

Focused Strategic Assessment

USAID Child Survival and Health Grants Program “Community-Based, Impact-Oriented Child Survival in Huehuetenango, Guatemala”

[Municipalities of San Sebastián Coatán, Santa Eulalia, and San Miguel Acatán]

October 1, 2011 – September 30, 2015

Cooperative Agreement No: AID-OAA-A-11-00041



Mothers in a Care Group meeting practice proper hand washing

Curamericas Global, Inc.

318 West Millbrook Road, Suite 105, Raleigh, NC 27609

Tel: 919-510-8787; Fax: 919-510-8611



USAID
FROM THE AMERICAN PEOPLE

The Community-Based Impact-Oriented Child Survival in Huehuetenango, Guatemala Project in Huehuetenango, Guatemala is supported by the American people through the United States Agency for International Development (USAID) through its Child Survival and Health Grants Program. The Project is managed by Curamericas Global, Inc. under Cooperative Agreement No. AID-OAA-A-11-00041. The views expressed in this material do not necessarily reflect the views of USAID or the United States Government. For more information about The Community-Based Impact-Oriented Child Survival in Huehuetenango, Guatemala Project, visit: <http://www.curamericas.org/>.

Authors

Principal Authors

Dr. Henry B. Perry (Principal Investigator)
Dr. Mario Valdez (Co-Principal Investigator)
Ira Stollak (Co-Principal Investigator)
Dr. Ramiro Llanque (Final Evaluator)

Contributing Authors

Dr. Stanley Blanco
Ing. Karin Rivas
Kaitlin Cassidy
Jason Lambden
Corey Gregg
Shayanne Martin
Maryiam Garcia
Nina Modanlo
Michelle Wilcox
Dr. Patricia Loo
Juan Antonio Díaz

Operational Research Advisory Committee

Dr. Danilo Rodriguez
Dr. Fernando Gomez

Suggested Citation: Perry HB, Valdez M, Stollak I, and Llanque R. 2016. Focused Strategic Assessment: USAID Child Survival and Health Grants Program “Community-Based, Impact-Oriented Child Survival in Huehuetenango Guatemala.” Curamericas Global, Inc. Raleigh, NC, USA.

PREFACE

The document you are reading is a milestone in a journey that began over 30 years ago in the cold wind-swept *altiplano* (high plain) of Bolivia. The Community-Based Impacted-Oriented Methodology, or CBIO, formerly the *Census-Based Impact-Oriented Methodology*, was developed by Drs. John Wyon and Henry Perry of Curamericas Global (then Andean Rural Health Care) in the 1980's in the Bolivian *altiplano* to address the challenge of achieving sustainable improvements in the health of rural indigenous populations in resource-poor areas. CBIO brings health education and services to every doorstep – “everyone counts, and everyone is counted”- and by monitoring vital events of every household CBIO can demonstrate actual impacts on maternal and child mortality. Working in partnership with the Bolivian PVO they helped found, the Andean Rural Health Council (*Consejo de Salud Rural Andino*), they achieved impressive results in lowering under-5 mortality, first in areas of the rural *altiplano* of northern Bolivia, and later in the peri-urban communities of Montero and El Alto.^{1,2,3}

Meanwhile, on the other side of the world in Mozambique, World Relief developed another path-breaking methodology, Care Groups, which, like CBIO, drills down to every doorstep, deploying cadres of female peer educators (Care Group Volunteers) who catalyze health behavior change through participatory lessons they teach to their neighbors. The Care Group methodology steadily accumulated a body of evidence for its effectiveness in Africa and Asia.^{4,5} Tom Davis, working part-time with Curamericas in 2001, recognized the similarities and the potential synergies of the two methodologies, particularly the way both methodologies were census-based and empowered communities and women in particular to become partners in improving their own health. So he proposed the marriage of these two methodologies, the CBIO + Care Group Methodologies (CBIO + CG).

This new hybrid service platform was first tested from 2002 to 2007 in Curamericas Global's USAID Child Survival Project (CSP) in the Western Highlands of Guatemala, working in partnership with the new Guatemalan PVO, Curamericas/Guatemala, founded in 2002 by Dr. Mario Valdez. Encouraged by the outcomes achieved in increasing coverage of high impact interventions and reducing under-5 mortality in this challenging context, CBIO + CG was put to the test again by Curamericas Global between 2008 and 2013 through another CSP in another post-conflict state, Liberia, in partnership with Ganta United Methodist Hospital. The results achieved were equally impressive.⁶

But in both projects there was a vital missing ingredient: an operational research effort to evaluate and improve the methodology and to accumulate evidence publishable in peer-reviewed journals to demonstrate its effectiveness. In 2011 the office of the USAID Child Survival Health Grants Programs graciously awarded Curamericas Global another grant that enabled us to return to the Western Highlands to continue the work begun there with Dr. Valdez and Curamericas/Guatemala, and to this time execute an ambitious multi-disciplinary operational research effort. The results of this effort are contained in this report, which we call a Focused Strategic Assessment. This Assessment combines the traditional content of a Child Survival Project Final Evaluation with the results of our operational research, both formative and evaluative, and serves to disseminate to the global health community and to the citizens of Guatemala the impressive results we achieved, the lessons we learned, and the challenges we still must overcome going forward.

¹ Perry, Henry, et. al. Attaining health for all through community partnerships: principles of the Census-Based Impact-Oriented approach to primary health care developed in Bolivia, South America. *Social Science and Medicine*. 48(1999). 1053-1067.

² Perry H and Tom Davis. The effectiveness of the census-based impact-oriented (CBIO) approach in addressing global health goals. In Beracochea E (ed.). *Aid Effectiveness in Global Health*. 2015. New York: Springer, pp261-278.

³ Perry, H., D. Shanklin and D.G. Schroeder. Impact of a community-based comprehensive primary healthcare programme on infant and child mortality in Bolivia. *J. Health Population Nutrition*. 2003. 21(4). 383-395.

⁴ Perry, H. et. al. Care Groups I: An innovative community-based strategy for improving maternal, neonatal, and child health in resource-constrained setting. *Global Health: Science and Practice*. 2015. Vol. 3. No.3.

⁵ Perry, H, et al. Care Groups II: Outcomes achieved using volunteer community health workers in resource-constrained settings. *Global Health: Science and Practice*. 2015. Vol. 3 No. 3.

⁶ Capps, Jean. Final Evaluation for the Nehnwa Child Survival Project: Census-Based Impact-Oriented Methodology for Community-based Primary Health Care in Nimba County, Liberia. Curamericas Global. Raleigh, NC: December 2013.

EXECUTIVE SUMMARY

Purpose of Focused Strategic Assessment: Between 2002 and 2013, Curamericas Global implemented two very successful Child Survival Health Grants Projects, one in Guatemala (2002-2007) and one in Liberia (2009-2013), utilizing a promising new service platform that integrates the Curamericas Community-Based, Impact-Oriented (CBIO) methodology with the Care Group methodology originally developed in Mozambique by World Relief. But both of these projects lacked an operational research effort to more rigorously evaluate and strengthen the new CBIO + Care Group methodology and to provide publishable evidence regarding the effectiveness of the combined approach. In 2011, Curamericas Global again partnered with Curamericas/Guatemala in the Western Highlands to implement another Child Survival Project (CSP) utilizing CBIO + Care Groups and to this time execute an ambitious multi-disciplinary operational research effort. Our central hypothesis was that the CBIO and Care Group (CBIO + CG) methodologies can produce superior health and social outcomes in a rural, resource-constrained setting compared to the status quo with respect to (1) coverage of interventions designed to address the epidemiological priorities of mothers and under-5 children; (2) the nutritional status of children younger than 2 years of age; (3) maternal and under-5 mortality; (4) women's health-related decision-making autonomy; and (5) community solidarity. In addition, we sought to show how *Comadronas* (traditional birth attendants) can transition into an effective new role in maternity care that improves the quality of care provided to indigenous women while respecting their cultural traditions and expectations.

The results of this effort are contained in this report, which we call a Focused Strategic Assessment. This Assessment combines the traditional content of a Child Survival Project Final Evaluation with the results of our operational research, both formative and evaluative, and serves to disseminate to the global health community and to the citizens of Guatemala the results we achieved, the lessons we learned, and the challenges that we still must overcome going forward.

Project Background: The Project was implemented in three municipalities located in the Cuchumatanes Mountains in the Department (state) of Huehuetenango, Guatemala, an isolated mountain region with a population that is overwhelmingly rural, poor, and Mayan. The maternal and under-five mortality in this area are on par with many poor countries in sub-Saharan Africa and among the highest in the Western hemisphere. Stunting affects 65% of under-5 children. Conditions are unsanitary and water is often contaminated. Childhood pneumonia is also frequent, exacerbated by under-nutrition. The great majority of births take place in the home attended by traditional birth attendants (called *Comadronas*). Impeding health facility deliveries as well as proper care-seeking for sick children are (1) long distances (in terms of travel time) to public health facilities over rugged terrain; (2) disrespect and abuse experienced by Mayan families at these facilities; (3) lack of culturally acceptable services provided in their language; and (4) traditional Mayan attitudes and beliefs that impede the practice of many healthy behaviors.

The Child Survival Project (CSP) aimed to respond to this health challenge by integrating the CSP with existing Ministry of Health (MSPAS) services to create a coherent local rural health care system that addresses community and epidemiological priorities, integrating the CBIO + Care Group methodology, *Casas Maternas* (community-based birthing centers) and the Ministry's Extension of Coverage Program (PEC). The Care Group training cascade, through the peer education provided to reproductive age women by Care Group Volunteers (called *Comunicadoras*), fomented key health behaviors such as care-seeking for children with symptoms of pneumonia and correct hand-washing by child caretakers, and also generated demand for health services such as antenatal care, health facility deliveries, and childhood immunizations. The *Casas Maternas* (community birthing centers staffed with Mayan health professionals providing culturally adapted services in the local language) and the PEC program (which sent mobile nurses into the communities to provide primary care) provided local fulfillment of this newly-generated demand. CBIO, through its census-based system, utilized Community Registers to closely monitor beneficiary needs and services at the household level, ensuring the efficient and equitable provision of these services to those most in need, and through its community-based surveillance of vital events at the household level utilizing the *Comunicadoras*, was able to document actual impacts on morbidity and mortality. CBIO provided far more than a census-based M&E system – it mobilized communities and their leadership to become conscious of their health challenges and fully engaged in improving

their own health. This meant the patient generation of trust among the communities in this very low-trust post-conflict context still scarred by the atrocities suffered during the long civil war.

Research Design, Methods, and Limitations: There were two operational research study areas. Half (89) of the targeted communities received Project services during the full four years of the Project; these communities constituted the Phase 1 Area. The remaining 91 communities, the Phase 2 Area, received services only during the final two years of the Project. We utilized a quasi-experimental research design, with the Phase 1 Area comprising the Intervention Study Area and the Phase 2 Area the Comparison Study Area, based on the hypothesis that the longer exposure to the Project and the CBIO + CG methodology in the Phase 1 Area would result in superior outcomes relative to the Phase 2 Area, producing a dose-response effect.

During the first two years of the Project (Phase 1) we conducted Formative Research to (1) assess and document the challenges and advantages of implementing the CBIO + CG methodology and integrating it within the MSPAS framework for health care delivery; (2) establish and assess a new role for *Comadronas* in maternity care; and (3) measure constructs such as community engagement and women's empowerment. The methods included focus group discussions, group interviews, and in-depth key informant interviews, all with purposefully-selected informants who included women of reproductive age, Care Group Volunteers, men/husbands, community leaders, *Comadronas*, and staff of both Curamericas/Guatemala and MSPAS. At the project's conclusion the same methods were used to (1) re-assess the challenges and advantages of implementing the CBIO + CG methodology; (2) re-assess the new role for *Comadronas* in maternity care; and (3) look at the effect of women's participation in the Care Group training cascade upon their self-efficacy and autonomy.

The Evaluative Research was conducted using the quasi-experimental study design described above to test our hypotheses that the CBIO and Care Group (CBIO + CG) methodologies can produce favorable health and social outcomes, utilizing quantitative assessment tools that included baseline and endline knowledge, practice and coverage (KPC) surveys in the intervention and comparison areas, household anthropometric surveys and anthropometric "censuses" of children younger than 2 years of age, "mini-KPC" Surveys, Registers of Vital Events and the results of verbal autopsies. For each Project outcome indicator we compared (1) the baseline to endline changes within each Phase Area; (2) the endline results of the two Phase Areas; and (3) the differences in the percentage changes from baseline to endline of the two Phase Areas (a difference-in-differences analysis). In addition, a mixed-methods case study of the *Casas Maternas* examined their ability to equitably increase health facility deliveries and integrate *Comadronas* into the maternity care provided there.

Key limitations included: (1) the CSP was too brief (4 years) for the CBIO + Care Group methodology to achieve its full effect and (2) there may have been spill-over between Phase Areas during the first two years of Project operations, and rapidly achieved results in the Phase 2 Area may have been due to the early strong impact of Care Groups and more-seasoned staff executing a methodology improved by the Phase 1 Formative Research and field experience in the Phase 1 Area.

Findings and Conclusions: The Project produced significant improvements from baseline to endline in the population coverage of the large majority of outcome indicators in both Phase Areas (1 and 2), particularly in the maternal/newborn care indicators. Outcomes were superior in the Phase 1 Area for around half of the outcome indicators, including nearly all maternal/newborn care indicators. However, indicators of coverage of PEC services (e.g., immunizations and vitamin A supplementation for children) did not show improvements in either Phase Area due to the government's termination of PEC services at the beginning of PY4.

In the Phase 1 Area, the maternal mortality ratio declined from 524 maternal deaths per 100,000 live births in PY1 (n=7) and 740 in PY2 (n=10) to 221 in PY4 (n=3, annualized), with the *Casas Maternas* likely contributing to this decline by increasing access to health facility deliveries and by making 82 successful referrals of obstetrical complications. In PY4, 12-59 mortality was nearly eliminated. Unfortunately, the vital events data indicated a sharp increase in neonatal mortality in PY4, particularly in the Phase 1 Area. The reasons for this are unclear, but are most likely artefactual and either represent inconsistencies in the reporting of stillbirths versus early neonatal deaths or they represent an enhanced capacity to register neonatal deaths, though we cannot rule out the effects of the closure of the PEC program by MSPAS in October 2014 and the loss of its preventative and curative services.

For the combined Phase Areas over the four years of the Project, postpartum hemorrhage accounted for 82% of registered maternal deaths and birth asphyxia accounted for 52% of registered neonatal deaths. Pneumonia was by far the leading cause of death among under-5 children (41% of all registered under-5 deaths). In the combined Phase Areas (1 and 2), 94% of maternal deaths and 95% of neonatal deaths were associated with home deliveries; 88% of neonatal deaths occurred at home; and 85% of all under-5 deaths occurred at home. These numbers reflect a persistent reluctance or inability of families to bring women with obstetrical complications, neonates in distress, or children with symptoms of pneumonia to health facilities for timely treatment due to distance, cost, and preference for traditional practices and/or fear of disrespectful or poor technical quality of treatment at MSPAS clinics.

In the Phase I Area, the prevalence of stunting was reduced from 74% to 39% over the course of the Project. However, the evidence for reductions in under-weight or wasting was not conclusive.

The findings indicate notable improvement in women's empowerment and women's autonomy, as measured by their active participation in community meetings and their ability to make health-related decisions, particularly regarding use of contraception and the place of delivery, which showed significant improvement. But the family context remains one of male control, with its traditional sense of male authority over women, male economic control over the household, and male control of female mobility. The Project was successful in increasing community involvement and solidarity, with significant increases in mothers of children younger than 2 years of age in the communities of both Phase Areas who reported that their community had an emergency transportation plan in place for women with obstetrical complications.

The Care Group methodology provides an ideal community-based platform for health education. It also provides a platform onto which Positive Deviance (PD)/Hearth workshops can be readily established. The PD/Hearth intervention confirmed that even in the apparently food insecure Project context there are available and affordable nutritious foods that can alleviate under-nutrition if properly included in a child's diet.

CBIO + Care Groups, when enhanced by the *Casas Maternas*, can achieve important reductions in maternal mortality, particularly in the partner communities of the *Casa Materna* micro-regions. Working with communities to establish *Casas Maternas* that provide high-quality, culturally appropriate and readily accessible maternity care provides a promising approach to reducing maternal mortality at low cost. The equipping of the *Casas Maternas* with small pharmacies (*boutiquines*) has enabled them to partially fill the gap created by the loss of PEC and supports their evolution to becoming general-purpose community-based primary health care clinics. The findings support the Curamericas strategy to redefine the role of the *Comadrona* in the rural health system by training them and integrating them into the *Casas Maternas*. However, cultural attitudes and perceptions that encourage home deliveries still present a major barrier to access and utilization of the services provided by *Casas Maternas* despite the strong encouragement of the *Comadronas*. Most *Comadronas* appear to understand and accept their new role in the rural health system and their integration into the operation of the *Casas Maternas*, which maintains their traditional role of monitoring the health of pregnant and puerperal women in exchange for their usual modest fee, but now has them encouraging women to deliver in the *Casa Materna*, accompanying them there, and assisting the *Casa Materna* staff with the delivery. They feel accepted by the *Casa Materna* staff as valued members of a team and they are crucial for encouraging women to deliver in the *Casas Maternas*.

Overall, this operational research study provides strong support for the effectiveness of the CBIO + CG methodology as implemented by Curamericas/Guatemala in the Department of Huehuetenango Project Area, in producing major and statistically significant improvements from baseline to endline in (1) key evidence-based interventions designed to address epidemiological priorities; (2) the reduction of maternal mortality; (3) the reduction in stunting in children younger than 2 years of age; and (4) the empowerment of women and communities to improve their own health, particularly when operating in the context of an integrated rural health system that includes *Casas Maternas* and the Extension of Coverage Program (PEC).

The lack of physically accessible and culturally acceptable government health services combined with the challenging mountainous geography, endemic poverty, lack of affordable transportation, and strong traditional cultural beliefs all contribute to maternal and child mortality and strengthen the case for (1) the *Casas Maternas*, (2) community case management of childhood pneumonia (i.e., the training of community-level workers to diagnose and treat pneumonia, as recommended throughout the world by WHO and UNICEF), and (3) the development of emergency transportation networks and insurance schemes to defray the cost of

transportation to a *Casa Materna* or other health facility for women who develop obstetrical complications, neonates in distress, and children ill with pneumonia.

In the future, women's empowerment and autonomy will need continued attention, including (1) reaching men and husbands; (2) enlisting community leaders; and (3) empowering women economically with sources of their own income. The success of the methodology depends heavily on community trust-building and the ability of implementers to identify and overcome challenges specific to the local context, particularly male dominance (*machismo*).

The CBIO + CG + *Casa Materna* approach as developed by Curamericas in the mountains of Huehuetenango for an indigenous population with high maternal and child mortality costs each year only US\$12.41 per mother and child beneficiary and only US\$5.80 per capita for the entire population. Such a level of expenditure should be easily affordable for the Guatemalan government and should be sustainable for long-term investment with in-country resources.

We are continuing the Project with all of its essential components (less PEC, which still has not been reinstated by MSPAS) on a reduced geographic scale with funding from Ronald McDonald House Charities. With this support we will be expanding to new municipalities in San Marcos and Sololá departments. We are collaborating with local municipal governments and the local offices of MSPAS to pilot new models of partnership and cost-sharing to pave the way for an eventual large-scale roll-out of the CBIO + Care Group + *Casa Materna* model in partnership with MSPAS.

As demonstrated in this report, the effectiveness as well as the cost-effectiveness of the CBIO + CG + *Casa Materna* approach in improving maternal and child health as well as in achieving community and women's empowerment make it an important strategy for further development and broader implementation not only in Guatemala but in other low-income settings.

GLOSSARY, ABBREVIATIONS AND ACRONYMS

ADIVES	Association for the Integrated Development of Life and Hope (<i>Asociación de Desarrollo Integral de Vida y Esperanza</i>)
Actas	Formal record of project event or activity, verified with organizational seal
Alcalde	Mayor
AMTSL	Active management of third stage of labor
ANC	Antenatal care
ARI	Acute respiratory infection
Asamblea	Community assembly
Barrido	Anthropometric “census” of all children younger than 2 years of age
BCC	Behavior change communication
BCG	Bacillus Calmette-Guérin (vaccine for tuberculosis)
Boutiquín	Small pharmacy
Cabecera	Town that functions as the capital/administrative center of a municipality
Casa Materna	Community-built and –operated birthing center
CBIO	Community-based, impact-oriented
CF	Community Facilitator
CG	Care Group
CGV	Care Group Volunteer
CHC	Community Health Committee
COICAM	Institutional Council of the <i>Casa Maternas</i>
CSHGP	Child Survival & Health Grants Program
CSP	Child Survival Project
Círculo	Support group
Comadrona	Traditional birth attendant (TBA)
Comunicadora	Care Group Volunteer
Curandero	Traditional healer
DALY	Disability-adjusted life years
DID	Difference in differences (analysis)
DIP	Detailed Implementation Plan
EBF	Exclusive breastfeeding
Educadora	Health Educator
EMT	Emergency Medical Technician
ENC	Essential newborn care
HBLSS	Home-Based Life-Saving Skills
IBF	Immediate breastfeeding
IF	Institutional Facilitator
IMR	Infant (0-11 month) mortality rate
IYCF	Infant and Young Child Feeding
KPC	Knowledge, practice, and coverage
LAC	Latin America and Caribbean
LiST	Lives Saved Tool
LMICs	Low- and middle-income countries
LOE	Level of effort
MCSP	Maternal Child Survival Program
M&E	Monitoring and evaluation
MCH	Maternal and child health
MMR	Maternal mortality ratio
MNC	Maternal and newborn care
MRC	Micro-Regional Committee
MSPAS	Ministry of Public Health and Social Welfare (of Guatemala)

NGO	Non-governmental organization
NNMR	Neonatal mortality rate
<i>Nahual</i>	Guardian spirit
OR	Operational research
ORS	Oral rehydration solution
PD	Positive deviance
PEC	Extension of Coverage Program (<i>Programa Extensión de Cobertura</i>)
PENTA	Pentavalent vaccine (for diphtheria, tetanus, pertussis, hepatitis, and Hib influenza)
PNNMR	Post-neonatal (1-11 month) mortality rate
PPC	Postpartum care
PVO	Private voluntary organization
PY	Project Year (October 1 – September 30)
<i>Sala Situacional</i>	“Situation Room” (site where community health data is posted)
SD	Standard deviation
SIAS	<i>Sistema Integral de Atención en Salud</i> (Integrated Health Service System)
SIDS	Sudden infant death syndrome
SIGSA	Guatemalan Health Information Management System (<i>Sistema Gerencial de Salud</i>)
<i>Taller hogareño</i>	Positive Deviance/Hearth workshop
TBA	Traditional birth attendant
TRACtion	Translating Research into Action (USAID-funded project)
U-5	Under five (years of age)
U-5MR	Under-5 mortality rate
USAID	United States Agency for International Development
WASH	Water and sanitation
WHIP	Western Highlands Integrated Project
WHO	World Health Organization
WRA	Women of reproductive age

ACKNOWLEDGEMENTS

The Focused Strategic Assessment team wishes to thank the Curamericas/Guatemala staff who made invaluable contributions as part of the evaluation team, in particular to Alma E. López, Juan Antonio Díaz, Carla Yanira Pedro Jose, Ricarda Felipe Virves, Vanessa Pablo Manuel and Lucia Pedro Andrés, all of whom who went out of their way amid busy schedules to provide unswerving support.

The team also wishes to thank our colleagues from USAID for their faith in us and generous material and technical support – especially Dr. Yma Alfaro and Dr. Baudilio Lopez of the USAID Guatemala Mission; Nazo Kureshy and Meredith Crews from the Child Survival Health Grants Project office; and Emma Sacks of USAID’s Maternal and Child Survival Program (MCSP). Thanks also to MCSP consultant Will Story who provided valuable insights and recommendations for this report (and patiently waited for us to complete it).

We recognize the contributions of our Operational Research Advisory Team: Dr. Fernando Gomez, Area Epidemiologist for the Huehuetenango office of the Ministry of Public Health and Social Welfare (MSPAS); and Dr. Danilo Rodriguez, MSPAS Departmental Coordinator for San Marcos Department, who both provided essential guidance, feedback, and access to data.

