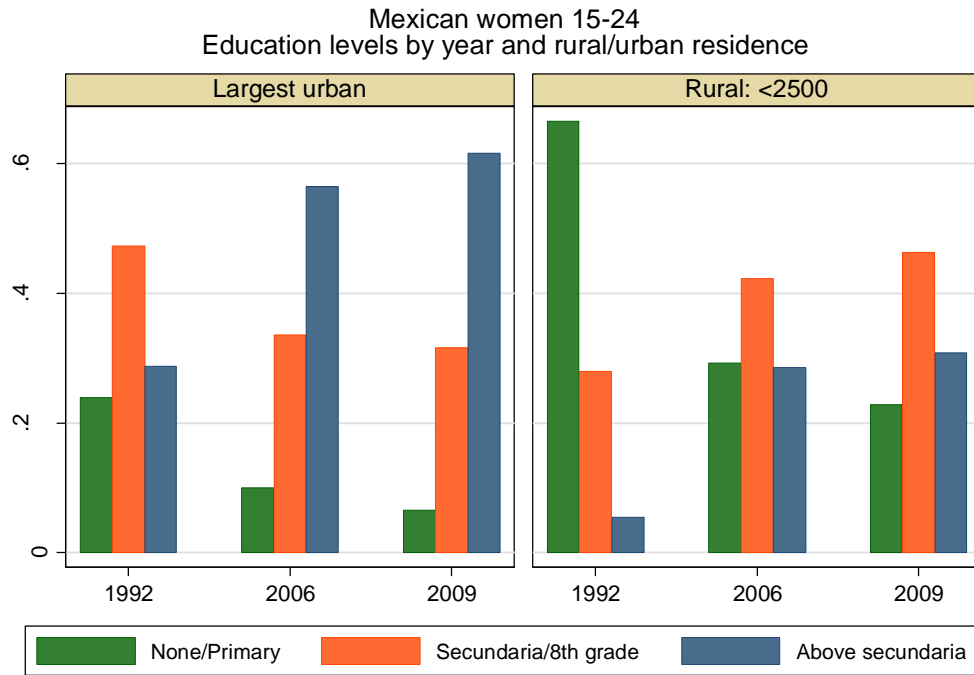


Fig 2.



Graphs by <2500 vs largest urban

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 0.58	4678 0.42	3832	2199 0.57	1633 0.43	6363	3648 0.57	2715 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	<i>not available</i>	-----	-----	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	<i>not available</i>	---	---	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 1 st 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 use of
modern contraceptive method (15-24), rural
Mexico, 2006. N=3452

	<u>OR (CI)</u>
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.

Conclusion

This dissertation focused on prospective and retrospective approaches to program evaluation in reproductive health. It includes primary and secondary data, quantitative and qualitative methods, and small-scale domestic and large-scale international programs. The goal of this work was to produce evidence about the impacts of a clinical education and training program, the Family Medicine Residency Training Initiative in Miscarriage Management (RTI-MM) in Washington State, and a large-scale social policy intervention in Mexico, the *Oportunidades* conditional cash transfer program.

We report that the RTI-MM is independently associated with self-report management of miscarriage using manual vacuum aspiration (MVA) among program participants at follow-up compared with baseline, controlling for other factors that may influence practice, and find evidence that support staff knowledge of MVA may impact physician practice. Our qualitative work focused on the implementation process revealed that perceived characteristics of the innovation must be explicitly addressed in dissemination strategies, support staff should be included in practice change initiatives, and raised questions about how to best support champions and influence perceptions of the innovation. Integrating MVA into family medicine settings has implications for access to evidence-based, comprehensive care for women.

In our retrospective evaluation in Mexico, we find no evidence that *Oportunidades*, the largest conditional cash transfer program of its kind, reduced the probability of pregnancy among poor, rural adolescents or increased the probability of using a modern contraceptive method. Education was associated with an increased probability of contraceptive use and decreased probability of reporting a pregnancy among adolescents; *Oportunidades* may indirectly delay fertility among younger adolescents via the schooling component of the program. Health

insurance had a significant impact on contraceptive use in our sample, but the overall level of contraceptive use remains very low compared to national averages. Mexico should focus on increasing the rate of contraceptive use among rural women 15-24 overall, especially nulliparous women, regardless of *Oportunidades* enrollment.

Interventions intended to improve reproductive service delivery, train clinicians, or impact fertility behaviors and outcomes should be rigorously evaluated. This dissertation uses a variety of data and methods to produce evidence about the impact of the RTI-MM and *Oportunidades* that can be used to inform programmatic work. Women deserve the best available evidence and the highest-quality programs, interventions, and reproductive health services. This dissertation makes a contribution towards this goal.