The team wishes to thank the graduate student interns who made huge contributions to the research presented in this document and who are contributing authors of this report and its appendices: Amber Hill, MPH student, Johns Hopkins University; Kaitlin Cassidy, MPH student, Tulane University; Marieme Dembele, MSPH student, Johns Hopkins University; Maryiam Garcia, MPH/MBA student, Johns Hopkins University; Corey Gregg, MPH/MD student, University of Miami; Jason Lambden, MPH student, Johns Hopkins University; Dr. Patty Loo, MPH student, Johns Hopkins University; Shayanne Martin, MPH student, Johns Hopkins University; Nina Modanlo, undergraduate student, Johns Hopkins University; and Michelle Wilcox, MSPH student, Johns Hopkins University.

The cooperation and input from all local partners must be acknowledged, including the staff of the MSPAS District Offices in the municipalities of San Sebastián Coatán, San Miguel Acatán, and Santa Eulalia, and mayors (*alcaldes*) and staff of the municipal governments of San Sebastián Coatán, San Miguel Acatán and Santa Eulalia.

A special thanks to the Ronald McDonald House Charities for their generous funding of our *Casas Maternas*. We must also recognize the research support of University Research Corporation (URC, LLC) and USAID Project TRACtion for their funding and technical support for our *Casa Materna* Case Study, in particular Kendra Williams, Emily Peca, Danielle Charlet, and Nancy Binkin. Also, special thanks to Ing. Karin Rivas of the University of San Carlos who co-authored the TRACtion Case Study and was its co-Principal Investigator.

We also recognize the support of the beneficiary communities themselves and their leadership: the Community Health Committees, the *Casa Materna* Micro-Regional Committees, the Institutional Council of the *Casa Maternas*, the volunteer mother peer educators (*Comunicadoras*), the *Comadronas* (traditional birth attendants), and the Community Facilitators, among others, for their important grassroots participation in the Child Survival Project implementation and their contribution as invaluable key informants during the final assessment of Project results.

We are enormously grateful for the help, guidance and leadership of Dr. Henry Perry and Ira Stollak in the design and execution of the operational research and the writing and editing of its results.

Finally, we must recognize above all Dr. Mario Valdez, Director of Curamericas/Guatemala, for his brilliant leadership, vision, and unswerving dedication to the improvement of the health of mothers and children in the Western Highlands of the Department of Huehuetenango, to the success of this Child Survival Project, and to the documentation of its achievements.

TABLE OF CONTENTS

EXECUTIVE SUMMARY.....	iv
GLOSSARY, ABBREVIATIONS AND ACRONYMS.....	viii
ACKNOWLEDGEMENTS.....	x
TABLE OF CONTENTS	xi
I. INTRODUCTION	1
I.A. Broad global issues.....	1
I.B. Specific problems and field setting	1
I.C. Project design	4
I.D. Collaborations and partnerships.....	8
I.E. Research justification	8
I.F. Research questions and hypotheses	9
II. METHODS	10
II.A. Design of the operational research.....	10
II.B. Data collection methods, participants, and analysis.....	12
II.C. IRB and informed consent.....	16
II. D. Study duration.....	16
II.E. Intervention details	16
II.F. Intervention monitoring	19
III. RESULTS AND FINDINGS	20
III.A. Intervention monitoring and evaluation results.....	20
III.B. Demographic characteristics of Project beneficiaries.....	24
III.C. Main results.....	24
III.C.1. To what extent did the project accomplish and/or contribute to the results (goals/objectives) stated in the DIP?	24
III. C.2. What were the key strategies and factors, including management issues, that contributed to what worked or did not work?	47
III.C.3. Which elements of the project have been or are likely to be sustained or expanded (e.g., through institutionalization or policies)?	65
IV. DISCUSSION AND RECOMMENDATIONS.....	69
IV.A. Main conclusions	69
IV.B. Summary of evidence.....	71
IV.C. Limitations of the study	72
IV.D Comparison of results with other research	72
IV.E. Implications of the results/programmatic and policy recommendations	74
V. APPENDICES.....	75

Appendix 1. Complete list of project outcome indicators.....	75
Appendix 2. Project results framework.....	77
Appendix 3. Organizational and community staffing, Curamericas/Guatemala Integrated Project, both Phase Areas.....	78
Appendix 4. Institutional Review Board (IRB) approval for operational research	79
Appendix 5. Endline KPC report	81
Appendix 6: Evaluation of the Project’s nutrition intervention	84
Appendix 7. Analysis of vital events data	86
Appendix 8. Operational research on women’s empowerment.....	86
Appendix 9. Qualitative analysis of Care Group implementation.....	86
Appendix 10. Assessing the ability of CBIO + Care Groups to increase community solidarity and to align the communities’ perception of their health priorities with the actual epidemiological priorities.....	86
Appendix 11. End of Phase 1 Research. Linking of the community-based, impact-oriented methodology with Care Groups: An approach to effective primary health care programming	86
Appendix 12. End of Phase 2 research on CBIO + Care Group advantages and disadvantages: Interviews with community-level Project staff, <i>Educadoras</i> , and Ministry of Public Health and Social Welfare municipality staff.....	87
Appendix 13. Integration of Extension of Coverage Program (<i>Programa Extensión de Cobertura, or PEC</i>) into the Child Survival Project.....	87
Appendix 14. TRACtion case study of the <i>Casas Maternas</i>	87
Appendix 15. Summary of census of <i>Comadronas</i>	89
Appendix 16. Integrating <i>Comadronas</i> into the rural health system.....	89
Appendix 17. Assessment of the transition of <i>Comadronas</i> into a new role of collaboration with <i>casas maternas</i>	89
Appendix 18. Cost study of the Child Survival Project	89
Appendix 19. The CBIO “People’s Manual” (in Spanish)	89

I. INTRODUCTION

I.A. Broad global issues

In many of the world's poorest countries, ensuring mothers stay alive and healthy and that their children survive and thrive are significant challenges. Since 1990, the number of maternal deaths worldwide has dropped by 45 percent, but every day some 800 women die from preventable causes related to pregnancy and childbirth.⁷ Almost all of these deaths occur in low-income settings as a result of postpartum hemorrhage, infection, and pregnancy-related high blood pressure. Approaches to reducing maternal mortality and perinatal/neonatal mortality of the newborn are closely linked. While remarkable progress has been made in reducing the overall mortality of children younger than 5 years of age, progress has been much slower for newborns, who now account for 44% of all childhood deaths.⁸ Each year, 2.6 million infants are stillborn and 2.9 million die within their first month of life (and most of these during the first 24 hours of life).⁹ The main causes, many of which are readily preventable and treatable, are complications due to prematurity and low birth weight, complications during delivery and birth asphyxia, and infection. Children 1-59 months of age continue to die primarily from pneumonia, diarrhea, and malaria. Under-nutrition is an underlying cause in approximately half of under-5 deaths. With healthier household behaviors and family practices along with higher coverage of evidence-based preventive and curative interventions that can be provided in the community, the great majority of these deaths could be avoided. However, many health systems in low- and middle-income countries (LMICs) have a shortage of health-care workers, a lack of basic equipment and essential affordable medicines, and a lack of readily available around-the-clock health service. And cultural, geographical, and financial barriers impede access to whatever limited services might exist. Exacerbating the lack of proper care-seeking is the widely documented frequent treatment by health care workers of poor women in childbirth with disrespect and abuse, which discourages pregnant women from accessing maternal care and delivering safely in health facilities rather than in their homes.^{10,11,12} All of these challenges are particularly relevant for indigenous peoples and the poorest of the poor in LMICs.

I.B. Specific problems and field setting

Guatemala, a lower-middle-income country in Central America, had an estimated population of 15 million in 2012 and a gross national income per capita of US\$2,870 in 2011. It is a multi-ethnic, multi-lingual, and multi-cultural country, where indigenous (Mayan, Xinka, and Garifuna) people account 43% of the total population.¹³ There is pervasive discrimination on the part of both the economic elite and the non-elite *Ladino* (people of mixed Spanish/Indian ancestry) population towards the indigenous population. Most of Guatemala's poor are rural indigenous people of Mayan descent who live in the highland regions; 75% of indigenous people live in poverty, more than twice the percentage of the non-indigenous population living in poverty. The average number of years of formal schooling of indigenous people is only 3.8 years, only half that of the number of years of schooling of non-indigenous people.¹⁴ The country is also characterized as a male-dominated (*machista*)

⁷ UNICEF. Trends in Maternal Mortality: 1990 to 2013. January 2013.

⁸ UNICEF. Ibid.

⁹ UNICEF. Ibid.

¹⁰ Bohren MA, Vogel JP, Hunter EC, et al. The Mistreatment of Women during Childbirth in Health Facilities Globally: A Mixed-Methods Systematic Review. *PLoS Med* 2015; **12**(6): e1001847.

¹¹ WHO. The Prevention and Elimination of Disrespect and Abuse during Facility-based Childbirth. 2014. http://apps.who.int/iris/bitstream/10665/134588/1/WHO_RHR_14.23_eng.pdf?ua=1&ua=1 (accessed 26 September 2015).

¹² Bowser, Diana and Kathleen Hill. Exploring Evidence for Disrespect and Abuse in Facility-Based Childbirth: Report of a Landscape Analysis. <http://www.tractionproject.org/resources/access-skilled-care-respectful-maternal-care/exploring-evidence-disrespect-and-abuse> (accessed 13 January 2016).

¹³ Guatemala Country Development Cooperation Strategy: 2012-2016. March 2012.

¹⁴ Guatemala Poverty Assessment World Bank. Report No. 43920 GT. March 2009.

society, in both the *Ladino* and indigenous populations, leading to low levels of educational achievement and literacy for women, high levels of gender-based violence against women, and dependency on men.

Though Guatemala's under-5 mortality rate has declined from 79 deaths per 1,000 live births in 1995 to 45 in 2009, it is still one of the highest in Latin America.¹⁵ The national prevalence of stunting (50%) in 2008-09 was the highest in the Latin America and Caribbean (LAC) region and among the highest in the world, a result of chronic food insecurity, lack of knowledge of proper child feeding practices, and the persistent traditional Mayan belief that maize alone constitutes sufficient nutrition for children.¹⁶ Although Guatemala's national maternal mortality ratio (MMR) has declined gradually, according to the 2011 National Maternal Mortality Survey the MMR was 139.7 per 100,000 live births and remains one of the highest in the LAC region.¹⁷ Inequalities in terms of health status and access to health care services are reflected in the following indicators: 59% of indigenous children are stunted; indigenous women represent 54% of the country's reproductive age women but suffer 71% of all maternal deaths.¹⁸ The MMR for indigenous women is twice that of non-indigenous women (163 and 78 deaths per 100,000 live births, respectively).¹⁹ Indigenous women are on average 7cm (2.8") more stunted than their financially better off counterparts in Guatemala, and 73% of indigenous women suffer from anemia.²⁰ Most deliveries of indigenous women take place in unsanitary dirt-floored homes.²¹ Only 21% of rural Mayan women received the recommended four antenatal care (ANC) checks.²² Indigenous women have an average of eight children; only 11% use a modern method of contraception, a far lower usage rate than for non-indigenous women.²³

Key barriers to access to maternal/newborn care and health facility deliveries for indigenous women are (1) the sheer time and distance to reach clinics and hospitals, often over difficult mountainous terrain; (2) a strong tradition of home deliveries; and (3) widespread disrespect and abuse of indigenous women by non-indigenous health facility staff, which includes verbal and physical abuse, discrimination/differential treatment, neglect, non-consented care, and refusal/inability to provide culturally acceptable services in the indigenous language.²⁴

A major challenge to improving the health of under-5 children in the rural indigenous (Mayan) population of Guatemala has been combating a very high prevalence of under-nutrition. According to the most recent Guatemala DHS survey (2008/09), in the Department of Huehuetenango, with an overwhelmingly rural Mayan population, 65% of under-5 children are stunted; 30% are underweight; and 1% suffer from wasting.²⁵ This malnutrition compromises immune systems and contributes to the high under-5 child mortality in the rural indigenous population. According to the 2008/9 DHS survey, the under-5 mortality rate for indigenous children was 59% greater than for the non-indigenous population (52 per 1,000 live births versus 33).²⁶

To respond to this health crisis among the rural indigenous population of Guatemala, USAID's Child Survival and Health Grants Program awarded the Community-Based, Impact-Oriented (CBIO) Child Survival Project (CSP) in Huehuetenango, Guatemala to Curamericas Global, Inc. Working with Curamericas Global in this Project have been its in-country implementing partner, Curamericas/Guatemala, a Guatemalan PVO, and the Guatemala Ministry of Public Health and Social Assistance (MSPAS). MSPAS's role has been primarily coordination of its local district offices and its Extension of Coverage Program (PEC) with the Project.

The Project was implemented in the municipalities of San Sebastián Coatán, Santa Eulalia, and San Miguel Acatán from 1 October 2011 to 30 September 2015. These municipalities are located in the Cuchumatanes Mountains in the Department (state) of Huehuetenango. This is an isolated mountain region of

¹⁵ MSPAS et al. 2009. National Survey of Maternal and Child Health 2008-09, Guatemala: 2009.

¹⁶ National Survey of Maternal and Child Health 2008-9.

¹⁷ SEGEPLAN/MSPAS. National Study of Maternal Mortality. Guatemala: 2011.

¹⁸ National Study of Maternal Mortality.

¹⁹ National Study of Maternal Mortality.

²⁰ Macro International Inc, 2011. MEASURE DHS STAT Compiler. <http://www.measuredhs.com>.

²¹ Guatemala MSPAS. 2009-2010. Epidemiological Surveillance Basic Indicators of Health Situational Analysis.

²² MSPAS et al. National Survey of Maternal and Child Health 2008-9, Guatemala, 2009.

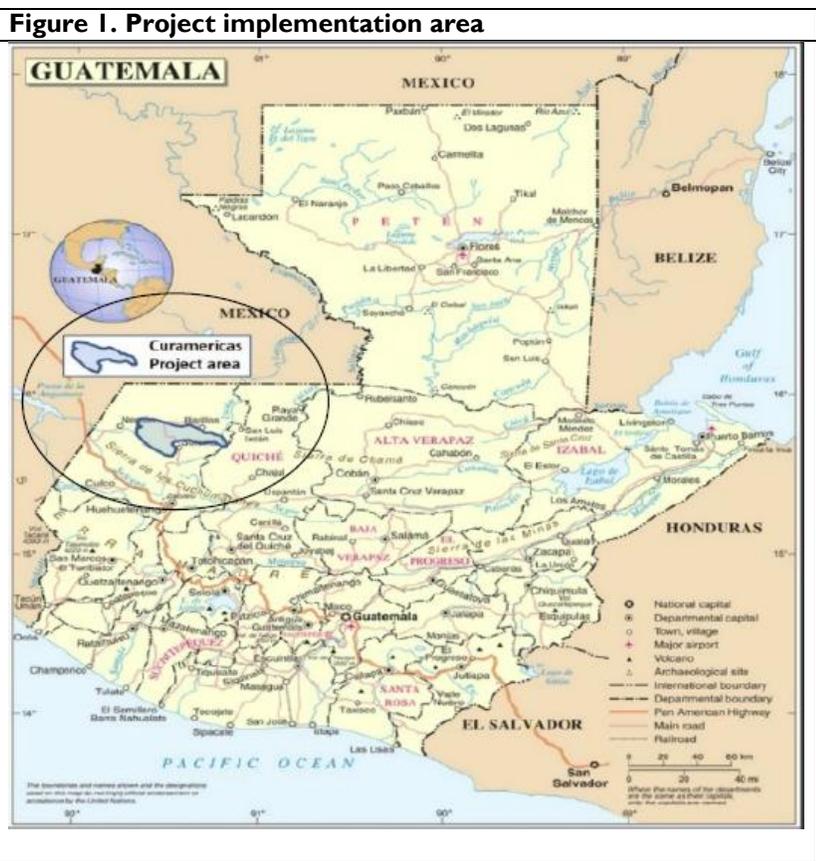
²³ ORC Macro, 2007. MEASURE DHS STAT Compiler. <http://www.measuredhs.com>, September 28 2007.

²⁴ Peca, Emily. Disrespectful and abusive maternity care in the Western Highlands of Guatemala: who is most vulnerable? <https://cdn2.sph.harvard.edu/wp-content/uploads/sites/32/2015/12/Peca.pdf> (accessed 13 January 2016).

²⁵ National Survey of Maternal and Child Health.

²⁶ National Survey of Maternal and Child Health.

the Western Highlands of the country with a population that is overwhelmingly Mayan. Because the population has some of the worst health indicators in Latin America, it has earned the region the name “the Triangle of Death” (Figure 1). The Project area, with a population of approximately 87,500, consists of 180 communities located on steep mountainous terrain at a very high altitude of 7,000 to 9,000 feet. The nearest hospital is in the city of Huehuetenango, 4-5 hours away.



Project beneficiaries consist of indigenous Chuj, Akateko, and Q’anjob’al Mayan people, with 47,657 direct beneficiaries (32,330 women of reproductive age (WRA) who are 15-49 years of age, and 15,327 under-5 children).²⁷ The beneficiaries include infants 0-11 months of age (6.5% of beneficiaries), children 12-23 months of age (8.5%), children 24-59 months of age (16.0%), and WRA (69.0%) (Table I). Each of the municipalities is overwhelmingly populated by one of several Maya ethnic groups. In the municipality of San Sebastián Coatlán, the Chuj ethnic group is predominant. In the municipality of San Miguel Acatán, the Akateko ethnic group is predominant, and in the municipality of Santa Eulalia, the Q’anjobal ethnic group is predominant. The dialects of Akateko and Q’anjobal are mutually intelligible, but Chuj is not intelligible to other groups and the Chuj people cannot understand Akateko or Q’anjobal.

Table I. Beneficiary population in project area by municipality and demographic group

Beneficiary population	San Sebastián Coatlán total population: 21,945	San Miguel Acatán total population: 30,977	Santa Eulalia total population: 45,419	Total
Infants: 0-11 months	632	1,043	1,314	2,989
Children: 12-23 months	645	881	1,232	2,758
Children: 24-59 months	2,684	2,479	4,417	9,580
Children: 0-59 months	3,961	4,403	6,963	15,327
Women: 15-49 years	7,445	9,113	15,772	32,330
TOTAL	11,406	13,516	22,735	47,657

The ongoing effects of the civil war from 1960 to 1996 produced some of the worst human development indicators in the country. Registration of vital events reported by the Ministry of Public Health and Social Welfare (MSPAS) in 2009 demonstrated a maternal mortality ratio (MMR) in the three municipalities of 681/100,000²⁸ and an under-5 mortality rate of 44/1,000.²⁹ The maternal mortality ratio there is on par with many poor countries in sub-Saharan Africa and among the highest in the Western hemisphere as is the under-5

²⁷ The Curamericas/Guatemala Project staff calculated the beneficiary population based on the 2010-2011 Ministry of Public Health and Social Welfare (MSPAS) epidemiological surveillance data and guidance from regional health facility records of recent population and community fluctuations. Later, these numbers were revised and annually updated utilizing the Project’s vital events registration system.

²⁸ Averages of 2009 MMR from the three municipalities according to MSPAS Epidemiological Surveillance Basic Indicators of Health Situational Analysis reports for the Department of Huehuetenango.

²⁹ MSPAS Epidemiological Surveillance Basic Indicators of Health Situational Analysis reports.

mortality rate. Forty-three percent of all under-5 deaths are among neonates. Stunting affects 65% of under-5 children.³⁰ One fourth (25%) of Mayan households in the program area do not have access to a toilet or latrine.³¹ Thus, conditions are often unsanitary and water is often contaminated, contributing to childhood diarrhea. Childhood pneumonia is also frequent, exacerbated by the altitude and chilly climate. At the outset of the Project, the great majority of births in the Project area took place in the home and were attended by traditional birth attendants (called *Comadronas*), who are still an integral part of maternity care in this very traditional society. Based on the January 2012 Project baseline knowledge, practice and coverage (KPC) survey findings, 89% of births were deliveries in the mother's home attended by a *Comadrona*. Impeding health facility deliveries as well as proper care-seeking for sick children are (1) long-distances (in terms of travel time) to MSPAS health facilities over the area's rugged mountain terrain; (2) traditions encouraging home deliveries and use of herbs and traditional healers and (3) disrespect and abuse experienced by Mayan women at these facilities, which includes refusal/inability to provide culturally acceptable services in their language.³²

I.C. Project design

The Child Survival Project (CSP) aimed to improve maternal and child health and nutrition and reduce maternal and under-5 mortality through community mobilization, capacity building, development of emergency transport systems, and high population coverage of evidence-based interventions. The overriding goal was to integrate the CSP with existing MSPAS services to create a coherent local rural health care system that addresses community and epidemiological priorities. Therefore, three key methodologies and an MSPAS program (PEC) were integrated to increase access, demand, and quality as well as to improve equity and enhance sustainability:

1) *The Community-Based, Impact-Oriented (CBIO) methodology.* CBIO mobilizes communities and ensures equitable services to those most in need.^{33,34} CBIO is implemented through the following steps: (1) mobilizing communities through local leaders to cement good relations as well as to secure community buy-in and ownership; (2) conducting censuses and participatory community health assessments in each community leading to a Community Diagnosis (*Diagnóstico comunitario*) that focuses on the community's health priorities; (3) drawing community maps, enumerating households, and creating a Community Register of every beneficiary by household; (4) establishing Community Health Committees and developing Community Health Plans with community members based on both epidemiologically-derived and community-perceived health priorities; (5) using the Community Registers to monitor coverage of health services to project beneficiaries and record vital events; (6) routinely making visits to all homes, with more frequent visits to those homes with special needs; and (7) utilizing a continuous health surveillance system that allows staff to tailor service delivery and engage in continuous quality improvement. The health surveillance includes ongoing registration all births and deaths occurring in the communities, with verbal autopsies completed for all under-5 and maternal deaths to ascertain causes, and the calculation of under-5, neonatal, post-neonatal, and 11-59-month mortality rates and maternal mortality ratios to monitor impact and to detect local epidemiological priorities. These data are continually collected and then analyzed monthly and annually by project staff for close monitoring of the epidemiological situation and for data-driven decision-making. CBIO methodically ensures services to all, especially those most in need. It detects and responds to actual local epidemiological priorities and enables detection of actual impacts on mortality via the vital events registration system. The community health data gathered is shared regularly with the community at open community meetings called *asambleas* (assemblies) to discuss progress,

³⁰ National Survey of Maternal and Child Health 2008/9 Guatemala.

³¹ Valdez, M. 2009. Diagnostic Data of San Sebastián Coatlán. Curamericas/Guatemala.

³² Interview with Alma Esperanza Dominguez RN, Curamericas/Guatemala, 22 January 2012.

³³ Shanklin D, Sillan D. The Census-Based, Impact-Oriented Methodology: A Resource Guide for Equitable and Effective Primary Health Care: Curamericas and the CORE Group, 2005. Available at: http://coregroup.org/storage/documents/Diffusion_of_Innovation/CBIO_Reference_Guide.pdf.

³⁴ Documento Popular de la Metodología de Base Comunitaria Orientada al Impacto. Curamericas/Guatemala: Calhuitz, San Sebastián Coatlán, Guatemala. 2014.

celebrate achievements, and address challenges going forward. More detail on CBIO is found below, in Intervention Details (p. 16).

2) *The Care Group methodology.* The Care Group methodology uses community volunteer peer educators called Care Group Volunteers to encourage healthy behaviors and the appropriate utilization of health services.³⁵ The project's 30 Health Educators (*Educadoras*) trained a Community Facilitator (CF) in each community, who in turn trained a Care Group consisting of 5-12 mother peer educators known as *Comunicadoras* (Health Communicators), who in turn carried out twice-monthly meetings with 10-15 neighbor women of reproductive age assigned to them, known as a Self-Help Group (*Grupo de autocuidado*). The *Comunicadoras* met with their Self-Help Group and also between meetings visited the homes of the members of the Self-Help Groups. This training cascade ultimately included 184 Community Facilitators and 779 *Comunicadoras* who reached 14,488 reproductive age women. The *Comunicadoras* used participatory learning techniques for non-literate adult audiences to teach key life-saving messages such as, but not limited to, the need for antenatal and postnatal care; the recognition of and prompt response to danger signs in during pregnancy, delivery, and the postpartum period; the recognition of and correct response to symptoms of pneumonia and diarrhea; the importance of exclusive breastfeeding during the first 6 months of life and proper complementary feeding thereafter; and point-of-use water treatment along with proper hand washing at critical moments.

Integrated into the Care Groups was the Positive Deviance/Hearth (PD Hearth) methodology, which was used to 1) identify locally available and affordable nutritious foods by interviewing local mothers of well-nourished children (children not stunted, underweight, or wasted – that is, the “positive deviants”) to learn what and how these mothers were feeding their children; and 2) teaching the women of under-nourished children how to prepare these locally available and affordable foods in a two-week long sequence of hands-on cooking lessons and recuperative feeding sessions called *talleres hogareños* (Hearth workshops). These sessions were also conducted as stand-alone lessons during Self-Help Group meetings so the food preparation and feeding skills and knowledge would disseminate to all child caretakers in order to establish new norms of child feeding practices.

Comunicadoras were also responsible for detecting and reporting vital events among their assigned Self-Help Group women, including new pregnancies, births, and deaths, thus establishing a community-based vital events surveillance system as part of the CBIO methodology. The *Comunicadoras* detect these vital events either in the Self-Help Group meetings or during home visits, and convey the information to their Community Facilitator (CF) at the time of the subsequent Care Group meeting. The CF, in turn, passes this information to her *Educadora* (Supervisor) during their twice-monthly trainings and the *Educadora* in turn reports the data to the project M&E staff. In addition, this timely detection and reporting of pregnancies and births by the *Comunicadoras* facilitates prompt provision of MNC services to pregnant and puerperal women and newborns. Throughout their pregnancy, newly pregnant women are monitored for complications by the *Educadora* and Community Facilitator and referred for prenatal care at the *Casa Materna* (see below) or the PEC program (see below). Postpartum women are similarly monitored for complications and referred for postpartum checks to the same sources of care. All reported deaths are followed up within two weeks with a verbal autopsy by a staff nurse (called an Institutional Facilitator). More detail on Care Groups is found below, in the section on Intervention Details (p. 17).

3) *Casas Maternas* are community-built and community-owned birthing centers developed with the help of Curamericas/Guatemala and are operated with financial support from local municipalities and funds made available to Curamericas from the Ronald McDonald House Charities and other donors. In-kind support is provided by the local workforce as the community's in-kind contribution and also by Curamericas Global volunteers.³⁶

³⁵ Laughlin M. *The Care Group Difference: A Guide to Mobilizing Community-Based Volunteer Health Educators* (2nd Edition). Baltimore, MD: World Relief and the Child Survival Collaborations and Resources (CORE) Group; 2010. http://www.coregroup.org/storage/documents/Resources/Tools/Care_Group_Manual_Final_Oct_2010.pdf

³⁶ Curamericas/Guatemala. *Manual de Replicación de la Casa Materna Rural*. Calhuitz, Huehuetenango, Guatemala; 2012.

It is important to point out that the *Casa Materna* is not a maternity waiting home (where women come from far away and await the onset of labor and deliver their baby adjacent to a referral facility) but rather a locally available facility where women come at the onset of labor to deliver their baby with the assistance of a skilled and trained health worker and where a rapid response transport capability is available should a complication arise. Each of these *Casas Maternas* is staffed by an Auxiliary Nurse and two Support Women, who are trained and supported by an obstetric Nurse Supervisor. This maternity care program includes training and integration of traditional birth attendants (*Comadronas*) as well as the establishment of an emergency response system (transportation and communication plans) to transport women to the *Casa Materna* and, if necessary, from the *Casa Materna* to the nearest referral hospital. The Auxiliary Nurse is intensively trained by an obstetric Nurse Supervisor in safe deliveries and in Essential Newborn Care (ENC), which includes clean cord care, immediate thermal care, and immediate/exclusive breastfeeding; the Active Management of the Third Stage of Labor (AMTSL) including the use of partographs and the administration of oxytocin after the delivery of the baby; as well as neonatal resuscitation (using bag and mask) and stabilization/resolution of any neonatal complications.

The referral system includes radio telephones and emergency transport linkages to emergency medical technicians (who are located at a neighboring town outside of the Project area at a lower elevation) to transport women and neonates to the nearest hospital in city of Huehuetenango, about four hours away (depending on the location of the *Casa Materna*). *Casa Materna* services are free of charge and provided in the local Mayan language; local birth customs are respected. For a growing majority of the women who have ready access to a *Casa Materna*, the *Comadronas*, rather than performing home deliveries, encourage women to deliver in the *Casa Materna*. The *Comadronas* accompany them there and assist appropriately in the delivery. The *Casa Materna* in Calhuitz (in the municipality of San Sebastián Coatán) began operating in 2009, two years before the Project started in October 2011. Three more *Casas Maternas* were built with community volunteer labor during the operation of the Project and began operating in the community of Santo Domingo (in the municipality of San Sebastián Coatán) in April 2013; in the community of Tuzlaj-Coya (in the municipality of San Miguel Acatán) in May 2014; and in the community of Pett (in the municipality of Santa Eulalia) in October 2015, soon after the Project ended. Additional information on the *Casas Maternas* is found below, in Intervention Details (p. 18) as well as in a forthcoming publication.³⁷

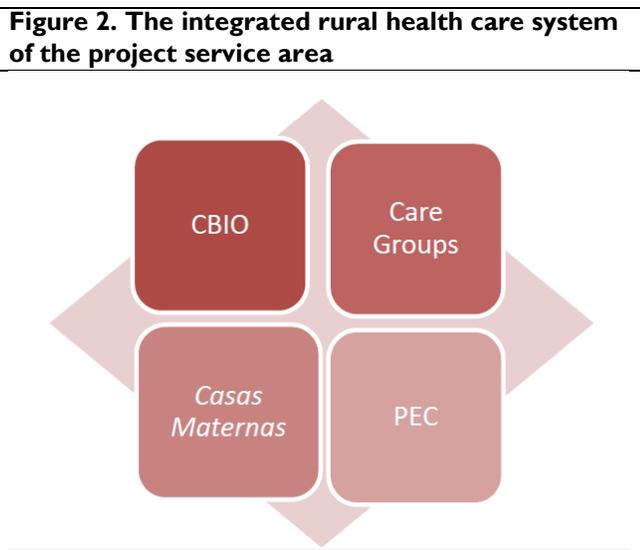
4) These services were harmonized with the MSPAS's Program for the Extension of Coverage (PEC) to strengthen primary care and extend health services to rural indigenous communities. Facility-based services provided by MSPAS and private providers are distant and infrequently used. There are only three MSPAS clinics serving the entire project area, one in each municipality (in the municipality's *cabecera*, which is the largest town in which the municipal government is located and which bears the same name as the municipality). These clinics are distant from the communities and difficult to access due to poor roads, mountainous terrain, and the cost in both time and money for transportation. PEC therefore brings Ambulatory Nurses who can provide primary health care services into the communities, with each Nurse serving 10-15 communities and visiting each community at least once per month. They come to strategically located points (Health Posts and *Centros de Convergencia*³⁸) to provide primary care services such as antenatal and postpartum checks, iron/folate supplementation and tetanus vaccinations for pregnant women, vitamin A supplementation and deworming for children, childhood immunizations, child growth monitoring, family planning, as well as treatment and follow-up for sick children. In the CSP area, PEC was implemented by Curamericas/Guatemala in the municipalities of San Sebastián Coatán and San Miguel Acatán (under contract with the MPAS) and by the Guatemalan PVO named ADIVES (*Asociación de Desarrollo Integral de Vida y Esperanza*) in the municipality of Santa Eulalia (also under contract with the MSPAS).

The CSP complemented PEC by focusing on community-based preventive education, community mobilization, and linking communities to the PEC program to create an effective and comprehensive Rural

³⁷ Stollak I, Rivas, K. Valdez M, Perry H. Casas Maternas in the Rural Highlands of Guatemala: A Mixed Methods Case Study of Their Introduction, Utilization, and Equity of Utilization by an Indigenous Population. *Global Health: Science and Practice* (in press).

³⁸ These are small buildings owned by MSPAS with basic primary care medicines and equipment, open at least once per month when visited by the PEC Ambulatory Nurses.

Health Care System with four “legs” or cornerstones as shown in Figure 2: CBIO, Care Groups, the *Casas Maternas*, and PEC. Demand for health services was created via the Care Group methodology through behavior change communication, health education and community consciousness-raising about epidemiological priorities, and this demand was fulfilled, when possible, by the *Casas Maternas* and the PEC Program. Household monitoring through the CBIO methodology made it possible to identify those in need of health services and assist women and children in obtaining the services they needed, and the vital events surveillance of CBIO monitored actual impact on maternal and child mortality. (Unfortunately, the PEC program was abruptly terminated by MSPAS in October 2014. The contribution of PEC and the effect of its termination will be discussed below (see Section III.C.2.iii. **How did integration of the Extension of Coverage Program (PEC) contribute to the project’s results?** p. 54).



High-impact interventions promoted by the Project included: quality antenatal care, health facility deliveries, timely postpartum care, Essential Newborn Care, and Active Management of Third Stage of Labor (AMTSL); proper hand washing, water purification and point-of-use water treatment, safe water storage and feces disposal; proper treatment and care-seeking for childhood diarrhea and pneumonia; immediate postpartum breastfeeding, exclusive breastfeeding during the newborn’s first 6 months of life along with proper complementary feeding during the 6-23-month period; and childhood immunizations. These interventions thus combined 1) achieving sustainable behavior change at the household level (e.g., hand washing, exclusive breastfeeding) primarily via the Care Groups, with 2) the promotion and provision of geographically and culturally accessible health services

at community-based health posts (conducted by mobile nurses provided by the PEC program) and at *Casas Maternas* (where not only deliveries took place but also antenatal care was provided and children with pneumonia were treated).

Other Project objectives included community and women’s empowerment as manifested by increased community investment in maternal and child health as well as by increased participation of women in community affairs and in family health-related decision-making. The complete list of CSP outcome indicators is found in Appendix 1. The Project’s Results Framework from its Detailed Implementation Plan (DIP) can be found in Appendix 2.

The Curamericas Global Backstops (Erin Pfeiffer and Ira Stollak) as well as trainers and consultants contracted by Curamericas Global provided capacity-building, technical assistance, and M&E guidance, but actual field implementation was conducted entirely by the in-country partner, Curamericas/Guatemala under the leadership of its capable Country Director, Dr. Mario Valdez. The Curamericas/Guatemala CSP staffing arrangement consisted of three teams, one for each of the three municipalities. The work in each municipality was supervised by a Municipal Coordinator. Supporting them was an RN Institutional Facilitator in each municipality to supervise and maintain the Vital Events Registers as well as perform verbal autopsies, and an *Educadora* Supervisor to oversee and support a cadre of 8 to 10 *Educadoras* (Health Educators) in each municipality (30 for the entire Project area). The *Educadoras* were the backbone of the field staff. The *Educadoras* each were assigned a territory of 5 to 8 communities, and in those communities they: 1) initiated the CBIO mobilization, census taking and mapping, and the Community Register; 2) trained and supported a Community Facilitator in each community to in turn train and support the community’s Care Group of mother peer educators (*Comunicadoras*) and to receive and manage vital events data; 3) conducted routine home visitations for growth monitoring, Vitamin A supplementation/deworming, promoting antenatal care and postpartum checks, and follow-up for sick or under-nourished children; 4) collected, organized, and analyzed project monitoring and vital events data for their communities and relayed that data to the project M&E staff

for aggregation with CSP data; and 5) coordinated with community leadership to disseminate and discuss the community's health data at *asambleas* and to jointly plan community responses. These municipal field teams were supported by a two-person M&E staff and a two-person accounting/fiscal management staff, both partly funded by PEC.

Parallel to the CSP staff structure was (1) the PEC staff, with two Nurse Supervisors overseeing 10 Ambulatory Nurses, 3 Institutional Facilitators, and 4 *Educadoras*; and (2) the staff of the *Casas Maternas*, an Auxiliary Nurse and 2 Support Women for each of the *Casas Maternas*, supervised by an obstetric Nurse Supervisor. Overseeing all this was a Field Coordinator and the Curamericas/Guatemala Director Dr. Mario Valdez.

At the community level there were also the 184 Community Facilitators (149 funded by the CSP and 35 by PEC) who were not Curamericas/Guatemala employees. These were literate community collaborators, usually female, who received a modest monthly stipend (approximately \$50) for their work training and supporting the Care Groups and collecting and conveying vital events data from their Care Group Volunteers. The Curamericas/Guatemala organizational chart is found in Appendix 3.

I.D. Collaborations and partnerships

Curamericas Global has worked steadily towards a vision of sustainability which includes developing strategic partnerships with local and other stakeholders in order to establish integrated effective local rural health systems, as described above. The prime implementation partner is Curamericas/Guatemala, a Guatemalan PVO founded by Dr. Mario Valdez in 2002. While Curamericas Global provided training and technical assistance and support for evaluation and research, on-the-ground implementation was the work of Curamericas/Guatemala and its staff, the majority of whom are Mayan and who speak the local languages.

In our effort to create an integrated rural health system, the Guatemala Ministry of Health and Social Assistance (MSPAS) was a necessary and key partner that provided coordination of services and exchange of information, primarily through the staff of its local clinics and district (municipal) offices in the three Project municipalities. Also, two higher-level MSPAS staff served as members of our Operational Research Advisory Committee. And, as described above, Curamericas/Guatemala functioned under contract as an agent of MSPAS to implement the PEC program in the municipalities of San Sebastián Coatán and San Miguel Acatán. At the grassroots level, the beneficiary communities and their leaders were essential partners. The CSP also worked closely with the three municipal governments, which contributed to various project needs such as land for the *Casas Maternas* construction. The USAID Guatemala Mission provided ongoing advice and feedback that ensured that we were aligning our project with the strategic objectives of the Mission. Funding from the Ronald McDonald House Charities supported the construction, operation, and staffing of the *Casas Maternas*. We also established a key partnership with the US-based PVO Medicines for Humanity to secure a reliable supply of oxytocin for the *Casas Maternas* and to establish small pharmacies there. Details of these partnerships will be explained below in relevant sections of this report.

I.E. Research justification

While evidence exists demonstrating the effectiveness of the CBIO and Care Group methodologies separately (as described in Section I.C. Project Design), no operational research has yet examined the two methodologies employed in synergy.^{39,40,41} A consolidation of existing evidence, improved quality of research,

³⁹ Perry H and Tom Davis. The effectiveness of the census-based impact-oriented (CBIO) approach in addressing global health goals. In Beracochea E (ed.). *Aid Effectiveness in Global Health*. 2015. New York: Springer, pp. 261-278.

⁴⁰ Perry, H., D. Shanklin and D.G. Schroeder. Impact of a community-based comprehensive primary healthcare programme on infant and child mortality in Bolivia. *J. Health Population Nutrition*. 2003. 21(4). 383-395.

⁴¹ Perry, H, et al. Care Groups II: Outcomes achieved using volunteer community health workers in resource-constrained settings. *Global Health: Science and Practice*. 2015. Vol. 3 No. 3.

and increased operational research on the logistics, best practices, and effectiveness was needed to develop recommendations for potentially scaling up the CBIO and CG methodologies together as an effective, low-cost approach for underserved communities.

The operational research activities carried out in conjunction with the CSP built upon past research conducted on CBIO. The learning objective of the research was to capitalize on the anticipated synergy of the CBIO and Care Group methodologies when implemented together and to create an approach that can be institutionalized in a cost-effective manner within the existing health system. The operational research project sought to measure the health impact and the social impact of the CBIO + CG combined methodology. The health impact was measured by changes in health behavior and mortality, and the social impact by changes in empowerment of women and communities in the project area. The operational research project also assessed the cost-effectiveness of the CBIO + CG approach by measuring implementation costs and lessons learned on how best to integrate the CBIO + CG approach into the MSPAS system. The project aimed to demonstrate that the CBIO + CG methodology is effective in improving maternal and child health as defined by positive changes in health behaviors of beneficiaries, by improved coverage of key MCH interventions, and by reductions in under-5 and maternal mortality.

I.F. Research questions and hypotheses

Our central hypothesis is that the CBIO and Care Group (CBIO + CG) methodologies can produce superior health and social outcomes in a rural resource-poor setting compared to the status quo. In addition, we hypothesize that integrating *Comadronas* into the operation of the *Casas Maternas* can help reduce maternal mortality. We proposed to test the following specific hypotheses and research questions:

Hypotheses

1. The CBIO + CG methodology produces significant improvements in the population coverage of interventions that are designed to address the epidemiological priorities for mothers and children (after four years of Project implementation), and these improvements are significantly greater than in an adjacent comparison area that will receive only two years of Project implementation and greater than in selected comparison municipalities of the Department of Huehuetenango and/or the rural population of Department of Huehuetenango where the project has not been implemented.
2. The CBIO + CG methodology produces significant improvements in the nutritional status of children (after four years of Project implementation), and these improvements are significantly greater than in an adjacent comparison area that will receive only two years of Project implementation and greater than in selected comparison municipalities of the Department of Huehuetenango and/or the rural population of Department of Huehuetenango where the project has not been implemented.
3. The CBIO + CG methodology produces significant improvements in maternal and under-5 mortality (after four years of Project implementation), and these improvements are significantly greater than in an adjacent comparison area that will receive only two years of Project implementation and greater than in selected comparison municipalities of the Department of Huehuetenango and/or the rural population of Department of Huehuetenango where the project has not been implemented.
4. The CBIO + CG methodology produces significant increases in women's participation in community health activities (after four years of Project implementation), and these improvements are significantly greater than in an adjacent comparison area that will receive only two years of Project implementation.
5. The CBIO + CG methodology produces significant increases in women's health-related decision-making autonomy (after four years of Project implementation), and these improvements are significantly greater than in an adjacent comparison area that will receive only two years of Project implementation.

6. The CBIO + CG methodology produces significant increases in community involvement related to problem solving (after four years of Project implementation), and these improvements are significantly greater than in an adjacent comparison area that will receive only two years of Project implementation.

Research Questions

1. What are the lessons learned in implementing the CBIO + CG methodology?
2. How can *Comadronas* transition into an effective new role in maternity care that improves the quality of care provided to mothers in the Project area and that respects cultural traditions and expectations?
3. How does the cost-effectiveness of the CBIO + CG methodology as implemented by Curamericas Global in Guatemala compare to that of other maternal and child health programs in Guatemala using different methodologies?

Focused Strategic Assessment Questions

To further inform the Focused Strategic Assessment we also sought to answer the following programmatic questions:

1. To what extent did the project accomplish and/or contribute to the results (goals/objectives) stated in the DIP? How were results achieved?
2. What were the key strategies and factors, including management characteristics, that contributed to what worked or did not work?
3. What were the contextual and management factors affecting implementation?
4. How did integration of the Extension of Coverage Program (PEC) contribute to the project's results? What were the lessons learned in integrating the PEC and collaborating with MSPAS?
5. What are the barriers to facility delivery, and are the *Casas Maternas* easily accessible and perceived as helpful? What are the benefits/continuing challenges with the *Casas Maternas*? Is there any possibility of using the *Casas Maternas* for postnatal care or other maternal and child health services along the continuum of care?
6. What are the prospects for the Project being sustained and replicated after the end of CSHGP funding and what factors will affect those prospects?

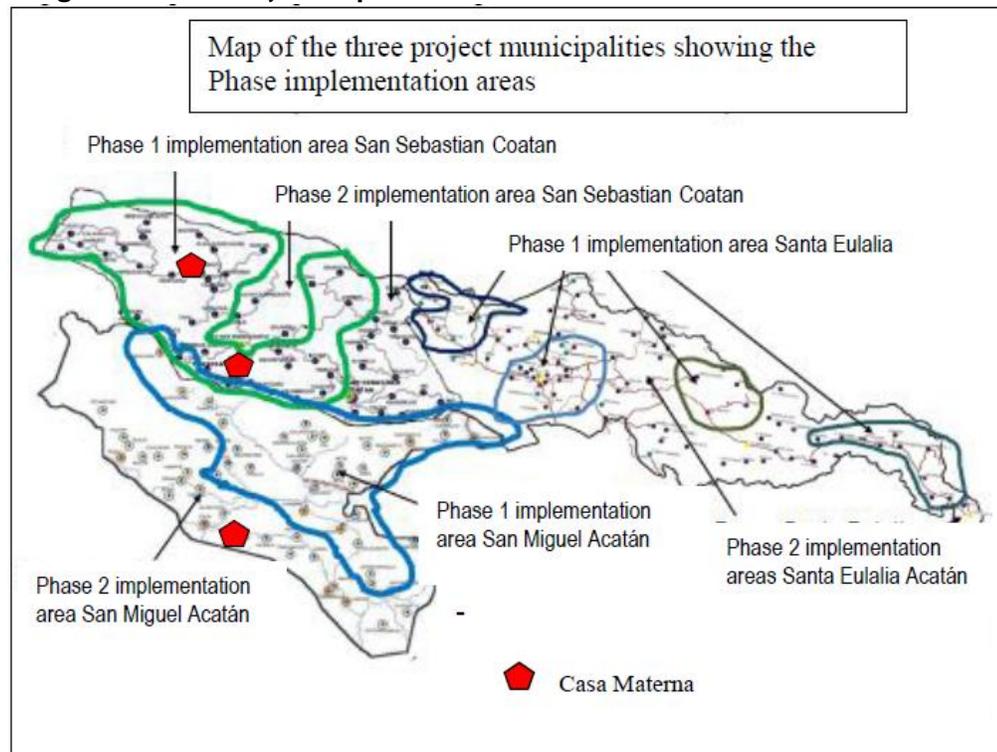
II. METHODS

II.A. Design of the operational research

The operational research contained two components: the Formative Research and the Evaluative Research. In addition, there were two operational research study areas within the single Project area. The difficult and extensive mountainous terrain of the project required that the project be implemented in two phases, with half (89) of the targeted communities mobilized and served during the first two years of the project (October 2011-Sept 2013). These first two years were known as "Phase 1" and these 89 communities constitute the Phase 1 Area. The remaining 91 communities were mobilized and served during the final two years (Phase 2) of the project (October 2013 to September 2015), and made up the Phase 2 Area. The communities of Phase 1 were generally more distant from existing MSPAS clinics and so were therefore prioritized for project services. The communities in the Phase 1 Area continued to receive full Project services during Phase 2, the final two years of the project. Figure 3 (below) contains a map of the three municipalities delineating the boundaries of the two Phase Areas in each municipality. Thus, the Phase 1 Area communities

received the Project’s services for the full four years of its duration, while the Phase 2 Area communities received the Project’s services for only the last two years.⁴²

Figure 3. Map of the three project municipalities showing the two Phase Areas of implementation and location of the three Casas Maternas that were operating during the time of Project Implementation



The two Phase Areas were adjacent and geographically and socio-culturally identical. The Phase I Area included approximately half of the geographic area and half of the populations of each of the three project municipalities. Thus, the population of the Phase I Area was approximately 3,000 children 0-23 months of age and 16,000 women of reproductive age. The study population of the Phase 2 Area was approximately 3,000 children 0-23 months of age and 20,000 women of reproductive age.

We incorporated this need for a phased implementation of the Project into a quasi-experimental research design, with the Phase I Area constituting the Intervention Study Area during Phase I of the project and the Phase 2 Area constituting the Comparison Study Area during Phase I. During Phase 2 of the Project, the Phase 2 Area continued to serve as a quasi-control based on the hypothesis that the longer exposure to the project and the CBIO + CG methodology in the Phase I Area would result in superior outcomes there relative to the Phase 2 Area, producing a dose-response effect. This also resolved the potential ethical issue of denying services to the population of the comparison arm. However, we did anticipate that there would be some unavoidable spill-over from the Phase I Area into the Phase 2 Area, and that this spill-over would affect comparative outcomes.

⁴² However, due to the time required to mobilize communities and establish the Care Group infra-structure, Phase I communities received the full set of interventions effectively for only about 3 years, April-June 2012 (depending on when communities were mobilized) through May 2015. For Phase 2 communities it was effectively only about 18 months (Oct-Dec 2013 - May 2015). Project interventions in both Phases outside of the 46 partner communities of the 4 Casa Materna micro-regions ended in June 2015 to allow remaining Project resources to be directed to the Project final evaluation, close-out, and transition to the post-Project phase. While the full set of CSP interventions did continue in the 46 Casa Materna partner communities past May 2015, the outputs and results for these communities between June and September 2015 were not included in this report or its component studies.

Formative Research: We capitalized on the need for phased-in implementation to utilize the first two years of the Project (Phase I) to conduct Formative Research to assess and improve the CBIO + CG methodology and derive lessons learned that could be applied during the final two years of the Project (Phase 2). The Formative Research during Phase I focused on (1) refining the CBIO + CG methodology, procedures and field manuals; (2) defining the project population and determining the community's health priorities; (3) assessing and documenting the challenges and advantages of (a) implementing the CBIO + CG methodology; (b) integrating it within the MSPAS framework for health care delivery; (c) establishing a new role for *Comadronas* in maternity care and establishing procedures and forms for assessing the integration of *Comadronas*; and (4) measuring constructs such as community engagement and women's empowerment.

After the conclusion of Phase I the findings of this Formative Research carried out in the Phase I implementation Area were assessed and the lessons learned applied going forward during the final two years of the Project in both implementation areas (Phase I and Phase II Study Areas), with improvements made in the methodology and implementation strategy at the end of Phase I. For example, the Phase I formative research confirmed our strategy for redefining the role of the *Comadronas* and so this strategy was continued and expanded to the Phase 2 Area to integrate more *Comadronas* into the operation of the new *Casas Maternas* in Tuxtla Coya (in the municipality of San Miguel Acatán) and Pett (in the municipality of Santa Eulalia). The assessment of the CBIO + CG methodology led to (1) improvements in coordination with MSPAS and PEC, and (2) writing of a new CBIO field manual for use by the communities.⁴³ The findings of the women's empowerment study revealed that men/husbands were a barrier to women's empowerment and led to reaching more men/husbands during Phase 2 via couples counseling during home visitations and the hiring of male health educators for working with men. The Formative Research was applied again at the project's conclusion by (1) re-assessing the challenges and advantages of implementing the CBIO + CG methodology; (2) re-assessing the new role for *Comadronas* in maternity care; and (3) re-assessing women's empowerment by looking at the effect of women's participation in the Care Group training cascade upon their self-efficacy and autonomy. (The term "formative research" in this context as used by USAID in setting up the operational research framework referred to qualitative research that was carried out not only at the onset of the Project but at later points as well, while the term "evaluative research" referred to quantitative research.)

Evaluative Research: The specific hypotheses posed by the Evaluative Arm are found above in Section I.F. Research Questions and Hypotheses. The Evaluative Research was conducted using the quasi-experimental study design mentioned above. Each hypothesis and research question was examined independently using a set of assessment tools, which are described in the next section.

II.B. Data collection methods, participants, and analysis

A baseline knowledge, practice, and coverage (KPC) household survey was used to establish quantitative baselines for intervention coverage and child nutrition. On an ongoing basis throughout the project mini-KPC surveys,⁴⁴ anthropometric monitoring of all children younger than 2 years of age was carried out, and analyses of Vital Events Registers were all used to monitor changes in intervention coverage, nutrition indicators and maternal and child mortality, respectively. An endline KPC survey and a final analysis of the project's Vital Events Registers were used to examine the Evaluative Research hypotheses and questions. Additional end-of-project qualitative research also explored the effect of the Project on women's empowerment. The results of these investigations are presented in Section III. Results and Findings, C. Main Results.

⁴³ Documento Popular de la Metodología de Base Comunitaria Orientada al Impacto. Curamericas/Guatemala: Calhuitz, San Sebastián Coatán, Guatemala. 2014.

⁴⁴ A "mini-KPC," as executed by the Project, is a knowledge, practice and coverage (KPC) household survey that, like the full baseline and endline KPC surveys, targets a random sample of mothers of children younger than 2 years of age for individual interviews conducted in the local Maya language following a standardized questionnaire, but differs from the full KPC by (1) utilizing simple random sampling (SRS) rather than stratified cluster sampling, with a sample size of 100 rather than 300 respondents and (2) focusing on only two to four outcome indicators, making for a far briefer interview.

Table 2 below captures the details of the overall Operational Research (OR) data collection methods and presents for each research question (1) the data collection methods used, (2) the sampling method, (3) who the participants/study subjects were, (4) when and where the investigation was done, and (5) the product of the investigation (and where the final report for that topic can be found). The OR utilized both quantitative and qualitative methods, attempting whenever feasible to triangulate quantitative findings with qualitative findings.

Details of all the methods are found in the full reports of the independent investigations, which can be accessed via the URL links provided in the Appendices.

The baseline and endline KPC survey findings for both Phase Areas were independently analyzed by two different analysts, providing confidence that the results are accurately reported. Similar, the anthropometric data arising from these two surveys and also from the September 2012 KPC survey were also analyzed independently by two different analysts, again providing confidence that the results are accurately reported.

Table 2. Operational research data collection methods, data sources, timeframes, and research products

Hypothesis/research question	Data collection method(s)	Sampling method	Informants/data source	Date/location	Product (URL links to each report are available in the respective appendices)
The CBIO + CG methodology produces significant improvements in the population coverage of interventions that are designed to address the epidemiological priorities for mothers and children relative to a Comparison Area (Phase 2 Area) and compared to (1) selected nearby municipalities of the Department of Huehuetenango where the Project was not working and (2) the rural population of the Department of Huehuetenango.	Baseline KPC survey	30-cluster sampling	300 mothers of under-2 children in each Phase Area	January 2012/ both Phase Areas	Endline KPC survey report (Appendix 5)
	Mini-KPC surveys	Simple random sampling	100 mothers of under-2 children for each survey	Dec 2012; Mar 2013, June 2013, Sept 2013; Feb 2014, and May 2014 (these were carried out in Phase 1 Area only)	Women's Empowerment study (Appendix 8) and Community Solidarity study (Appendix 10)
	Household survey	No sampling involved since the "universe" of mothers were interviewed	275 mothers in Phase I Area (municipality of San Sebastian Coatlán only) who gave birth between 1 April 2013 and 31 March 2014	September 2014/ Phase 1 Area (municipality of San Sebastián Coatlán only)	TRACtion Case Study of the Casas Maternas (Appendix 14)
	Key informant Interviews	Purposive sampling	22 mothers who gave birth between April 1, 2013 and March 31, 2014		
	Group interviews	Purposive sampling	Comadronas and Community Health Committees		
	Endline KPC survey	30-cluster sampling	300 mothers of under-2 children in each Implementation Area (Phase 1 and 2 Areas)	June 2015/ both Phase Areas	Endline KPC survey report (Appendix 5)

Hypothesis/research question	Data collection method(s)	Sampling method	Informants/data source	Date/location	Product (URL links to each report are available in the respective appendices)
The CBIO + CG methodology produces significant improvements in the nutritional status of children relative to a Comparison Area (the Phase 2 Area) and relative to (1) selected municipalities of the Department of Huehuetenango where the Project is not working and (2) the rural population of the Department of Huehuetenango.	Baseline KPC survey	30-cluster sampling	300 under-2 children weighed in each Phase Area (Phase 1 and 2 Areas)	January 2012/ both Phase Areas (weight but not length measured)	Nutrition study (Appendix 6)
	Anthropometric household survey	30-cluster sampling	288 under-2 children weighed and measured	September 2012/ Phase 1 Area only	
	Anthropometric "censuses"	No sampling since all children in the Project area were weighed (by visiting all homes)	All under-2 children in Project area weighed and measured	June 2013, Sept 2013, and January 2014 (Phase 1 Area only) Aug 2014 and Nov 2014 (both Phase 1 and Phase 2 Areas)	
	Endline KPC survey	30-cluster sampling	300 under-2 children weighed and measured in each Phase Area	June 2015/ Both Phase Areas	
The CBIO + CG methodology produces significant improvements in maternal and under-5 mortality relative to a Comparison Area (the Phase 2 Area) and compared to (1) selected municipalities of the Department of Huehuetenango where the Project was not working and (2) the rural population of the Department of Huehuetenango.	Verbal autopsies	Analysis of verbal autopsies for all maternal and U-5 deaths	Families of 34 deceased women and 314 under-5 children	Oct 2011- May 2015 (Phase 1 Area)/ Oct 2013-May 2015 (both Phase Areas)	Vital events report (Appendix 7)
	Analysis of Vital Events Registers	Analysis of Register data for all births, stillbirths, and maternal/U-5 deaths	Vital events gathered by <i>Comunicadoras</i> , Community Facilitators, and <i>Educadoras</i>		
	Analysis of MSPAS mortality data for Huehuetenango	Analysis of MSPAS data for the Project's 3 municipalities and for 3 comparison municipalities outside of the Project area	Data from government national vital events registries (<i>registro civil</i>)	July 2015 (3 comparison municipalities outside the Project area and both Phase Areas)	
The CBIO + CG methodology produces significant increases in community involvement in problem solving relative to a Comparison Area.	Baseline KPC survey	30 cluster sampling	300 mothers of under-2 children in each Implementation Area	Jan 2012 (both Phase Areas)	Community Solidarity Study (Appendix 10)
	Mini-KPC survey	Simple random sampling	100 mothers of under-2 children	Sept 2013 (Phase 1 Area only)	
	Endline KPC survey	30-cluster sampling	300 mothers of under-2 children in each Implementation Area (Phase 1 and Phase 2 Areas)	June 2015 (both Phase Areas)	

Hypothesis/research question	Data collection method(s)	Sampling method	Informants/ data source	Date/location	Product (URL links to each report are available in the respective appendices)
<p>The CBIO + CG methodology produces significant increases in women's participation in community health activities relative to a Comparison Area.</p> <p>The CBIO + CG methodology produces significant increases in women's health-related decision-making autonomy relative to a Comparison Area.</p>	Baseline KPC survey	30 cluster sampling	300 mothers of under-2 children in each Implementation Area (Phase 1 and 2 Areas)	January 2012 (both Implementation Areas)	Women's Empowerment Study (Appendix 8)
	Mini-KPC survey	Simple random sampling	100 mothers of under-2 children	February 2014 (Phase 1 Area only)	
	Endline KPC survey	30-Cluster Sampling	300 mothers of under-2 children in each Phase Area	June 2015 (both Intervention Areas)	
	Focus group discussions	Purposive sampling	Women, husbands, mothers-in-law, and Community Health Committees	February 2014 (Phase 1 Area only)	
	Key informant interviews and focus group discussions	Purposive sampling	Community Facilitators, <i>Comunicadoras</i> , Self-Help Group participants	May 2015 (both Phase Areas 1 and 2)	Qualitative analysis of the effect of Care Groups (Appendix 9)
<p>What are the lessons learned in implementing the CBIO + CG methodology? How can the CBIO + CG methodology be best and most feasibly introduced into the MSPAS framework for health care delivery?</p>	Written questionnaire, key informant interviews, and focus group discussions	Purposive sampling	Curamericas/ Guatemala staff and MSPAS staff	August 2013 (Phase 1 Area)	Assessment of challenges and advantages of CBIO + CG (Appendix 11)
		Purposive sampling		June 2015 (both Phase Areas 1 and 2)	Re-assessment of challenges and advantages of CBIO + CG (Appendix 12)
	Key informant interviews and focus group discussions	Purposive sampling	Community Facilitators, <i>Comunicadoras</i> , Self-Help Group participants	May 2015 (both Phase Areas 1 and 2)	Qualitative analysis of the effect of Care Groups (Appendix 9)
	Baseline, endline, and mini-KPC surveys	30-cluster sampling (KPC) and simple random sampling (mini-KPC)	Mothers of under-2 children	Baseline KPC: Jan 2012 (both Phase Areas 1 and 2); mini-KPC surveys: Dec 2012, March 2013, June 2013, and Feb 2014 (Phase 1 Area only); Endline KPC: June 2015 (both Phase Areas)	Analysis of the integration of the PEC Program (Appendix 13)
	Literature review	Not applicable	Existing literature about PEC	Aug-Nov 2015	
	Key informant interviews	Purposive sampling	Curamericas/ Guatemala staff	Aug 2015	

How can <i>Comadronas</i> transition into an effective new role in maternity care that improves the quality of care provided to mothers and that respects cultural traditions and expectations?	<i>Comadrona</i> census	Census	<i>Comadronas</i>	July 2013 (Phase 1 Area)	<i>Comadrona</i> census (Appendix 15)
	Individual interviews	Purposive sampling		July 2013 (Phase 1 Area)	Analysis of <i>Comadrona</i> integration (Appendix 16)
	Focus group discussions	Purposive sampling		June 2015 (both Phase Areas)	Follow-up <i>Comadrona</i> study (Appendix 17)
How does the cost-effectiveness of the CBIO + CG methodology as implemented by Curamericas/Global in Guatemala compare to that of other Guatemala maternal and child health programs using different methodologies (based on cost per life saved and cost per DALY averted)?	Cost analysis; LiST (Lives Saved Tool)	Not applicable	Analysis of project fiscal records, project Vital Events Registers, Community Register population data	November 2015 (both Phase Areas)	Cost study (Appendix 18)

II.C. IRB and informed consent

We applied for and received IRB approval for our Operational Research from the Guatemala National Ethics Committee in April 2012. A copy of the formal approval is found in Appendix 4. Informed consent from study subjects was always obtained in their native Mayan language before proceeding with the research activity. The information provided verbally to them in the local language included the purpose of the study, assurances that they are free to not participate or end their participation at any moment, that they will not be denied services if they choose not to participate, and assurances that the information they provide will be confidential and that their name will never be associated with the disseminated findings. For household surveys, including the baseline and endline KPC Surveys, we obtained written informed consent in the form of a thumbprint or signature. For qualitative data collection methods such as focus group discussions, group interviews, and key informant interviews, we obtained verbal informed consent witnessed by third parties and documented in the transcripts of those activities.

II. D. Study duration

The operational research was carried out alongside the Child Survival Project, and many of the monitoring and evaluation activities of the CSP also contributed to the operational research. Thus, the operational research began in October 2012 and continued through to the end of the Project on 30 September 2015, but further analysis and writing continued until the submission of the final report.

The operational research consists in part of a number of smaller studies, most of which were carried out toward the end of Phase I (in the summer of 2013) and then toward the end of Phase II (in the summer of 2015).

II.E. Intervention details

The CSP's core methodologies – CBIO, Care Groups, and the *Casas Maternas* – have already been introduced above in Section I.C. Project Design (p. 4). However, this section will provide additional details about the implementation of the following strategies: (1) CBIO community mobilization; (2) Care Groups; (3) the project's nutrition intervention; and (4) the *Casas Maternas* and their integration of the *Comadronas*.

CBIO – CBIO begins slowly with the “generation of trust” stage during which the project staff and community become mutually acquainted, the community understands the purposes and methods of the Project, and the

Project staff earn the community's trust by fulfilling promises and exhibiting honesty and respect. A key tool for this process is the community assemblies (*asambleas*). In Guatemala, these are traditional community meetings open to all during which, in this first stage, mutual acquaintance and trust can be built. Once the CBIO Project is implemented, the *asambleas* continue on a regular (usually quarterly) basis to share community health data and engage the community in problem-solving. In addition, each community has a *sala situacional* ("situation room"), a public space where the community's health data are exhibited in easily understood graphic form to stimulate interest, awareness and transparency. Despite these efforts, sometimes, for a variety of reasons, trust-building falters and communities decline to participate in the Project or their participation is weak. This can present challenges to CBIO implementation.

Care Groups – The Care Group model is also a pedagogic model that utilizes learner-empowered participatory methods that engage the participants actively in the learning process. Its lessons are designed for non-literate audiences and teachers. The Care Group Volunteers (the *Comunicadoras*) who teach their neighbors in the Self-Help Groups are usually non- or semi-literate. Curamericas/Guatemala has developed a manual of Care Group lessons covering all the Project's targeted health behaviors and indicators.⁴⁵ The manual contains a year-long cycle of lessons that are taught in the local language and include ice-breakers, learning games, songs, skits, practicing of skills (such as breastfeeding and hand washing) and testimonials. Despite this departure from traditional pedagogy (of theoretical and passive learning), the lessons taught emphatically respect the learners' capacity for theoretical understanding and teach concepts such as germ theory, nutritional content of food, the principles behind immunizations, as well as the reasons for antenatal care, health facility deliveries, and postpartum care. Another key aspect of the pedagogy is that it involves "just-in-time" learning and the learners in the training cascade teach others in the same way they were just taught. For example, the Community Facilitator will teach her Care Group Volunteers in the same way the *Educadora* taught her using the same learning materials, and she will do so within a week of her being taught while the lesson is fresh. This just-in-time replication flows down the entire training cascade and helps ensure fidelity and quality.

The nutrition intervention – The CSP devoted 30% of its level of effort to address the high prevalence of under-nutrition in children younger than 2 years of age with a prevention focus through regular growth monitoring, improved knowledge of and skills in appropriate child feeding practices, and improved access to and utilization of preventive measures. A Community-Based Growth-Promotion approach was utilized in which staff *Educadoras* (Health Educators) and Community Facilitators (CFs) who were properly trained in anthropometric techniques regularly measured length and weight of children younger than 2 years during home visits. At a minimum, all children were weighed and measured when they reached 3, 6, 12, 18 and 24 months of age. CBIO community registers and maps were used to locate, visit and identify as early as possible children with insufficient growth progress in order to target them and their caretakers for additional nutritional counseling and problem solving. Mothers of stunted and underweight children were targeted for either support groups for breastfeeding women (*Círculos de madres lactantes*) or Hearth workshops (*talleres hogareños*) to learn proper complementary food preparation and feeding practices. Their children were then closely monitored for improvement. Cases of wasting were referred to MSPAS health posts or clinics for provision of nutritional supplementation and medical attention.

Crucial to this strategy was the integration of Care Groups and the Positive Deviance/Hearth (PD/Hearth) methodologies. The Care Group mother/peer educators known as *Comunicadoras* brought nutritional skills and knowledge to mothers with an under-5 child via the Self-Help Groups and home visitation. Exclusive breastfeeding for 0-5-month-old children was emphasized and support groups for lactating women (*Círculos de madres lactantes*) were held at the *Casas Maternas*. Self-Help Group lessons also addressed proper complementary feeding (see below) and proper hand washing.

Locally available and affordable nutritious foods were identified utilizing the PD/Hearth methodology. Children who were at or above the normal weight and length for their age per the WHO reference population tables were identified via a household survey carried out in September 2012 (described further on p. 29 in the

⁴⁵ Manual de guías de capacitación a Grupos de cuidado y Autocuidado. Asociación Civil Curamericas/Guatemala. Calhuitz, San Sebastián Coatán, Huehuetenango, Guatemala: 2014.

footnotes). The mothers of these children (the “positive deviants”) were then interviewed to discover what and how they were feeding their children. It was found that they were using locally available and affordable foods that included cheap vegetable oil, garden vegetables, wild greens, fruits, eggs, and legumes. Curamericas *Educadoras* then designed a two-week menu cycle supplementing the traditional maize-based diet with these additional nutritious foodstuffs. Then, assisted by the Community Facilitators and *Comunicadoras*, they implemented *talleres hogareños* (Hearth workshops) in the kitchens of the Community Facilitators or the *Comunicadoras* in which the mothers in the Self-Help Groups whose children were malnourished received hands-on instruction and practice in preparing the foods of the two-week recuperative menu cycle, bringing their children and feeding them during the *talleres*. In addition, the *talleres* were integrated into the Self-Help

Figure 4. A Positive Deviance/Hearth workshop



Groups as stand-alone lessons so the child feeding skills and knowledge would reach all the reproductive-age women to establish new norms of child feeding practices.

The *Comunicadoras* and Community Facilitators, through the process of encouraging exclusive breast-feeding (EBF) during Self-Help Groups and home visitations, monitored EBF among their assigned lactating women and noted whether the mother was consistently practicing EBF. If she was not, she was provided counseling and problem-solving assistance. If, after the child turned 6 months of age, the mother had apparently faithfully practiced EBF for the full 6 months, the Community Facilitator reported this to her *Educadora* and the child was registered in the CSP M&E system as having been exclusively breastfed.

Casas Maternas – The *Casa Materna* is designed for cultural acceptability. The physical

structure of the *Casas Maternas* is based upon traditional Mayan home designs and provides access to culturally appropriate maternity services. In addition to an exam room, delivery room, and postpartum recovery room, a *Casa Materna* includes a traditional Maya kitchen, where the woman’s family can prepare traditional food, and a *chuj*, the traditional Mayan sweat lodge. Services are provided in the local Mayan language and local birth-related customs are respected.

To strengthen cultural acceptability, the local *Comadronas* (traditional birth attendants) are integrated into the *Casa Materna* team: they bring women to the *Casa Materna* to deliver instead of attending deliveries in the women’s homes. The *Comadronas* assist the *Casa Materna* staff appropriately in the delivery. MSPAS has long been struggling to define the role of the *Comadrona* in the rural health system and has settled on a “harm-reduction” approach that involves the training of *Comadronas* by MSPAS staff in the provision of clean safe births and home-based life-saving skills to improve the safety and quality of their home deliveries. Curamericas/Guatemala has been collaborating with the MSPAS in the provision of this training. Once the *Comadronas* are integrated into the *Casa Materna* team, the *Casa Materna* staff continues this training, but with a focus on the *Comadrona* bringing women to the *Casa Materna* to deliver and exercising her new skills in the *Casa Materna*.

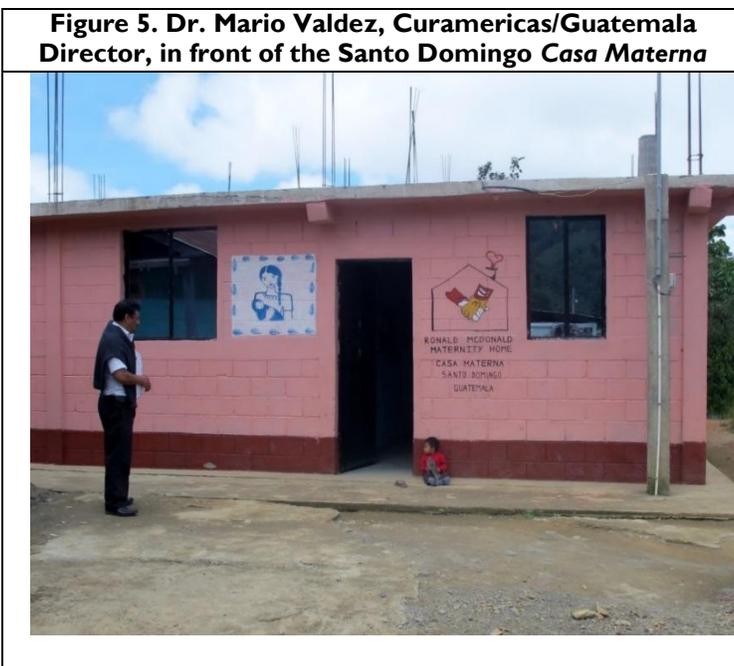
Second, the *Casas Maternas* ensure accessibility, serving a catchment of 8-12 communities known as a micro-region, which is a set of communities that choose to engage with and support the establishment of a new *Casa Materna*. These communities are located within 8 kilometers of their *Casa Materna*. In addition, services are always available 24 hours a day, 7 days per week, with *Casa Materna* staff on-call in rotating shifts.

Third, the *Casas Maternas* are based on the CPIO principles of community engagement and partnership. The micro-regional communities establish a Micro-Regional Committee (MRC) composed of representatives from each community in the micro-region. The MRC members are trained to manage the

construction of the *Casa Materna* and its operations once it begins functioning. The edifice housing the *Casa Materna* is built and maintained entirely with volunteer community labor on land donated by the municipal government. The catchment communities making up the micro-region are referred to as “partner communities” and communities that are not located in a micro-region are known as “non-partner communities.” Women from non-partner communities are free to use a *Casa Materna*.

Fourth, the *Casas* are affordable. Services are free, whether the woman is from a partner or non-partner community. There is a small optional fee of approximately US\$7, which is for food and cleaning of linens, and which the families can pay themselves or provide the service themselves without paying anything. Pregnant women also have the option to make a one-time payment of approximately US\$7 to the MRC as emergency transport insurance so that if a referral to the hospital is required, one-half of the \$150 cost of transport to the referral facility – the MSPAS hospital in the city of Huehuetenango – will be paid by the MRC.⁴⁶

Last, the *Casas Maternas* provide antenatal care, postpartum care, and health education in the form of support groups (*Círculos*) for pregnant women (*Círculos de embarazadas*), for lactating women (*Círculos de madres lactantes*), and adolescent girls (*Círculos de adolescentes*). These operate independently of the Care Groups/Self-Help Groups and women may participate in both activities. In 2014 the *Casas* were equipped with small pharmacies (*boutiquines*) through the partnership with Medicines for Humanity which has enabled them to provide antibiotic treatment for infections and other basic primary care (e.g., treatment of rashes, scabies, minor infections, and so forth). Also, to enhance women’s participation in the *Casas*, a Woman’s Support Committee was established for each *Casa Materna*, each undertaking a project to enhance their *Casa Materna*’s services (e.g., a kitchen garden at the Santo Domingo *Casa Materna*).



II.F. Intervention monitoring

Table 3, below, summarizes the project’s intervention monitoring system, indicating for each type of data the data source, how often it was collected, by whom, and where the data was recorded.

⁴⁶ Most of this covers the cost of the ambulance service of the emergency medical technicians (EMTs) in the town of San Antonio Huistia, approximately an hour drive away, who, after being contacted by satellite phone by the *Casa Materna* staff, receive the women at a point approximately half-way between San Antonio Huistia and the *Casa Materna* and then transport her the rest of the way to the MSPAS hospital in Huehuetenango, another 3 hours away. The balance is the fee charged by the local on-call service provider (usually a mini-van) who brings the woman to the rendezvous point with the EMTs. While the approximately \$75 net cost to the family of the transported woman is high in this context of poverty, to date all families have managed to gather this sum and the cost does not appear to impede the referral process, but rather, facilitates it.

Table 3. The Project monitoring and evaluation system: data sources, data collectors, frequency of data collection, and data record

Data	Data Source	Data Collector(s)	Frequency	Data Record
Outputs of project activities	<ul style="list-style-type: none"> • Logs (<i>actas</i>) of project activities • Attendance records of Care Groups, Self-Help Groups, <i>Circuitos</i>, and PD/Hearth workshops • Community Registers • Logs of home visitations 	<i>Educadoras</i> , Community Facilitators	Monthly (ongoing)	Excel database of project M & E system
Child nutritional status	Anthropometric "censuses"	<i>Educadoras</i> and Community Facilitators	Bi-annually	
	Regular child growth monitoring visits to households		Monthly	
Vital events (new pregnancies, births, stillbirths, deaths)	Self-Help Group and Care Group meetings	<i>Comunicadoras</i> , Community Facilitators, <i>Educadoras</i> , Institutional Facilitators	Monthly (ongoing)	Vital Events Registers; Community Registers
Causes of mortality and contributing factors	Verbal autopsies	Institutional Facilitators	Monthly (ongoing)	Verbal autopsy reports and Vital Events Registers
Coverage of interventions	Mini-KPC surveys	<i>Educadoras</i>	Quarterly	Epi-Info and Excel data bases
<i>Casa Materna</i> outputs	<i>Casa Materna</i> clinical records	<i>Casa Materna</i> Auxiliary Nurses	Monthly	Excel database for <i>Casa Materna</i> services
Extension of Coverage Program (PEC) outputs	Extension of Coverage (PEC) data collection forms from national health management information system (SIGSA)	Ambulatory Nurses and Institutional Facilitators	Monthly	National HMIS (SIGSA)

III. RESULTS AND FINDINGS

III.A. Intervention monitoring and evaluation results

Table 4 presents the main results produced by the CSP based on data and information collected from the M & E system, baseline and endline KPC surveys, the anthropometric "censuses," and the operational research.

Table 4. Summary of project inputs, activities, outputs, and selected key outcomes for both Phase Areas (outcomes compare baseline and endline measures from the KPC surveys and the anthropometric data collected at the time of the baseline and endline household surveys)

Inputs	Activities	Outputs	Outcomes
1. Increase access to quality maternal and newborn care			
<ul style="list-style-type: none"> - Manual for Care Groups - <i>Manual de Capacitación</i>⁴⁷ (Training Manual) for SBAs and <i>Comadronas</i> - Home-based Live Saving Skills (HBLSS) Training materials and trainers from American College of Nurse Midwives - <i>Casa Materna Replication Manual</i>⁴⁸ - Community registers and maps 	<ul style="list-style-type: none"> - Community selection of Community Facilitators - Recruitment of <i>Comunicadoras</i>, establishment of Care Groups and Self-Help Groups - Training of <i>Educadoras</i>, Community Facilitators, and <i>Comunicadoras</i> in maternal/ newborn health - Care Group meetings - Self-Help Group Meetings - Mobilization of <i>Casa Materna</i> partner communities - Formation and training of Micro-Regional Committees (MRCs) using the <i>Casa Materna</i> Manual 	<ul style="list-style-type: none"> - 12 <i>Casa Materna</i> staff, 30 <i>Educadoras</i>, 184 Community Facilitators, 242 <i>Comadronas</i> and 779 <i>Comunicadoras</i> recruited and trained in maternal/newborn health - 14,488 women educated in MNC and HBLSS - 11,674 women educated in family planning - 180 Health Committees educated in MNC and HBLSS - 3,150 women receive 4 antenatal care checks from the PEC program 	<ul style="list-style-type: none"> Pregnant women who had at least 4 antenatal checks increased from 13% to 65% for Phase 1 Area and from 6% to 53% for Phase 2 Area. Percentage of mothers who know at least 2 danger signs during pregnancy increased from 22% to 78% for Phase 1 Area and from 21% to 66% for Phase 2 Area. Percentage of mothers who know at least two danger signs during delivery increased from 13% to 66% for Phase 1 Area and from 13% to 54% for Phase 2 Area.
<ul style="list-style-type: none"> - Personnel: 30 <i>Educadoras</i>, 4 <i>Educadora</i> Supervisors, 3 Municipal Coordinators, 4 <i>Casa Materna</i> Auxiliary Nurses and 8 <i>Casa Materna</i> Support Women, 2 <i>Casa Materna</i> Supervisory Nurses, 184 Community Facilitators, 779 <i>Comunicadoras</i>, 10 PEC Ambulatory Nurses, 242 trained <i>Comadronas</i> - <i>Casa Materna</i> construction materials - Donated land for <i>Casas Maternas</i> - Volunteer community labor to build <i>Casas Maternas</i> 	<ul style="list-style-type: none"> - Securing commitment from municipal governments for 3 new <i>Casas Maternas</i> - Construct and equip 3 new <i>Casas Maternas</i> - Train <i>Casa Materna</i> staff and <i>Comadronas</i> in Essential Newborn Care (ENC), Active Management of Third Stage of Labor (AMTSL), and Home-Based Life-Saving Skills (HBLSS) - Train communities in HBLSS and establish community emergency transportation plans - Reporting of vital events (new pregnancies, births, maternal and neonatal deaths) - Home visitation in response to newly registered pregnancies and to deliveries - Verbal autopsies and community assemblies to discuss maternal and child deaths 	<ul style="list-style-type: none"> - 2,268 pregnant women received tetanus vaccination (PEC) - 2,908 pregnant women received iron/folic acid (PEC) - 1,355 health facility deliveries (including 747 <i>Casa Materna</i> deliveries) - 15 <i>Casa Materna</i> staff and 242 <i>Comadronas</i> trained in Essential Newborn Care (ENC), Active Management of Third Stage of Labor (AMTSL), and Home-Based Life-Saving Skills (HBLSS) - 51 <i>Casa Materna</i> partner communities mobilized - 4 Micro-Regional Committees formed and trained - 3 municipal government donate land for <i>Casas Maternas</i> - 3 new <i>Casas Maternas</i> built; 3 <i>Casas Maternas</i> operational - 747 <i>Casa Materna</i> deliveries - 2,153 women received postpartum 	<ul style="list-style-type: none"> Percentage of children whose births were attended in a health facility increased from 16% to 29% in Phase 1 Area and from 7% to 13% for Phase 2 Area. Percentage of children who received all three elements of essential newborn care increased from 6% to 39% for Phase 1 Area and 5% to 31% for Phase 2 Area. Percentage of mothers who received AMTSL during their most recent delivery increased from 9% to 20% in Phase 1 Area and from 7% to 11% in Phase 2 Area. Percentage of mothers who received a postpartum visit within two days of birth increased from 22% to 39% in Phase 1 Area and from 16% to 18% in Phase 2 Area. Percentage of mothers who knew at least two postpartum danger signs increased from 17% to 66% in Phase 1 Area and from 19% to 54% in Phase 2 Area. Percentage of non-pregnant

⁴⁷ Manual de capacitación. Asociación Civil de Curamericas/Guatemala. Calhuitz, San Sebastián Coatlán, Huehuetenango, Guatemala: 2012.

⁴⁸ Manual de la replicación de la *Casa Materna*. Asociación Civil de Curamericas/Guatemala. Calhuitz, San Sebastián Coatlán, Huehuetenango, Guatemala: 2013.

Inputs	Activities	Outputs	Outcomes
		visits within 48 hours -84 obstetric emergency referrals (79 successfully referred) - 157 communities with emergency transport plan -348 verbal autopsies completed for WRA and under-5 children	mothers who are using a modern contraceptive method decreased from 36% to 34% in Phase 1 Area and from 27% to 25% in Phase 2 Area.
2. Improve nutrition in children 6-23 months of age			
-Manual or Care Groups -Manual for Hearth model (Positive Deviance) intervention -Community registers and maps - Personnel: 30 Educadoras, 4 Educadora Supervisors, 3 Municipal Coordinators, 4 Casa Materna Auxiliary nurses and 8 Casa Materna Support Women , 2 Casa Materna Supervisors, 149 Community Facilitators, 779 Comunicadoras, 10 PEC Ambulatory Nurses, 242 trained Comadronas -Scales for weighing children -Measuring boards for children	-Training of <i>Educadoras</i> , Community Facilitators (CFs), and <i>Comunicadoras</i> in nutrition - Establishment of Care Groups and Self-Help Groups - Care Group meetings - Self-Help Group Meetings -Positive Deviance/Hearth Intervention: weighing/measuring; survey of positive deviants; design of menu and workshops - <i>Talleres Hogareños</i> (community workshops on complementary feeding) -Growth monitoring of children -Vitamin A supplementation of children 6-23 months	-12 Casa Materna staff, 30 <i>Educadoras</i> , 184 CFs and 779 <i>Comunicadoras</i> trained in nutrition and Hearth Model (Positive Deviance) -14,488 women educated in nutrition (IBF, EBF, IYCF) - 11,179 children receive vitamin A supplementation -117 children treated for acute malnutrition (wasting) -19,352 household visits for child growth monitoring -5,965 children months weighed and measured (93-100% of children in Phase 1 Area and 93-96% of children in Phase 2 Area -555 under-nourished children and their mothers receive the 2-week Positive Deviance intervention (PD/Hearth Workshops)	Percentage of infants aged 0-5 months who were given breast milk only in the preceding 24 hours increased from 75% to 82% in Phase 1 Area and decreased from 79% to 72% in Phase 2 Area. Percentage of infants and young children aged 6-23 months fed according to a minimum of appropriate feeding practices increased from 53% to 74% in Phase 1 Area and from 56% to 65% in Phase 2 Area. Percentage of children aged 6-23 months who received a dose of Vitamin A in the previous 6 months decreased from 79% to 74% in Phase 1 Area and from 73% to 67% in Phase 2 Area. Percentage of children who are stunted decreased from 74% to 39% in Phase 1 Area. Percentage of children who are underweight increased from 16% to 20% in Phase 1 Area and was unchanged at 20% in Phase 2 Area.
3. Increase prevention and treatment of Diarrhea and ARI/pneumonia			
- Manual for Care Groups -Community registers and maps -Personnel: 30 <i>Educadoras</i> , 4 <i>Educadora</i> Supervisors, 3 Municipal Coordinators, Municipal Coordinators, 4 <i>Casa Materna</i> Auxiliary nurses and 8 <i>Casa Materna</i> Support Women, 149 Community Facilitators, 779 <i>Comunicadoras</i> , 10 PEC Ambulatory Nurses, 242 trained <i>Comadronas</i> - Community pharmacies (<i>boutiquines</i>) with antibiotics and ORS in the <i>Casas Maternas</i>	-Training of <i>Educadoras</i> , Community Facilitators, and <i>Comunicadoras</i> in diarrhea and ARI/pneumonia prevention and care-seeking, hand washing, and water treatment/storage - Establishment of Care Groups and Self-Help Groups - Care Group meetings - Self-Help Group Meetings - Provision of diarrhea and ARI/pneumonia treatment by PEC staff	-30 <i>Educadoras</i> , 184 Community Facilitators and 779 <i>Comunicadoras</i> trained in diarrhea and ARI prevention and treatment - 14,488 mothers educated in proper hand washing, water treatment, feces disposal - 14,488 mothers educated in dangers signs and treatment of diarrhea and ARI/pneumonia - 3,205 children with diarrhea received treatment with ORS - 488 children with ARI/pneumonia received treatment with antibiotics	Percentage of children with chest-related cough and fast and/or difficult breathing in the previous 2 weeks who were taken to an appropriate health provider increased from 26% to 52% in Phase 1 Area and from 21% to 47% in Phase 2 Area. Percentage of children with diarrhea in the previous 2 weeks who received oral rehydration solution and/or recommended home fluids increased from 28% to 41% in Phase 1 Area and from 30% to 40% in Phase 2 Area. Percentage of households that

Inputs	Activities	Outputs	Outcomes
	<ul style="list-style-type: none"> - Provision of diarrhea and ARI/pneumonia treatment by <i>Casa Materna</i> staff utilizing community pharmacies 	(PEC) <ul style="list-style-type: none"> - 988 children with ARI/pneumonia and other infections received treatment at <i>Casa Materna</i> mini-pharmacies (<i>boutiquines</i>) 	<ul style="list-style-type: none"> treat water effectively and regularly increased from 67% to 98% in Phase 1 Area and from 58% to 98% in Phase 2 Area. Percentage of mothers who wash their hands with soap before food preparation, before feeding children, after defecation, and after cleaning a child increased from 1% to 34% in Phase 1 Area and from 2% to 29% in Phase 2 Area. Percentage of households that disposed of the youngest child's feces safely the last time s/he passed stool increased from 43% to 45% in Phase 1 Area and from 9% to 52% in Phase 2 Area.
4. Improve coverage of child immunization			
<ul style="list-style-type: none"> - Manual for Care Groups - Community registers and maps - Personnel: 30 <i>Educadoras</i>, 4 <i>Educadora</i> Supervisors, 3 Municipal Coordinators, 149 Community Facilitators, 779 <i>Comunicadoras</i>, 10 PEC Ambulatory Nurses, 242 trained <i>Comadronas</i> 	<ul style="list-style-type: none"> - Training of <i>Educadoras</i>, Community Facilitators, and <i>Comunicadoras</i> in immunizations - Establishment of Care Groups and Self-Help Groups - Care Group meetings - Self-Help Group Meetings - Provision of immunizations by PEC staff 	<ul style="list-style-type: none"> - 30 <i>Educadoras</i>, 184 Community Facilitators and 779 <i>Comunicadoras</i> trained in importance of immunizations - 14,488 mothers educated in importance and function of immunizations - 1,933 children vaccinated for measles (by the PEC program) - 1,868 children received all their immunizations (by the PEC program) 	<ul style="list-style-type: none"> Percentage of children aged 12-23 months who received measles vaccination decreased from 79% to 65% for Phase 1 Area and from 79% to 56% for Phase 2 Area Percentage of children aged 12-23 months who received all required antigens and doses by the time of the survey decreased from 74% to 57% for Phase 1 Area and from 69% to 50% for Phase 2 Area.
5. Improve participation of women and community support of maternal/child health			
<ul style="list-style-type: none"> - CBIO Manual - Vital Events Manual - Community registers and maps - Community participatory diagnoses - Community health plans - Personnel: 30 <i>Educadoras</i>, 4 <i>Educadora</i> Supervisors, 3 Municipal Coordinators, 149 Community Facilitators, 779 <i>Comunicadoras</i>, 10 PEC Ambulatory Nurses, 242 trained <i>Comadronas</i> 	<ul style="list-style-type: none"> - Community assemblies - Formation of Community Health Committees - Mapping and census of communities - Participatory community diagnoses and drafting of community health plans - Selection and training of Community Facilitators - Recruitment and training of <i>Comunicadoras</i> - Establishment of Care Groups and Self-Help Groups - Care Group meetings - Self-Help Group Meetings - Monthly community assemblies to discuss progress and challenges 	<ul style="list-style-type: none"> - 2,157 community assemblies - 180 Community Health Committees established - 180 community diagnoses and health plans established - 184 Community Facilitators trained - 180 communities with active Community Facilitator - 779 <i>Comunicadoras</i> trained - 242 <i>Comadronas</i> trained - 14,488 mothers educated in Self-Help Groups - 4 Women's Support Committees established at the <i>Casas Maternas</i> - 180 communities with Care Groups and Self-Help Groups - 157 communities with emergency 	<ul style="list-style-type: none"> Percentage of households in which either the mother alone or the mother jointly with another person decided the location and birth attendant for her most recent delivery increased from 69% to 78% in Phase 1 Area and from 72% to 76% in Phase 2 Area. Percentage of households in which either the mother or the mother jointly with her husband/partner (or another person) decided if she would practice contraception and, if so, the method to be used increased from 56% to 84% in Phase 1 Area and from 56% to 83% in Phase 2 Area. Percentage of mothers who report that in the previous 3 months they attended and expressed their opinion at a community meeting increased from 10% to 24% in Phase 1 Area and from 11% to 28% in Phase 2 Area.

Inputs	Activities	Outputs	Outcomes
	- Establish Women's Support Committees at the <i>Casas Maternas</i>	transport plan	Percentage of mothers who report that their community has in place an emergency response plan increased from 29% to 45% in Phase 1 Area and from 37% to 53% in Phase 2 Area.

III.B. Demographic characteristics of Project beneficiaries

Project beneficiaries consisted of indigenous Chuj, Akateko, and Q'anjobal Mayan people, with 47,657 direct beneficiaries consisting of 32,330 reproductive-aged women (ages 15-49) and 15,327 children younger than 5 years of age. According to the endline KPC survey, the respondents (mothers of children 0-23 months) ranged in age from 14 to 45 (median of 24 for both Phase Areas); had very low levels of formal education (median of 3 years for both Phase Areas), and were overwhelmingly housewives (94% in Phase 1 Area, and 95% in Phase 2 Area) living with their spouse/conjugal partner (87% in Phase 1 Area, 89% in Phase 2 Area). The vast majority (98%) preferred to speak their native Mayan language (Chuj, Akateko, or Q'anjobal) and fewer than half were able to communicate in Spanish (44% in Phase 1 Area, 37% Phase 2 Area). No statistically significant differences were found between the characteristics of the respondents from the Phase 1 Area and the respondents from the Phase 2 Area.

III.C. Main results

III.C.1. To what extent did the project accomplish and/or contribute to the results (goals/objectives) stated in the DIP?

III.C.1.i Operational Research Hypothesis 1: The CBIO + CG methodology produces significant improvements in the population coverage of interventions that are designed to address the epidemiological priorities for mothers and children [in Project Phase 1 Area] relative to a Comparison Area [Project Phase 2 Area] and compared to selected municipalities of the Department of Huehuetenango and the rural population of the Department Huehuetenango department.

Results of the Baseline and Endline KPC Surveys^{49,50}

The Project produced significant baseline to endline improvements in outcomes for the large majority of indicators in both Phase Areas (1 and 2), including nearly all of the maternal/new-born care indicators according to the findings of the baseline and endline KPC surveys (Table 5). The findings also demonstrate significant increases over baseline in key Behavior Change Communication (BCC) indicators that include knowledge of danger signs (during pregnancy, delivery, and the postpartum period); proper care-seeking for a child with symptoms of pneumonia; oral rehydration therapy (ORT) for a child with diarrhea; key water, sanitation and hygiene (WASH) indicators, especially hand-washing at critical times; and recommended Infant and Young Child Feeding (IYCF). However, indicators related to family planning usage, immunizations, and vitamin A supplementation for children do not show expected improvements.

Table 5 (below) presents the baseline and endline outcome indicator coverage for the health-service-utilization- and health-behavior-related indicators. Baseline and endline findings are presented for each Phase

⁴⁹ The full Endline KPC Report can be found in Appendix 5. Findings are drawn from the baseline and endline KPC surveys, administered in January 2012 and June 2015 in both Phase Areas. Details of the survey methodology can be found in the full report.

⁵⁰ A difference in differences (DID) analysis was also done comparing the baseline to endline percentage changes of the two Phase Areas to see if these results confirmed the comparison of the endline results of the two Phase Areas done in the KPC report. The results of the DID analysis are found in Table 1 in Appendix 5.

Area with their associated 95% confidence intervals, and p-values are presented for: (1) the difference in the baseline and endline values for each indicator by Phase Area; and the (2) the comparison of the endline results for the two Phase Areas. A table showing the baseline to endline percentage changes for each indicator for both Phase Areas and the p-value for the comparison of those percentage changes is found in Appendix 5.

Table 5. Project outcome indicators: baseline KPC results compared to endline KPC results for both Phase Areas (1 and 2) and results of endline KPC for Phase 1 Area compared to results of endline KPC for Phase 2 Area

Outcome Indicator	PHASE 1 AREA			PHASE 2 AREA			p-value – Endline KPC Phase 1 Area vs. Endline KPC Phase 2 Area
	Baseline KPC (n=299) Pctg. (95% CI)	Endline KPC (n=300) Pctg. (95% CI)	p-value (baseline vs. endline KPC)	Baseline KPC (n=300) Pctg. (95% CI)	Endline KPC (n=300) Pctg. (95% CI)	p-value (baseline vs. endline KPC)	
Maternal/newborn care							
At least 4 quality antenatal care checks during most recent pregnancy	13.4% (8.7, 18.1)	65.0% (59.5, 70.5)	0.000	6.3% (2.9, 9.7)	53.3% (47.4, 59.2)	0.000	0.002
Tetanus toxoid Immunization during most recent pregnancy	63.2% (56.5, 69.9)	67.7% (62.8, 72.6)	0.144	63.0% (56.3, 69.7)	62.3% (56.9, 67.7)	0.466	0.100
Iron/folate for at least 90 days during most recent pregnancy	21.7% (16.0, 27.4)	64.3% (58.7, 69.9)	0.000	10.0% (5.8, 14.2)	26.3% (20.7, 31.9)	0.000	0.000
Knowledge of at least 2 danger signs during pregnancy	22.1% (16.3, 27.9)	78.3% (73.5, 83.1)	0.000	21.3% (15.6, 27.0)	66.3% (60.8, 71.8)	0.000	0.001
Last delivery took place in a health facility (hospital, clinic, or Casa Materna)	16.4% (11.3, 21.5)	28.7% (23.6, 33.8)	0.000	6.7% (3.2, 10.2)	13.0% (9.2, 16.8)	0.013	0.000
Essential newborn care during most recent delivery (clean umbilical cord care, immediate BF, thermal care)	6.0% (2.7, 9.3)	39.0% (33.5, 44.5)	0.000	5.0% (2.0, 8.0)	31.0% (25.8, 36.2)	0.000	0.049
Active Management of Third Stage of Labor during most recent delivery	9.4% (5.4, 13.4)	20.0% (15.5, 24.5)	0.000	7.0% (3.5, 10.5)	11.0% (7.4, 14.6)	0.057	0.000
Knowledge of at least 2 danger signs during delivery	13.4% (8.7, 18.1)	66.3% (61.0, 71.6)	0.000	13.3% (8.6, 18.0)	53.7% (48.1, 59.3)	0.000	0.002
Postpartum visit for the mother and newborn within 48 hours after delivery	22.4% (16.6, 28.2)	39.0% (33.2, 44.8)	0.000	16.0% (10.9, 21.5)	18.3% (14.0, 22.6)	0.258	0.000
Knowledge of at least 2 postpartum danger signs	17.1% (11.9, 22.3)	66.3% (60.8, 71.8)	0.000	18.7% (14.3, 25.1)	54.3% (48.5, 60.1)	0.000	0.000
Knowledge of at least 2 neonatal danger signs	27.4% (21.2, 33.6)	64.7% (59.2, 70.2)	0.000	29.7% (23.4, 36.0)	58.7% (53.0, 64.4)	0.000	0.035
Knowledge of at least 2 risks associated with a pregnancy interval of <24 months	6.4% (3.0, 9.8)	46.7% (41.1, 52.3)	0.000	12.0% (7.5, 16.5)	33.7% (28.4, 39.0)	0.000	0.000
Current modern contraceptive use among non-pregnant women	35.8% (29.1, 42.5)	34.0% (28.6, 39.4)	0.354	27.0% (19.8, 32.2)	25.0% (20.1, 29.9)	0.320	0.020
Birth interval < 24m between last 2 deliveries	25.1% (18.8, 31.4)	18.7% (14.3, 23.1)	0.035	25.7% (19.6, 31.8)	25.0% (20.1, 29.9)	0.462	0.011
Child nutrition							
Exclusive breastfeeding (children 0-5 months) in past 24 hrs	75.0% (63.7, 86.3)	82.0% (74.0, 90.0)	0.173	79.2% (67.7, 90.7)	71.6% (61.8, 81.4)	0.186	0.004
Vitamin A Supplementation for Child 6-23 months in last 6 months	79.1% (72.4, 85.8)	74.3% (68.4, 80.2)	0.216	73.7% (66.7, 80.7)	67.1% (60.9, 73.3)	0.078	0.059
Proper Infant Young Child Feeding (children 6-23 months)	53.0% (44.8, 61.2)	74.3% (68.4, 80.2)	0.000	56.1% (48.2, 64.0)	65.3% (50.0, 71.6)	0.029	0.026
Treatment of pneumonia							
Children with cough and rapid/difficult breathing in the 2 weeks prior to the interview.	25.8% (19.7, 31.9)	20.7% (14.6, 26.8)	0.084	26.0% (19.9, 32.1)	19.3% (13.2, 25.4)	0.031	0.559
Appropriate care seeking for child with symptoms of pneumonia	26.0% (14.0, 38.0)	51.6% (39.6, 63.6)	0.001	20.5% (9.5, 31.5)	46.6% (35.6, 57.6)	0.001	0.328
Treatment and prevention of diarrhea							
Children with diarrhea episode in the 2 weeks preceding the interview	40.1% (33.3, 46.9)	34.3% (28.9, 39.7)	0.083	39.8% (33.0, 46.6)	39.0% (32.2, 45.8)	0.500	0.097
ORT use (or recommended home fluids) during a diarrheal episode	28.3% (18.4, 38.2)	40.8% (31.3, 50.3)	0.034	30.5% (20.3, 40.7)	40.2% (31.3, 49.1)	0.078	0.194
Increased fluid intake during a diarrheal episode	7.5% (1.7, 13.3)	18.4% (11.0, 25.8)	0.011	7.6% (1.7, 13.5)	16.2% (9.6, 22.8)	0.034	0.157

Outcome Indicator	PHASE 1 AREA			PHASE 2 AREA			p-value – Endline
Increased food intake during a diarrheal episode	0.0%	0.0%	NA	2.5% (-1.0, 6.0)	5.1% (1.1, 9.1)	0.245	0.010
Zinc treatment for diarrhea	6.7% (1.2, 12.2)	10.7% (4.8, 16.6)	0.203	1.7% (-1.2, 4.6)	10.3% (7.4, 13.2)	0.005	0.193
Regular point-of-use water treatment	66.6% (60.1, 73.1)	97.7% (96.0, 99.4)	0.000	58.3% (51.5, 65.1)	97.7% (95.9, 99.5)	0.000	1.00
Safe water storage	11.7% (7.2, 16.2)	28.0% (22.9, 33.1)	0.000	10.3% (6.1, 14.5)	26.0% (21.0, 31.0)	0.000	0.430
Safe disposal of child's feces the last time he/she defecated	43.1% (36.2, 50.0)	45.0% (39.4, 50.6)	0.353	38.7% (32.0, 45.4)	52.0% (46.3, 57.7)	0.000	0.050
Appropriate hand washing station in the home (with water, soap, recipient)	2.3% (0.2, 4.4)	44.7% (39.1, 50.3)	0.000	2.3% (0.2, 4.4)	44.0% (38.4, 49.6)	0.000	0.816
Hand washing at the 4 critical times: after defecating, before preparing food, after cleaning a child, before feeding a child	1.3% (-0.3, 2.9)	34.0% (28.6, 39.4)	0.000	1.7% (-0.1, 3.5)	28.7% (18.3, 38.3)	0.000	0.187
Childhood immunizations							
Measles immunization in children 12-23 months of age	79.3% (70.5, 88.1)	64.8% (56.4, 73.2)	0.000	78.9% (70.8, 87.0)	55.5% (46.6, 64.4)	0.000	0.035
Complete vaccination coverage (BCG, PENTA 1-3, polio 1-3, measles) among children 12-23 months of age	73.6% (64.0, 83.2)	56.6% (47.8, 65.4)	0.000	68.7% (59.5, 77.9)	50.4% (41.4, 59.4)	0.000	0.151

Maternal and neonatal care. The endline KPC results reveal notable and highly statistically significant increases from baseline to endline for almost all maternal/newborn care indicators in Phase Areas 1 and 2, confirming that the CSP achieved its key objectives in the area of its highest level of effort: maternal/newborn care (Table 5). Final coverages of nearly all maternal/newborn care indicators for Phase 1 communities are significantly higher than final coverages for Phase 2 communities. The baseline to endline percentage change for these indicators are also in almost all cases greater in Phase 1 Area than in Phase 2 Area, supporting our hypothesis of a “dosage effect”, that with increased exposure to the CBIO + CG intervention, impact is enhanced (Table 1, Appendix 5).

Family planning/child spacing. The percentage of mothers of children 0-23 months who know at least two risks of having a birth interval of less than 24 months increased substantially and significantly from baseline to endline in both Phase Areas (Table 5). But despite this increase in knowledge, the percentage of non-pregnant women who reported using a modern contraceptive method was effectively unchanged from baseline to endline in both Phase Areas. Despite this lack of change in contraceptive use, the percentage of women whose interval between the births of her two youngest children was equal to or less than 24 months declined significantly in the Phase 1 Area. The levels of the endline indicator for the Phase 1 Area for knowledge of the dangers of short birth intervals was significantly higher than in the Phase 2 Area and the percentage of births with a short birth interval was significantly lower in the Phase 1 Area. These results were confirmed by the DID analysis, with the baseline to endline percentage changes for both indicators greater in the Phase 1 Area than in the Phase 2 Area (Table 1 in Appendix 5).

Breastfeeding and IYCF. Significant changes over baseline were observed in both Phase Areas for the percentage of mothers who reported practicing correct Infant and Young Child Feeding (IYCF) for the under-2 children in the previous 24 hours (Table 5).⁵¹ The other nutrition indicators showed no significant change in both Phase Areas. Final coverage of correct IYCF behaviors was significantly higher in the Phase Area 1 than in the Phase 2 Area. This was confirmed by the DID analysis: the baseline to endline percentage change for this

⁵¹ IYCF criteria concern number of daily feedings given to the child, and the amount and content of those feedings with respect to portion size and the inclusion of a variety of food groups, with size, number and content of feedings based on the child's age in months (0-5 months, 6-8 months, or 9-23 months) and whether the child is still being breastfed. The IYCF indicator is based upon a 24-hour recall of food groups fed to the children aged 6-23 months. The eight food groups are: (1) infant formula, milk other than breast milk, cheese or yogurt; (2) foods made from grains, roots, and tubers, including porridge, fortified baby food from grains; (3) vitamin A-rich fruits and vegetables (and red palm oil); (4) other fruits and vegetables; (5) eggs; (6) meat, poultry, fish, and shellfish (and organ meats); (7) legumes and nuts; and (8) foods made with oil, fat, and butter.

indicator was significantly greater in the Phase 1 Area (40%) than in the Phase 2 Area (16%) (Table 1 in Appendix 5).

Treatment of pneumonia. Prompt care seeking and treatment from a health professional for a child with symptoms of pneumonia increased dramatically and significantly in both Phase Areas from baseline to endline (Table 5). The differences between Phase Areas 1 and 2 in the endline measures of the indicators were not statistically significant. This result was confirmed by the comparison of the baseline to endline percentage change for this indicator for the two Phase Areas, with no significant difference noted (Table 1 in Appendix 5.)

Treatment of diarrhea. Significant improvements were noted in the management of diarrhea at the household level (Table 5). The percentage of mothers who provided oral rehydration solution (ORS) or recommended home fluids improved significantly in Phase 1 Area and also increased in the Phase 2 Area (but the change was not statistically significant). Statistically significant increases from very low baseline levels are also seen in both Project Phase Areas in the percentage of children with diarrhea who were offered increased fluid intake. The use of zinc (to shorten and ameliorate diarrhea episodes) increased in both Phase Areas, but the increase was statistically significantly in only Phase 2 Area. However, no significant changes were seen in offering increased food intake for children with diarrhea, which remained very low. There were no significant differences between Phase Areas 1 and 2 in the endline coverages of diarrhea-treatment-related indicators except for offering the child increased feeding during diarrhea episodes, which was significantly higher in Phase 2 Area. The DID analysis yielded slightly different results: greater baseline to endline percentage changes for increased feeding and for zinc treatment of diarrhea were seen in the Phase 2 Area; while the percentage change in the Phase 1 Area for increased fluid intake (145%) was significantly greater than in the Phase 2 Area (113%) (Table 1 in Appendix 5).

Water, Sanitation and Hygiene (WASH). The endline KPC survey shows outstanding results and significant improvements over baseline levels in nearly every WASH indicator (Table 5). The percentage of mothers reporting appropriate point-of-use treatment of water, the percentage of mothers reporting safe water storage practices, and the percentage of mothers reporting safe water storage practices all increased significantly in both Phase Areas. The percentage of mothers reporting that their household has an appropriate hand washing station (with soap, water, and water container), and the percentage of mothers who reported washing their hands at all four critical moments (after defecating, after cleaning a child who has defecated, before preparing food, and before feeding a child) both increased substantially and significantly in both Phase Areas. Safe disposal of a child's feces the last time s/he passed stool was essentially unchanged in the Phase 1 Area but increased significantly in the Phase 2 Area. Significant differences in the endline coverage of WASH indicators between the two Phase Areas 1 and 2 are noted only for safe feces disposal, with a significantly higher final coverage level for the Phase 2 Area despite the briefer intervention. The DID analysis yielded a slightly different result: significantly higher baseline to endline percentage changes were noted for the Phase 2 Area for regular point-of-use water treatment and safe water storage as well as for safe disposal of feces while higher baseline-to-endline percentage changes were noted in the Phase 1 Area for the two hand washing indicators (hand washing station in home and hand washing at all 4 critical moments) (Table 1 in Appendix 5).

Childhood Immunization. Both childhood immunization indicators – measles coverage and comprehensive coverage (BCG, pentavalent [PENTA] and polio) for children 12-23 months of age decreased significantly from baseline to endline in both Phase Areas (1 and 2) (Table 5). Endline coverage of measles immunization was significantly higher in the Phase 1 Area than in the Phase 2 Area. No significant difference was noted for endline comprehensive immunization coverage between the two Phase Areas. This result was confirmed by the DID analysis, with no significant difference noted between the Phase Areas for the baseline to endline percentage changes for these indicators.

Discussion. The project's main goals and objectives were met in almost all cases. Particularly noteworthy were the improvements in maternal/newborn care indicators. Nearly all showed statistically significant improvements and support the lowered maternal mortality documented through the vital events registration

(see Vital Events Findings, p. 34). Significant progress was also made in behavior change indicators that were promoted through Care Groups: knowledge of danger signs (during pregnancy, delivery, and the postpartum period); proper care-seeking for children with symptoms of pneumonia; treatment of diarrhea with ORS or recommended home fluids; water and sanitation practices (especially hand-washing at critical times); and recommended complementary feeding of children 6-23 months of age.

However, indicators for services provided by the Extension of Coverage (PEC) program (e.g., child immunizations) did not show similar improvements. This is likely a result of the termination by MSPAS of the Extension of Coverage Program in October 2014. Consequently, for the 9 months between the termination of PEC by MSPAS and the collection of endline data, the services provided by PEC such as childhood immunizations, vitamin A supplementation for children, iron/folate for pregnant women, and distribution of contraceptive supplies were not provided in both Phase Areas. During that time these services were available only at distant facilities that were time-consuming, and expensive for the local population to access.

The difference in differences analysis showed a statistically significant greater percentage change from baseline to endline in the Phase 1 Area for half of the indicators, partially confirming out “dosage effect” hypothesis. The DID analysis strongly confirmed the superior outcomes in the Phase 1 Area for the maternal/newborn care indicators.

The absolute change as well as the percentage change in coverage from baseline to endline for the indicators of the Phase 2 Area may have been favorably influenced by three different phenomena. First of all, there may have been a “contamination” or “spillover” effect during Phase 1 of new practices into the Phase 2 Area by social diffusion and adoption of new health behaviors by persons in the Phase 2 Area who were ready for behavior change (the so-called “low-hanging fruit”). This is a small geographic area and people do have a chance to interact at markets and so forth, and word of mouth travels quickly. A second phenomenon could have been the rapid uptake of interventions seen with other Care Group projects during the first two years of implementation with lower annual improvements after that time. Thus, the additional two years of Project intervention in Phase 1 Area may not have yielded that much additional benefit in population coverage of key indicators. Finally, since the Project staff implementing the interventions during Phase 2 in the Phase 2 Area were more experienced than when they began the implementation during Phase 1 in the Phase 1 Area, they could have been more effective in achieving better results more rapidly during Phase 2 in the Phase 2 Area (though it should be noted that these experienced staff worked alongside new staff hired for Phase 2 of the Project). All three of these factors could have contributed to favorable changes in intervention coverage in the Phase 2 Area.

Possible limitations. Larger sample sizes for the KPC surveys would have made our findings more precise, but since most comparisons of coverage differences reached high levels statistical significance, it is not likely that further increases in power (achieved with a larger sample size) would have affected our findings.

Though interviewers were intensely trained, many were inexperienced and this may have affected interview comprehension and accuracy of findings. A number of project staff served as interviewers, but they were assigned to collect data from geographic areas where they were not normally working. Thus, they were not likely to have biased the results by trying to present a favorable picture of their own area.

The results may have been affected by the marked seasonal differences in disease incidence in the area, with pneumonia far more prevalent during the dry/cold season (December to March) when the baseline KPC was done, and diarrhea more prevalent during the rainy season (June-October) when the endline KPC was done. Thus, the modest declines in prevalence of symptoms of pneumonia could be due to this seasonal effect since the baseline data were collected when pneumonia incidence was presumably higher and the endline data were collected when pneumonia incidence was presumably lower. For diarrhea, we noted no changes in prevalence. However, the influence of seasonal effects of the timing of baseline and endline data collection could have obscured a reduction in diarrheal prevalence that potentially might have been present.

Oral translation of questions written in Spanish but administered in Chuj, Akateko, and Q’anjobal could have affected comprehension and therefore results. However, these difficulties should not have systematically biased our findings in favor of baseline versus endline results or results in Phase Area 1 compared to Phase Area 2.

Lastly, we were unable to obtain from the MSPAS comparable data for intervention coverage for municipalities of the Department of Huehuetenango and for the rural population of the Department of Huehuetenango, limiting our comparisons to before and after in the same areas (Phase Areas 1 and 2) and to comparisons of endline results between Phase Areas 1 and 2.

Conclusions. The household survey results demonstrate a significant increase from baseline to endline in key maternal, newborn, and child health outcomes in areas in which the C BIO + CG methodology was applied. The results also indicate that government-supported outreach and provision of immunizations, vitamin A, iron/folate, and family planning appear to be important for the improvement of several key outcomes. This is shown by the effect of the loss of the PEC program in the Project's final year, which is the most likely reason for the observed decline in the population coverage of the services that the program provided, such as vitamin A supplementation and child immunizations. We could also speculate that the CSP might have been able to achieve more progress in utilization of family planning services if the PEC program had not been discontinued. Where the CSP could fulfill the demand it created, as with family and household behaviors and with its *Casas Maternas* for maternal/newborn care, it was most successful.

III.C.1.ii. Operational Research Hypothesis 2: The C BIO + CG methodology produces significant improvements in the nutritional status of children (in the Phase 1 Area) compared to a Comparison Area (the Phase 2 Area) and compared to selected municipalities of the Department of Huehuetenango and the rural population of Department of Huehuetenango.

*Analysis of Project Nutrition Intervention and Results*⁵²

Findings. Based on the baseline and endline KPC surveys, and on the September 2012 household survey done in the Phase 1 Area (at which time length, which had not been measured during the baseline KPC survey was also measured along with weight), results for 0-23-month-old children demonstrated a marked decline in stunting in the Phase 1 Area: from 74.5% at the time of the September 2012 household anthropometric survey to 39.5% at endline in June 2015 ($p=0.00$) (Table 6)⁵³

For underweight, there was no significant change from baseline to endline for the children in the Phase 1 Area, but a significant change from the September 2012 household survey, 29.8%, to endline survey, 20.1% ($p<.01$) (Table 6). No significant change for these children is seen in wasting, with a final prevalence of wasting detected that is rather high (3.1%) (Table 6).

⁵² The report "Analysis of Project Nutrition Intervention and Results" which contains the complete findings can be found in Appendix 6. Findings are drawn from (1) the January 2012 baseline KPC survey conducted in both Phase Areas (which weighed but did not measure the length of a representative sample of children younger than 2 years of age in each of the Phase Areas, with a total sample size of 599); (2) an anthropometric survey done in September 2012 in the Phase 1 Area that weighed and measured the length of 288 randomly-selected children younger than 2 years of age; (3) the June 2015 endline KPC survey of a representative sample in each of the two Phase Areas (which weighed and measured 600 under-2 children); (4) anthropometric "censuses" conducted in the Phase 1 Area between June 2013 and November 2014 and in the Phase 2 Area between August and November 2014 during which 93-100% of all under-2 children (identified by the C BIO methodology and vital events registration) were weighed and measured for length; and (5) the results of the monitoring of exclusive breastfeeding of 0-5 month children during 2014. Details of the methods can be found in the full report.

⁵³ The September 2012 KPC household survey utilized the same 30-cluster stratified sampling as the baseline and endline KPC surveys but was carried out only in Phase 1: 288 randomly selected women with children 0-23 months of age from 30 randomly selected Phase 1 Area communities were interviewed and their youngest child 0-23 months of age was weighed and measured for length. The goal of $n=300$ was not achieved due to the small size of several of the randomly selected communities who lacked 10 eligible interviewees (women with children 0-23 months who were present at the time of the interviews).

Table 6. Baseline and endline anthropometric survey data for children younger than 2 years from the Phase 1 and Phase 2 Areas

Anthropometric indicator and data source	Phase 1 Area			Phase 2 Area		
	Pctg.	95% confidence interval	p-value for June 2015 survey vs. Jan 2012 and Sept 2012 surveys	Pctg.	95% confidence interval	p-value for June 2015 survey vs. Jan 2012 survey
Stunting - children <2y of age who were <-2SD below normal length for age per WHO reference population						
Sept 2012 household survey (n=288)	74.5%	69.0, 79.6%	0.00	ND	ND	NA
June 2015 endline KPC survey (n=600)	39.5%	33.8, 45.3%		51.7%	45.8, 57.5%	
Underweight - children <2y of age who were <-2SD below normal weight for age per WHO reference population						
Jan 2012 baseline KPC survey (n=599)	16.1%	12.1, 20.8%	0.240 (Jan 2012) 0.009 (Sept 2012)	19.7%	15.3, 24.6%	
Sept 2012 household survey (n=288)	29.8%	24.5, 35.6%		ND	ND	ND
June 2015 endline KPC survey (n=600)	20.1%	15.6, 25.1%		20.1%	15.6, 25.1%	0.918
Wasting - children <2y of age who were <-2SD below normal weight for length per WHO reference population						
Sept 2012 household survey (n=288)	4.7%	2.5, 7.9%	0.385	ND	ND	0.515
June 2015 endline KPC Survey (n=600)	3.1%	1.4, 5.7%		4.4%	2.4, 7.4%	

Note: ND means no data. NA means not available.

For the under-2 children in the Phase 2 Area, no significant change is seen in underweight from baseline to endline (Table 6). We have no baseline measures of stunting or wasting in the Phase 2 Area, so we are unable to determine if there were changes over time. Just as with the children from the Phase 1 Area, we see a relatively high final prevalence of wasting (4.4%) (Table 6).

Comparing the anthropometric results from the June 2015 endline survey for the children in Phase Areas 1 with the children in Phase 2 Area, we see a significant difference only for stunting, with 39.5% of the children from the Phase 1 Area classified as stunted compared to 51.7% of the children from the Phase 2 Area ($p < 0.01$) (Table 7).

Table 7. Endline stunting, underweight, and wasting in children younger than 2 years of age in Phase 1 Area compared to similarly aged children in Phase 2 Area at the time of the June 2015 endline KPC survey

Phase Area of children who were weighed and measured	Pctg. (n=300)	95% confidence interval	p-value
Stunting - children <2y of age who were weighed and measured and who were <-2SD below median length for age per WHO reference population			
Phase 1 Area*	39.5%	33.8, 45.3%	0.004
Phase 2 Area*	51.7%	45.8, 57.5%	
Underweight - children <2y of age who were weighed and measured and who were <-2SD below median weight for age per WHO reference population			
Phase 1 Area	20.1%	15.6, 25.1%	1.00
Phase 2 Area	20.1%	15.6, 25.1%	
Wasting - children <2y of age who were weighed and measured and who were <-2SD below normal median weight for length per WHO reference population			
Phase 1 Area	3.1%	1.4, 5.7%	0.515
Phase 2 Area	4.4%	2.4, 7.4%	

* n=300 for both Phase Areas

The regular growth monitoring of children younger than 2 years of age was supplemented by anthropometric “censuses,” known as *barridos*. Every under-2 child in the Project service area was weighed and measured at home using the CBIO census and vital events registers. In the Phase 1 Area *barridos* were conducted in June and September 2013 and in June, August, and November 2014. In the Phase 2 Area *barridos* were conducted in August and November 2014. The coverage of children ranged from 93% to 100% for these “censuses” (see Table 1 in Appendix 6).

Comparisons of nutritional status at the time of the first “census” in the Phase 1 Area in June 2013 with the nutritional status at the time of the last “census” in November 2014 showed important differences.⁵⁴ We observed a significant decline in the percentage who were stunted, from 53.1% to 39.8% (p=0.00) (Table 8). We also observed a significant decline in the percentage who were underweight, from 23.2% to 10.9% (p=0.00), and in the percentage who were wasted, from 1.9% to 0.3% (p=0.00) (Table 8). For the children in the Phase 2 Area, we observed a significant decline from August 2014 to November 2014 only for underweight, from 20.1% to 15.5% (p=0.00). Figures 1-3 in Appendix 6 show the trajectory of the changes in under-nutrition for both Phases as demonstrated by the anthropometric “censuses,” as also as demonstrated by the findings of the anthropometry obtained at the time of the baseline and endline KPC survey findings.

Table 8 Comparison of baseline with endline data from the anthropometric “censuses” for Children younger than 2 years of age from the Phase Areas 1 and 2 (June 2013 versus Nov 2014 for Phase 1 Area and Aug 2014 versus Nov 2014 for Phase 2 Area)

Month/year of anthropometric “census”	Pctg. stunted (<-2SD median length for age)	p-value	Pctg. underweight (<-SD median weight for age)	p-value	Pctg. wasted (<-2SD median weight for length)	p-value
Under-two children from Phase 1 Area						
June 2013 (n=2,093)	53.1%	0.00	23.2%	0.00	1.9%	0.00
November 2014 (n=2,194)	39.8%		10.9%		0.3%	
Under-two children from Phase 2 Area						
August 2014 (n=2,198)	54.7%	0.101	20.1%	0.00	1.1%	0.381
November 2014 (n=2,051)	52.2%		15.5%		0.8%	

In Table 9 we compare the results of the final anthropometric “census” of November 2014 for the two Phase Areas (1 and 2). We see significantly lower levels of stunting, underweight, and wasting among the children of the Phase 1 Area compared to Phase 2 Area: 39.8% versus 52.2% for stunting (p=0.00); 10.9% versus 15.5% for underweight (p=0.00); and 0.3% versus 0.8% for wasting (p=0.027). A difference of differences analysis was carried out. Assessing the percentage changes from the first to the final “censuses” in each Phase Area, the percentage changes for Phase 1 from the June 2013 census to the November 2014 census were: -25.0% for stunting, -53.0% for underweight, and -84.2% for wasting, compared to the percentage changes from the August 2014 census to the November 2014 census for Phase 2 of -4.6% for stunting, -22.9% for underweight, and -27.3% for wasting. These differences of differences between the two Phase Areas (-20.6% for stunting, -30.1% for underweight, and -56.9% for wasting) were more pronounced in the Phase 1 Area and the differences were statistically significant (p=0.00).

The greatest decreases detected by the anthropometric “censuses” in stunting and underweight were in the 0-5-month old children in the Phase 1 Area: stunting declined from 26.9% in June 2013 to 14.6% in November 2014 (p=0.00) and underweight declined from 12.3% to 3.0% (p=0.00, data not shown). These changes coincided with an increase in the percentage of 0-5-month-old children who were exclusively breastfed for a full 6 months. Close monitoring of lactating women for EBF by Care Groups Volunteers (*Comunicadoras*) and Community Facilitators (as described above in Intervention Details, p. 17) showed that in the municipality of San Sebastian Coatán the percentage of children who were exclusively breastfed during their first 6 months of life increased from 16% in May 2013 to 48% in November 2014 (p=0.00); and in the municipality of Santa Eulalia, from 35% in May 2013 to 60% in April 2014 (p=0.00). (No similar data are currently available for the municipality of San Miguel Acatán).⁵⁵

⁵⁴ Table 1 in Appendix 6 shows the coverage of anthropometric “censuses” (*barridos*) by Phase Area, including number of children weighed and measured in each “census” and the percentage coverage for each “census” of the total population of 0-23 month children at the time of the “census.”

⁵⁵ These children monitored for EBF were also included in the anthropometric “censuses.”

Table 9. Stunting, underweight, and wasting in children younger than 2 years of age in in Phase 1 Area compared to similarly aged children in Phase 2 Area, data from the final Nov 2014 anthropometric “census” (Phase 1 Area n=2,194; Phase 2 Area n=2,051)

Phase Area	Pctg.	p-value
Stunting - children <2y of age who were <-2SD below median length for age per WHO reference population		
Phase 1 Area	39.8%	0.00
Phase 2 Area	52.2%	
Underweight - children <2y of age who were weighed and measured and who were <-2SD below median weight for age per WHO reference population		
Phase 1 Area	10.9%	0.00
Phase 2 Area	15.5%	
Wasting -children <2y of age who were <-2SD below normal median weight for length per WHO reference population		
Phase 1 Area	0.3%	0.027
Phase 2 Area	0.8%	

Comparing the endline results for children younger than 2 years of age in the Phase 1 Area with the under-5 children from the 2013 WHIP survey⁵⁶, the Phase 1 Area children showed significantly less stunting (39.5% versus 67.4%, $p=0.00$), similar levels of underweight (20.1% versus 17.3%, difference not significant), and significantly more wasting (3.1% versus 0.8%, $p=0.00$).

Discussion. The data support our hypothesis that the C BIO + Care Groups methodology along with its nutrition intervention as implemented by Curamericas/Guatemala in an isolated, difficult-to-reach mountainous area in the Department of Huehuetenango was associated with significant improvements in the nutritional status of children from baseline to endline in each of the two Phase Areas. Apart from the findings from household KPC surveys, independently collected anthropometric “census” measurements also demonstrate improvements in nutritional status, giving further confirmation to our findings. Our findings are particularly notable for stunting. The prevalences of stunting in the Phase 1 Area calculated from the endline KPC survey and from the final anthropometric “census” are almost identical (39.5% versus 39.8%, respectively), giving additional validity to the measurement of this outcome. A comparison of data from the WHIP survey with data from the Project area also suggests a reduction of stunting in the Project area.

However, while it appears the longer Project intervention in the Phase 1 Area produced the desired dose-response effect in reducing stunting, the lack of baseline data for stunting for the Phase 2 Area prevents an assessment of whether superior outcomes in reduction of stunting were achieved in the Phase 1 Area compared to the Phase 2 Area. In addition, the favorable results for stunting in comparison with the findings of the WHIP survey must be qualified by the difference in the ages of the children weighed and measured: while we performed anthropometry among children 0-23 months of age, the WHIP survey performed anthropometry among children 0-59 months of age. As stunting tends to accumulate over time in contexts of chronic under-nutrition and food insecurity, children 24-59 months of age may exhibit a higher prevalence of stunting than under-2 children. Thus, the prevalence of stunting among children 0-23 months of age in the WHIP survey is likely to be somewhat less than for the total group of 0-59-month-old children.

One potential reason for the improvement in stunting includes the successful integration of the Positive Deviance/Hearth (PD/Hearth) intervention, which confirmed that there were locally available and affordable nutritious foods and that costly food supplementation programs may not be necessary. Another possible explanation for the improvement in stunting was the promotion of correct Infant and Young Child Feeding

⁵⁶ We were unable to obtain recent comparable nutrition data for other municipalities of the Department of Huehuetenango or for the rural population of Huehuetenango for the planned comparison of their nutrition indicators with the endline results in the Phase 1 Area. Instead we utilized data from the 2013 Baseline Survey of the Western Highlands Integrated Project (WHIP), which includes anthropometric data for 3,312 under-5 children from 30 municipalities in the Western Highlands of Guatemala. The municipalities are from five Departments, including the Department of Huehuetenango. These 30 municipalities have geographic and demographic characteristics very similar to our three CSP municipalities. We were unable to obtain disaggregated data for the WHIP municipalities from the Department of Huehuetenango, so we used the anthropometric data for all 30 municipalities in the WHIP survey for the comparison.

(IYCF) practices and WASH interventions, as was demonstrated in the KPC survey coverage results. For example, regular point-of-use water purification increased from 66.6% to 97.7% in the Phase 1 Area and from 58.6% to 97.7% in the Phase 2 Area ($p=0.00$ for both Areas). Hand-washing at the 4 critical moments increased from 1.3% to 34.0% in the Phase 1 Area and from 1.7% to 28.7% in the Phase 2 Area ($p=0.00$ for both Areas).⁵⁷ The significant decreases in stunting and underweight in 0-5-month-old children detected by the anthropometric “censuses” may also be due in part to the increasing practice of exclusive breastfeeding for this age group, as detected by surveillance of this behavior by Care Group Volunteers.

We must acknowledge, however, that the evidence for significant decreases in underweight and wasting is less convincing than the evidence for the decrease in stunting, as the results of the KPC surveys do not confirm the results of the anthropometric “censuses” for these indicators. We do not have the capacity to explain why the Project’s impact on underweight and wasting were not as pronounced as on stunting. Underweight and wasting are more volatile indicators that can change more rapidly from month to month in young children than can stunting, whose changes are cumulative and tend to be more gradual. Therefore, we speculate that in the seven months that elapsed between the final anthropometric “census” in November 2014 and the endline KPC survey in June 2015, contextual changes may have caused a spike in both underweight and wasting. This timeframe coincided exactly with the closure of the PEC program and the loss of its treatment services for sick children: both diarrhea and pneumonia can provoke weight loss that can register as underweight or wasting. Seasonal differences in the timing of the data collection also may have affected the findings: the baseline household KPC survey was carried out in January, the cold dry season when there is a seasonally lower incidence of diarrhea, which contributes heavily to underweight due to water and nutrient loss. The endline KPC survey was carried out in June during the rainy season, when there is a seasonally higher incidence of diarrhea, increasing underweight.

The project emphasized the strategy of utilizing Self-Help Groups, support groups for lactating mothers (*Círculos de madres lactantes*), and Care Group Volunteers to both monitor and encourage this behavior at the household level. Future research should further explore which aspects of the CBIO + Care Group methodology were most effective at improving child nutrition over time, particularly in reducing stunting. As mentioned above, potential mechanisms to explore include the PD/Hearth intervention for empowering communities to improve child feeding practices with their own available and affordable resources, the promotion of recommended IYCF practices, and WASH interventions.

Possible limitations. The findings of statistically significant differences both for underweight and wasting over only a seven-month period between the November 2014 final anthropometric “census” (*barrido*) and the June 2015 endline KPC survey may seem implausible and call into question the accuracy of the data. The lack of experience in anthropometric techniques among the interviewers for both the baseline and endline KPC surveys must be recognized as well. Even though they did receive an intensive day of classroom training and another day of field training and were closely supervised, their skills still may not have been optimal.

Lack of baseline data for stunting and wasting from the baseline KPC survey in Phase Area 2 impeded the drawing of firm conclusions regarding (1) the changes achieved at the end of Project in those indicators and (2) the superior results apparently achieved in the Phase 1 Area versus the Phase 2 Area.

Conclusions. The Phase 1 Area demonstrated a statistically significant improvement over time in stunting in children younger than 2 years of age. This may be due, in part, to the Positive Deviance/Hearth (PD/Hearth) methodology and also to the Care Group training cascade for nutritional practices that provides an ideal community-based infrastructure onto which PD/Hearth workshops can be readily grafted. Finally, a key tenet of the PD/Hearth approach was borne out in our context as in most other contexts: in apparently food insecure contexts, such as ours, there are usually available and affordable nutritious foods that can alleviate under-nutrition if they are included in a child’s diet.

⁵⁷ The four critical moments are: 1) after defecating; 2) after cleaning a child who has defecated; 3) before preparing food; and 4) before feeding a child.

III.C.1.iii. Operational Research Hypothesis 3: The CBIO + CG methodology produces significant improvements in maternal and under-5 mortality relative to a Comparison Area (Phase 2 Area) and compared to selected municipalities of the Department of Huehuetenango and the rural population of Department of Huehuetenango

*Analysis of Project Vital Events*⁵⁸

Findings. Table 10 presents the age-specific mortality rates for children younger than 5 years of age and the maternal mortality ratios for each year of Project activities based on the data reported in the Vital Events Register. Vital events data were not collected in Phase Area 2 during the first two years of the Project.

Table 10. Annual mortality ratios/rates in Phase 1 Area and Phase 2 Area and in the two Phase Areas combined by project year (PY).

Mortality indicator	Phase 1 Area				Phase 2 Area		Both Phase Areas combined	
	PY1	PY2	PY3	PY4	PY3	PY4	PY3	PY4
Maternal mortality ratio	524	740	281	221	435	624	350	428
Neonatal mortality rate	16	20	12	38	16	21	14	29
Post-neonatal mortality rate	12	24	12	23	19	15	16	19
Infant mortality rate	28	44	25	61	35	35	30	48
12-59-month mortality rate	8	10	9	2	6	6	8	4
Under-5 mortality rate	37	53	34	63	41	42	37	52

PY= Project year (Oct 1 - Sept 30, except for PY4, which was Oct 1 - May 31)

Maternal Mortality: In the Phase 1 Area there was an important decrease in the maternal mortality ratio (MMR) from 524 in PY1 and 740 in PY2 to 281 in PY3 and a further decline to 221 in PY4, a 70% decline from PY2 (Table 10). The numbers of deaths for individual project years are small so these differences may not be statistically significant. Further analyses will be required to ascertain this. But, comparing the MMR for the Phase 1 Area for the combined PY1 and PY2 data (632) with the MMR for the combined PY3 and PY4 data (257) for that same Phase Area, the change is statistically significant at $p=0.05$. In contrast, in the Phase 2 communities the MMR increased 43% from 435 in PY3 to 624 in PY4 (change not statistically significant). In the Phase 1 Area, there were 7 maternal deaths in PY1, 10 in PY2, 4 in PY3, and only 2 in PY4 (annualized to 3 since the period of Project implementation was less than 12 months in PY4).⁵⁹ In the Phase 2 Area, there were 5 maternal deaths in PY3 and 6 in PY4 (annualized to 9 in PY4).

Verbal autopsies, carried out for all 34 maternal deaths that occurred in both Phase Areas over the entire course of the project, provide information surrounding the cause of death. Ninety-four percent ($n=32$) of the 34 maternal deaths for the combined set of communities in the Phase 1 and 2 Areas occurred to women who delivered at home. The large majority of maternal deaths (62%, $n=21$) occurred at home (where these women had delivered). For these deaths, there was presumably no time for transport or the family was unable/unwilling to transport the woman to a health facility. An important percentage of maternal deaths occurred *en route* to a health facility (26%, $n=9$). All but one of the women who died *en route* died after delivering at home; one delivered *en route* and also died *en route*. Postpartum hemorrhage accounted for 82% ($n=28$) of maternal deaths, followed by pre-eclampsia/eclampsia (9%, $n=3$), sepsis (6%, $n=2$), and complications of cesarean section (3%, $n=1$). All 9 deaths that occurred *en route* to a health facility were due to postpartum

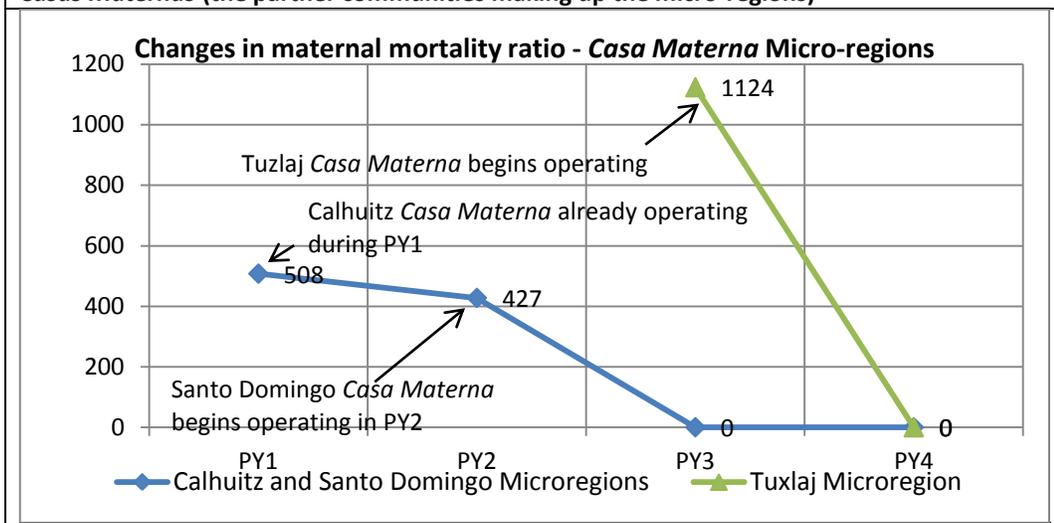
⁵⁸ The “Analysis of Project Vital Events Report” can be found in Appendix 7. Findings are drawn from (1) the CSP’s Vital Events Registers, which recorded all births, stillbirths, new pregnancies, and maternal and under-5 deaths and (2) the verbal autopsies obtained from the families of deceased women and of under-5 children. The verbal autopsy protocol (used throughout Guatemala by the MSPAS) collected information about the cause of death, location of death, location of delivery (for maternal and neonatal deaths) and contributing factors. These data were collected in the Phase 1 Area from October 2011 through May 2015 and in the Phase 2 Area from October 2013 through May 2015. The details of the methods can be found in the full report.

⁵⁹ Though community mobilization was not completed until June 2012 for the Phase 1 Area, we utilized the Care Group Volunteers (*Comunicadoras*) to retrospectively report all maternal deaths in their assigned households that occurred during or after October 2011; consequently PY1 data need not be annualized.

hemorrhage. Retained placenta was by far the most common underlying cause of death from hemorrhage (75%, n=21), followed by uterine atony (18%, n=5) and uterine rupture (7%, n=2).

The second delay (recognizing the danger but not seeking care or seeking care too late) accounted for 29% (n=10) of maternal mortality; the most frequently cited reason for not seeking care or for a delay in seeking care was lack of money for transportation.⁶⁰ An equally large percentage of deaths were associated with third delays (delay produce by long transport time to the referral facility), 29% (n=10), which correlates almost exactly with the high percentage who died *en route* to a health facility. Only 12% of the maternal deaths (n=4) were fourth delays (delays in receiving treatment once at the referral facility or inadequate treatment provided); this low percentage underlines how few women who deliver at home with complications manage to reach a referral health facility.

Figure 6. Maternal mortality ratios by project year (PY) for communities that were supporting Casas Maternas (the partner communities making up the micro-regions)



It appears that the *Casas Maternas* contributed to a reduction of maternal mortality in their respective micro-regions and in the lowering of maternal mortality in the Phase I Area. In the two micro-regions of Calhuitz and Santo Domingo, when the statistics for births and maternal deaths are combined, the MMR declined from 508 in

PY1 to 0 in PY4, and for the Tuzlaj-Coya micro-region (where a *Casa Materna* began operating in PY3), the MMR declined from 1,124 in PY3 to 0 in PY4 (Figure 6). For the three micro-regions combined, the MMR declined from 366 in PY3 to 0 in PY4. There were no maternal deaths in the 26 partner communities of the three *Casa Materna* micro-regions in PY4, and no maternal deaths were identified in the Calhuitz or Santo Domingo micro-regions in PY3 (Figure 6). This drop in maternal mortality over the four years of Project activities was accompanied by the emergency transport from the three *Casas Maternas* to the MSPAS referral hospital in Huehuetenango of 84 women with complications during pregnancy, delivery, or the postpartum period. In 82 out of the 84 transfers, the mother survived. These 84 referrals were from women resident in non-partner as well as partner communities who were cared for at a *Casa Materna*. These women resided in communities of the municipalities of San Sebastián Coatán and San Miguel Acatán, as well as some women from the municipality of Santa Eulalia and the neighboring municipality of San Rafael de Independencia outside of the Project area.

Neonatal mortality (among newborns 0-28 days of age): In the Phase I Area, the neonatal mortality rate (NNMR), after declining 40% from 20 in PY2 to 12 in PY3, spiked sharply to 38 in PY4, an increase of 215% (Table 10). This increase from PY3 is statistically significant at p=0.00. In the Phase 2 Area, the NNMR increased 33% from 16 in PY3 to 21 in PY4 (Table 10) (change not statistically significant). Verbal autopsies,

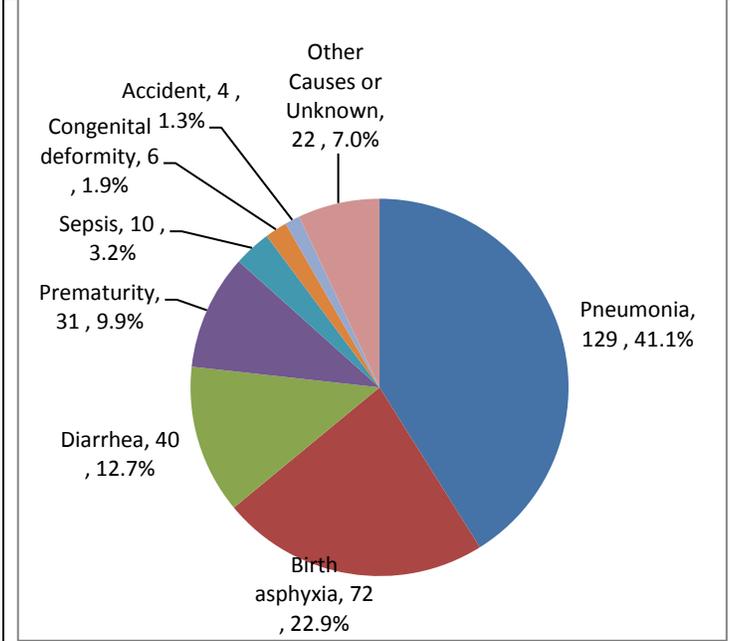
⁶⁰ Note: we utilized a “four-delay” model: First delay – not recognizing and therefore not responding promptly to danger signs; Second delay – recognizing danger signs but not seeking care or delaying in seeking care; Third delay – delay produced by a long transport time to the referral health facility; Fourth delay – delay in receiving services at the referral health facility or receiving sub-standard services. This mode is detailed in: M. Ghebrehwet and RH Morrow. Delay in Seeking and Receiving Emergency Obstetric Care in Eritrea. *Journal of the Eritrean Medical Association*. Vol. 2 No.1 (2007). The MSPAS uses this same four-delay mode in analyzing their maternal verbal autopsy data.

obtained for 134 of the 138 neonatal deaths that were detected over the course of the Project, shed light on the circumstances surrounding these deaths. For Phase Areas 1 and 2 combined, 131 (95%) of the 138 neonatal deaths registered were among newborns who were born at home. Of these, 121 (88% of the registered neonatal deaths) also died in the home, mostly commonly on the day of delivery from birth asphyxia. The other 10 neonates who died after being delivered at home died *en route* to a health facility (n=4) or at the health facility (n=6). Thus, very few neonates in distress were taken to a health facility, or they died quickly before the family could respond. Birth asphyxia was by far the largest cause of neonatal mortality (52%, n=72), followed by complications of prematurity (18%, n=25), pneumonia (17%, n=24), and sepsis 6% (n=9). These four causes accounted for 94% (n=130) of neonatal mortality for both Phase Areas (1 and 2) combined. From PY1 through PY4, birth asphyxia decreased from 77.3% of neonatal deaths in PY1 (Phase 1 Area) to 40.7% in PY4 (both Phase Areas combined, change significant at $p<0.01$) while complications of prematurity increased from 9.1% to 27.8% (change not significant). The percentage of deaths from other causes showed no clear time trend. Given that birth asphyxia was the leading cause of neonatal death, it is not surprising that 61% (n=84) of neonatal deaths occurred on the first day of life. A full 81% (n=112) of neonatal deaths occurred during the first week of life, accounting for 36% of all under-5 deaths. After the first week, deaths were fairly evenly distributed over the remaining 21 days of the neonatal period.

Post-neonatal mortality (among infants 29 days-<12 months of age): In the Phase 1 Area, the post-neonatal mortality rate (PNNMR) decreased notably from PY2 to PY3 from 24 to 13 (change significant, $p=0.04$), and then increased to 23 in PY4 (Table 10) (year-on-year change not statistically significant). In contrast, in the Phase 2 Area, the PNNMR dropped 21% from 19 in PY3 to 15 in PY4 (change not statistically significant). Verbal autopsies obtained for all 124 post-neonatal deaths that were registered during the course of the Project showed that the main cause, by far, of post-neonatal death in the Phase 1 and Phase 2 Areas combined was pneumonia: pneumonia was the cause of 63% (n=78) of the 124 deaths among this age group. The next leading cause in this age group was diarrheal disease, accounting for 18% (n=23) of the deaths. Pneumonia and diarrhea combined accounted for 81% of the PNN deaths. Sepsis/infection accounted for 3% (n=4), and complications of prematurity in two-month old children another 2% (n=3). Other miscellaneous causes accounted for 14% of PNN deaths. None of the individual causes in this category accounted for more than 1% of total deaths.

12-59-month mortality: Unlike neonatal and post-neonatal mortality, the 12-59-month mortality rate in Phase 1 communities declined from 9 for the combined PYs 1-3 to 2 in PY4, a decline of 77% (significant at $p=0.04$), with only 2 deaths in this age group in PY4 (annualized to 3). In PY4, 12-59-month deaths were almost eliminated in the Phase 1 Area communities (Table 10). In the Phase 2 Area communities, the 12-59-month mortality rate was unchanged from PY3 to PY4 at 6. Based on verbal autopsies conducted for all 52 12-59 month deaths that were detected in both Phase Areas over the course of the Project, we found that the two main causes of 12-59-month mortality were pneumonia (52%, n=27) and diarrhea (31%, n=16). These two causes together accounted for 83% of the deaths among 12-59-month olds. Miscellaneous causes accounted for 17% of mortality. Among these causes were accidents, epilepsy/convulsions, acute malnutrition/wasting, and meningitis.

Figure 7. Causes of under-5 mortality, Phase Areas 1 and 2 combined (October 2011 – May 2015)



Under-5 mortality: In the Phase 1 Area communities, changes in the under-5 mortality rate (U-5MR) showed no clear downward trend, primarily reflecting the marked increases in the neonatal mortality rates in PY4 observed in both the Phase 1 and Phase 2 Areas. In the Phase 2 Area communities, the U-5MR remained virtually unchanged, from 41 in PY3 to 42 in PY4. Pneumonia was the overall leading cause of under-5 deaths for the entire Project area (Phase Areas 1 and 2 combined), accounting for 41% (n=129) of all under-5 deaths (Figure 7). The second leading cause was birth asphyxia (23%, n=72), followed by diarrhea (13%, n=40), complications of prematurity (10%, n=31), and sepsis (3%, n=10). These five causes accounted for 90% of all under-5 mortality.

The vast majority of under-5 deaths occurred at home (85%, n=268); 6% (n=18) occurred *en route* to a health facility; and only 9% (n=28) occurred at a health facility. For all deaths among children younger than 5 years of

age, the Institutional Facilitators (who carried out the verbal autopsies) assigned one of “four delays” that made the greatest contribution to the child’s death. The second delay – the family recognizing danger but not responding to the danger signs by seeking proper care, or responding too late – was the most common, implicated in almost half (43%) of under-5 deaths.

Reasons cited by families for delays in seeking care at a facility include: (1) using a traditional healer (*curandero*) or home herbal remedies; (2) anticipation of poor quality or rude treatment; (3) lack of money to pay for transportation; or (4) fatalistic attitudes towards child death, such as “it is God’s will,” or “the child’s *nahual* [spirit] dictates the time of death.” The second delay was the major cause of delay (among the four delays mentioned previously), and it declined only slightly from PY1 to PY4 (from 47% of U-5 deaths in PY1 to 41% in PY4), but the change was not statistically significant. Also, despite the educational efforts of the Care Groups, the percentage of deaths in which the families did not recognize nor respond to danger signs (the first delay), especially symptoms of pneumonia, declined only slightly from 35% in PY1 in Phase 1 communities to 29% in PY4 for the combined set of communities (change not statistically significant).

Comparing the end-of-project mortality during PY4 in the Phase 1 Area with that in Phase 2 Area, we observe a statistically significant lower neonatal, infant, and under-5 mortality rate in the Phase 2 Area compared to the Phase 1 Area (Table 11).

Table 11. Mortality rates during the final year of project operations (October 2014- May 2015) in Phase 1 Area and Phase 2 Area

Mortality Indicator	Phase 1 Area	Phase 2 Area	p-value for comparison of the two Phase Areas
Maternal mortality ratio	221	624	0.18
Neonatal mortality rate	38	21	0.03
Post-neonatal mortality rate	23	15	0.17
Infant mortality rate	61	35	0.01
12-59-month mortality rate	2	6	0.18
Under-5 mortality rate	63	42	0.04

Our hypothesis that we would see lower mortality across the board in the Phase 1 Area, due to the longer exposure to the project and its interventions, was not borne out. This is primarily due to the marked

increase in neonatal mortality – and to a lesser degree, in post-neonatal mortality – observed in PY4 in the Phase I Area (Table 10).⁶¹

Comparison with MSPAS mortality data: We compared our mortality data for the calendar year 2014 for the Project’s three municipalities (containing the combined Phase 1 and 2 Areas) with the 2014 MSPAS mortality data for those same municipalities. We observed modest differences in the number of live births registered but very large differences in the number of under-5 child deaths registered, with the project capturing 115 under-5 child deaths in the three municipalities versus only 59 captured by MSPAS, with the greatest difference being the Project’s far superior capture of neonatal deaths: the Project registered 48 neonatal deaths in 2014 while MSPAS registered only 7. The MSPAS vital events registration system did capture 5 maternal deaths in 2014 that the project did not capture. Comparing our project vital events data for each of the three municipalities in our project area with the vital events data collected by the MSPAS in three municipalities outside the project area that had been paired with each of our own project municipalities, we observe much higher 2014 neonatal, post-neonatal, and under-5 mortality rates in the Project municipalities and comparable 11-59-month mortality rates. Levels of maternal mortality are also similar. The higher mortality rates among children younger than 5 years of age in the Project area are most likely due to the far superior capture of under-5 deaths in the Project area, especially neonatal deaths as noted above, and not an indication of inferior intervention outcomes. MSPAS collection of vital events combines facility-based reporting with voluntary registration of vital events by families with the local office of RENAP (the national vital events register). While families are motivated to register births in order to obtain certain benefits (e.g., receiving a national identification card), there is little incentive to register deaths that occur at home, and very few child deaths occurred in health facilities.

Discussion: The project’s major achievements based on vital events registration include (1) a marked reduction in the maternal mortality ratio in the Phase I Area communities, from 524 to 221, with the *Casas Maternas* appearing to contribute strongly to this decline; and (2) the reduction in 12-59-month mortality in the Phase I Area communities, with only 2 deaths (annualized to 3) in this age group reported there in PY4. Unfortunately, observed rates of neonatal and post-neonatal mortality increased markedly from PY3 to PY4 in the Project Phase I Area communities and, as a result, the end-of-project neonatal, post-neonatal, and under-5 mortality rates were all significantly higher in the Phase I Area communities than in the Phase 2 Area communities during PY4.

The reasons for this increase cannot be definitively determined from our available data. The most likely explanations include one or more of the following (ranked from most to least likely). (1) There was better differentiation between stillbirths and deaths soon after birth among live-born children in PY4 as the Institutional Facilitators improved their questioning skills while conducting verbal autopsies, thus enabling them to more accurately differentiate whether the death was among an infant who died prior to birth and an infant who was born live but died shortly after birth, leading to a higher proportion of perinatal deaths being classified as neonatal deaths whereas previously similar deaths were registered as stillbirths. (2) There was an improved capture of deaths during the perinatal period as *Comunicadoras* honed their vital events detection skills and developed more trust with their assigned households, which facilitated detection. (3) There was loss of the curative and preventive services of the MSPAS Extension of Coverage Program (PEC), which MSPAS closed at the beginning of PY4. (4) There was an increase in the local cost of transportation combined with increased poverty due to loss of remittances from men working in the US. (5) The local effects of the current Guatemalan socio-political crisis, which led to further deterioration of MSPAS health services more generally. The first two explanations seem much more likely than the last three, and the effect of the last three explanations should have been observed in the mortality of other age groups as well.

⁶¹ The increase in mortality from PY1 to PY2 for most indicators in the Phase I Area was expected and is typical of CBIO + CG projects, as it takes time to both roll-out the Care Group infrastructure whose Care Group Volunteers capture the vital events data and to establish sufficient trust with the families to the point where they feel comfortable reporting a maternal or child death. Consequently PY2 mortality rates often appear to increase when in fact we are seeing a truer picture of the actual mortality rates. Achievement of a very high level of vital events capture using CBIO + CG is a process that can take several years, and depends heavily on the establishment of trust.

Also, the higher neonatal and post-neonatal mortality observed in PY4 in the Phase 1 Area compared to Phase 2 Area may also be attributed to the increasingly superior capture of deaths in Phase 1 as the Project progressed through time, as the vital events registration system in the Phase 2 Area was only instituted in PY3. It should be noted that maintaining contact with all homes through the Care Group process facilitates the registration of vital events. However, Curamericas has observed repeatedly in multiple projects in different settings that achieving a high level of coverage of registration of vital events can take several years. Thus, the CPIO implementation process produces mortality rates that appear to be artefactual increases for several years before beginning to demonstrate reductions.

The *Casas Maternas* not only appeared to have contributed to a notable decrease in maternal mortality, but also to the decline in the proportion of neonatal deaths due to birth asphyxia, as the *Casas Maternas* were able to respond to perinatal complications with timely neonatal resuscitation of newborns who were not breathing at birth (using bag and mask) as well as timely referrals of newborns if appropriate.

Pneumonia remains the main cause of death among under-5 children, and the persistent reluctance of families to bring children to health facilities for timely treatment due to distance, cost and/or fear of disrespectful or poor technical quality of treatment further strengthens the need for the introduction of Community Case Management of pneumonia by appropriately trained community-level workers. With respect to maternal mortality, the high percentage of maternal deaths that occurred at home at the time of a home delivery, the high number of women dying in transit, the persistence of postpartum hemorrhage as the major cause, and the elimination of maternal mortality in the three *Casa Materna* micro-regions in PY4 all strengthen the case for health facility deliveries and for the *Casas Maternas* in particular, as well as for piloting the use of misoprostol by women who insist on having home deliveries. The barriers to transporting women with obstetrical complications and sick children to health facilities, including the economic barriers, also must be addressed. Successful local emergency transportation insurance schemes, such as the one currently utilized by the *Casas Maternas*, can provide models on which to build (see p. 20 for a brief description of the *Casa Materna* insurance scheme).

Possible limitations: There may have been inconsistencies in classifying of cause of death, in assigning the correct type of delay to obtaining appropriate care, and in differentiating stillbirths from neonatal deaths. Verbal autopsies are inherently crude diagnostic tools since families can provide inaccurate accounts during verbal autopsies, as they are affected by guilt, shame, and recall error. Even if this were not the case, the inherent uncertainty surrounding the diagnostic process still leads to considerable uncertainty about the true cause of death in some cases.

Conclusions: CPIO + Care Groups, enhanced by the *Casas Maternas*, appear to have reduced maternal and 12-59-month mortality during the period of Project intervention. The CPIO + Care Group vital events collection and verbal autopsies can reveal the actual local epidemiological priorities as well as reveal factors contributing to child and maternal mortality that can inform data-driven decision-making and appropriate intervention responses. The lack of physically accessible and culturally acceptable government health services combined with a challenging mountainous geography, endemic poverty, and lack of affordable transportation contributes to maternal and U-5 mortality, and strengthens the case for the *Casas Maternas*, Community Case Management of pneumonia, the provision of misoprostol for women who deliver at home, and the development of emergency transportation networks and insurance schemes. With 80% of maternal mortality due to hemorrhage among women who still deliver at home, we see the need to pilot the WHO-recommended strategy of providing misoprostol to all women delivering at home (via traditional birth attendant or community health workers).^{62,63} This would require MSPAS approval, as the use of misoprostol is currently banned in Guatemala due to fears of its occasional misuse to induce abortions.

⁶² Tang J, et. al. WHO recommendations for misoprostol use for obstetric and gynecologic indications. *Int J Gynaecol Obstet*, 2013 May;121(2):186-9. doi: 10.1016/j.ijgo.2012.12.009. Epub 19 Feb 2013.

⁶³ WHO. WHO Recommendations for the Prevention of Post-Partum Hemorrhage. WHO, Geneva, 2012.

III.C.1.iv. Operational Research Hypothesis 4: The CBIO + CG methodology produces greater increases in women's participation in community health activities than in a Comparison Area. Operational Research Hypothesis 5: The CBIO + CG methodology produces greater increases in women's health-related decision-making autonomy than in a Comparison Area.

*Operational Research on Women's Empowerment*⁶⁴

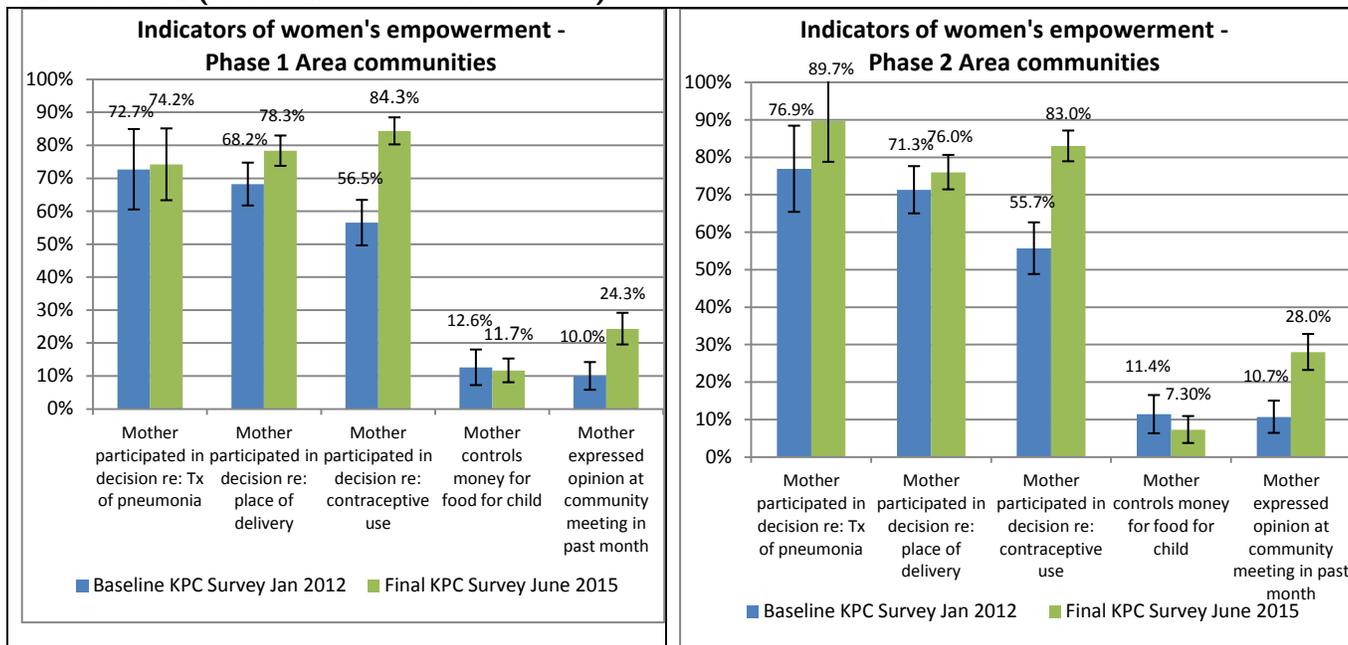
Quantitative Findings. The endline KPC survey showed important statistically significant increases from the baseline KPC Survey in women's active participation in community meetings in both Phase Areas (1 and 2) (Figure 8). In the Phase 1 Area, the percentage of women who indicated that they had participated in a community meeting by expressing an opinion increased from 10.0% to 24.3% ($p=0.00$) between endline and baseline. Similar findings were observed in the Phase 2 Area, with an increase from 10.7% to 28.0% ($p=0.00$). Contact with Care Groups/Self-Help Groups in the previous month increased similarly in both Phase Areas (1 and 2): from 8.4% at baseline to 67.7% at endline for the Phase 1 Area ($p=0.00$) and from 10.3% to 59.7% for the Phase 2 Area ($p=0.00$) (data not shown). Among women in both Phase Areas 1 and 2, a major and significant increase was noted in the percentage of women who reported that they participated in the decision regarding family planning use: in the Phase 1 Area it increased from 56.5% to 84.3% ($p=0.00$), and in the Phase 2 Area it increased from 55.7% to 83.0% ($p=0.00$) (Figure 8).

A smaller but nonetheless statistically significant increase was noted in participation in decisions regarding location of the most recent delivery among women in the Phase 1 Area. No statistically significant changes were noted in either of the two Phase Areas in the percentage of women who said they participated in the decision to seek treatment for a child with symptoms of pneumonia or in the percentage of women who said that they control the money for purchasing food for their children.

Comparing the endline KPC results from the two Phase Areas (1 and 2), we see a slightly higher percentage of mothers of 0-23-month-olds in the Phase 1 Area reported a Care Group contact in the previous month than women in the Phase 2 Area (67.7% versus 59.7%, $p=0.05$). Despite the shorter time period for intervention implementation in Phase 2 Area, a modestly higher percentage of mothers there reported making or participating in the decision regarding treatment for a child with symptoms of ARI/pneumonia (89.7% in the Phase 2 Area versus 74.2% in the Phase 1 Area, $p=0.04$). These findings are confirmed by a comparison of the percentage changes from baseline to endline for these two indicators for the two Phase Areas, with Care Group contact increasing 705.9% from baseline to endline in Phase 1 versus a 479.6% increase in Phase 2 ($p=0.00$) and mothers participating in the decision regarding treatment of children with symptoms of pneumonia increasing only 2.1% from baseline to endline in Phase 1 compared to an increase of 16.7% in Phase 2 ($p=0.00$).

⁶⁴ The Operational Research on Women's Empowerment can be found in Appendix 8. Quantitative findings are drawn from the January 2012 baseline KPC survey; mini-KPC Surveys conducted in September 2013 and February 2014 in the Phase 1 Area only; and the June 2015 endline KPC survey. The women's empowerment qualitative findings are from focus group discussions conducted in February 2014 with purposefully selected women, men/husbands, Community Health Committees, and mothers-in-law of married reproductive age women from Phase 1 Area communities. The details of the methods can be found in the full report.

Figure 8. Changes in indicators of women's empowerment, baseline and endline KPC surveys in Phase Areas 1 and 2 (95% confidence intervals shown)



Note: Tx refers to treatment

The endline KPC survey showed that actual use of modern contraceptives in both Phase Areas was essentially unchanged from baseline, which does not seem to correlate with the significant increase observed in the percentage of women participating in the decision to use contraceptives or not (assuming there is a significant unmet interest among women in using family planning). Also, though 78.3% of all the respondents in the Phase I Area and 76.0% of all the respondents in the Phase 2 Area interviewed for the endline KPC stated that they participated in the decision concerning the location of their most recent delivery, only 28.7% of all the respondents in the Phase I Area and only 13.0% of all respondents in the Phase 2 Area indicated that they had delivered their most recent child in a health facility. These discrepancies in decision-making autonomy and the resulting decision that was made suggest that perhaps women were opting to not use modern methods of contraception or to deliver in a health facility. This corroborates the qualitative finding (below) that decision-making participation and autonomy do not necessarily lead to decisions to practice a given optimal health behavior. There are other factors at work in addition to disempowerment that appear to influence these decisions.

Qualitative Findings. Most focus group discussion participants of all informant types (reproductive age women, men/husbands of reproductive age women, Community Health Committees, and mothers-in-law of reproductive age women) noted improvements in the capacity of women to control and direct their own lives. Respondents mentioned that these improvements are manifested in the attainment of higher levels of education for women; adoption of key health-related behaviors; greater female participation in community meetings and activities, including the Care Groups and Self-Help Groups; increased support for these changes from husbands and other family members; greater self-confidence and self-esteem among women; greater mobility for women to allow them to leave the home to participate in community meetings and activities; women's (and men's) greater awareness of women's rights; and a greater sense among women of ownership and control of their own bodies, such as choosing their own health services and participation in the decision about the use of family planning. These findings corroborate the quantitative findings (cited above) for increased participation in community meetings and increased decision-making autonomy.

Participants in the focus group discussions cited various Project activities as well as other factors that facilitated the women's empowerment process: (1) the health education work of Curamericas/Guatemala through the Care Groups/Self-Help Groups; (2) the teachings of local liberal Catholic priests; (3) expanded formal and informal educational opportunities for women; (4) the growing ability of women to speak Spanish;

(5) more women producing their own income through employment or small businesses; (6) women's growing ability to negotiate their geographic mobility with accommodating husbands; (7) women being given more opportunities by community leaders to participate without fear in community meetings and projects; (8) the absence of the husband when away working, allowing the woman to represent him in meetings; and (9) the influence of key individuals who include Curamericas/Guatemala staff, Care Group Volunteers (*Comunicadoras*), supportive husbands and mothers-in-law, progressive community leaders, and female role models.

Impediments to women's empowerment cited included: (1) controlling husbands who limit women's mobility and participation in affairs outside of the household, often with the threat of violence in response to non-compliance; (2) community leaders who do not permit women's participation in community meetings and do not inform them of meetings ahead of time; (3) women not having income of their own, with the husband controlling all finances; (4) timidity and fear of expressing themselves in public; (5) inability to speak Spanish; (6) lack of formal education; and (7) lack of awareness of their rights. The women also cited their sense that their many domestic chores prevent them from leaving the house to participate in community affairs or in Self-Help Groups. Male economic dominance was very explicit – the money he earns is “his,” not a family resource.

The women in the focus group discussions generally asserted that the decision regarding the place of delivery or use of family planning was theirs (or made jointly with their spouse) and that the decision made was their preference. Nonetheless, they often took the “easy” path. They usually opted for a home delivery because of its tradition, convenience and family support; and they often opted to not practice family planning because of fears (usually unfounded) of side effects and credence in local myths about its dangers. The decision to not take a child ill with symptoms of pneumonia to a health facility was often made due to (1) lack of funds or (2) the expectation of disrespectful treatment or (3) poor or no clinical services at the facility.

Discussion. The picture generated is one of improving female autonomy and empowerment, but still in a context of often severe traditional male domination that represents a stubborn impediment to women's autonomy. A key finding is that there is no one “magic bullet” to overcome this long-standing disempowerment, but rather a constellation of facilitators that are chipping away to slowly overcoming these barriers. These include the influence of Curamericas/Guatemala and the Catholic Church, women's income-generation, support of community leaders, increased education, including the ability to speak Spanish, and perhaps most of all, progressive husbands with whom they can negotiate mobility and autonomy.

But the focus group discussions also revealed that this progress is far from universal and appears to vary widely from community to community, and from family to family within communities. The main arena of women's empowerment, or lack of it, remains the family unit, particularly the woman's relationship with her husband. This family context remains one of male control, including male control over the household finances, male control over female mobility, and, in its harshest manifestations, the generation of fear through pathological jealousy, intra-familial violence, and threat of gender-based violence against spouses who do not conform to the husband's wishes. This repressive domestic environment instills in women low self-esteem, fear of failure, feelings of timidity and shame, and lack of interest in affairs outside the home, cited by many women as impediments to their empowerment.

The focus group discussions also corroborated the quantitative findings that show the lack of correlation between self-declared decision-making autonomy and the making of what we would consider better decisions. So it would appear that what is needed is to provide the women with the education and resources (perhaps including social support) necessary to make and execute more informed decisions. Decision-making power can be squandered unless the knowledge or the material resources needed to make and execute a better decision are available. This means not only the provision of information and behavior change communication, but also accessible services, such as affordable transportation, affordable user-friendly and properly-stocked clinics, and more locally available *Casas Maternas*.

Limitations. Limitations of the study include a potential loss of meaning in the translation of responses from the Mayan languages to Spanish and then again to English; the lack of certainty as to the extent of the women's participation in decisions made “jointly” with their spouse; and a lack of experience of those who were leading the focus group discussions.

Conclusions. To achieve its dual goals of improvements in the health of this population and women's empowerment, future activities will need interventions to reduce the specific barriers identified to women's autonomy as well as interventions to reinforce the facilitators that were identified, including the educational activities, community mobilization and conscious-raising efforts it has already done. Greater attention will need to be given to (1) reaching men and husbands, (2) enlisting community leaders, and (3) empowering women economically with sources of their own income.

*Qualitative Assessment of Care Group Implementation*⁶⁵

Findings: The Care Group Volunteers, who were from both Phase Areas, reported that as a result of their two to four years of functioning as a CGV they experienced increased social status, increased self-efficacy, and increased decision-making autonomy. Reasons given for increased social status were related to their roles in a program considered effective by their community, including their role as health advisers. The leadership experience translated to greater participation in community events. Increased social status was expressed more frequently by CFs and *Comunicadoras* than by Self-Help Group participants. Increased self-efficacy resulted from practical knowledge of illness and health gained from Care Group participation as well as awareness gained about the rights of women. Women reported increased decision-making autonomy which resulted from (1) heightened confidence among the participants in their ability to make correct decisions, (2) increased belief in their right to make those decisions, and (3) experience with making decisions during Care Group and Self-Help Group meetings. Increased decision-making autonomy was reported for both health and non-health decisions, and the women stated that this new knowledge translated into increased power that they

Figure 9. A Care Group meeting: A Community Facilitator training Care Group Volunteers (*Comunicadoras*) in her home



now had over their own lives. Learning the theoretical/scientific basis of health behaviors (e.g. germ theory) was important to their sense of empowerment. Women also cited financial savings due to decreased illness among the families of participants, creating more disposable income for the family.

Discussion: The Care Group training cascade was implemented in communities where the participants had first-hand experience with serious illness and death but had lacked the knowledge or skills to respond appropriately. By providing theoretical and practical knowledge, and through this process increasing self-efficacy and social status, the cascade empowered them to make positive health behavior changes for themselves and for their

families. Learning the theoretical basis of new health behaviors was a key to the adoption of the recommended behaviors and also to the women's sense of empowerment. This empowerment increased the social status of the Care Group Volunteers in their communities, reduced their timidity and fear, and increased their self-esteem and decision-making autonomy. This empowerment was facilitated by increasing "bridging social capital" with community leaders and "bonding social capital"⁶⁶ among the women themselves, and was reinforced by

⁶⁵ The report, "Qualitative Analysis of Care Group Implementation," can be found in Appendix 9. The findings of the Care Group study are drawn from focus group discussions conducted in May 2015 with purposefully selected Community Facilitators, *Comunicadoras*, and women participants of Self-Help Groups in both Phase Areas. The details of the methods can be found in the full report.

⁶⁶ "Bridging social capital" refers to establishing bonds of cooperation and trust between different sub-groups or strata within a social group – in this case, between the women and community leaders. "Bonding social capital" refers to establishing similar bonds among members of the same sub-group, in this case, among Care Group Volunteers.

the visible results of the practical application of the health knowledge they learned resulting in improved health for themselves and their children. According to self-reports from women participants, empowerment and increased agency (i.e., acting autonomously and skillfully to fulfill one's needs) resulted in reduced effects of male dominance (*machismo*), increased participation of women in community meetings, and community capacity building. The training methodology successfully engaged the participants in a culturally and educationally appropriate manner and led to behavior change.

Limitations: Bias may have resulted from interviewing only Care Group Volunteers and not triangulating with observations from non-participants outside the Care Group cascade (e.g., non-participating women, husbands, and mothers-in-law). Bias may have also resulted from errors translating from indigenous languages to Spanish, then to Spanish and finally to English. Additionally, responses were not recorded and transcribed but rather themed and analyzed by a single researcher.

Conclusions: The combined CBIO + Care Group methodology as implemented by the Project appears to have resulted in increased empowerment of female participants, increased community capacity, and positive changes in health behaviors while generating important recommendations for project replication and quality improvement.

III.C.I.v. Operational Research Hypothesis 6: The CBIO + CG methodology produces significant increases in community involvement related to problem solving compared to a Comparison Area

Assessing the Ability of CBIO + Care Groups to Increase Community Solidarity⁶⁷

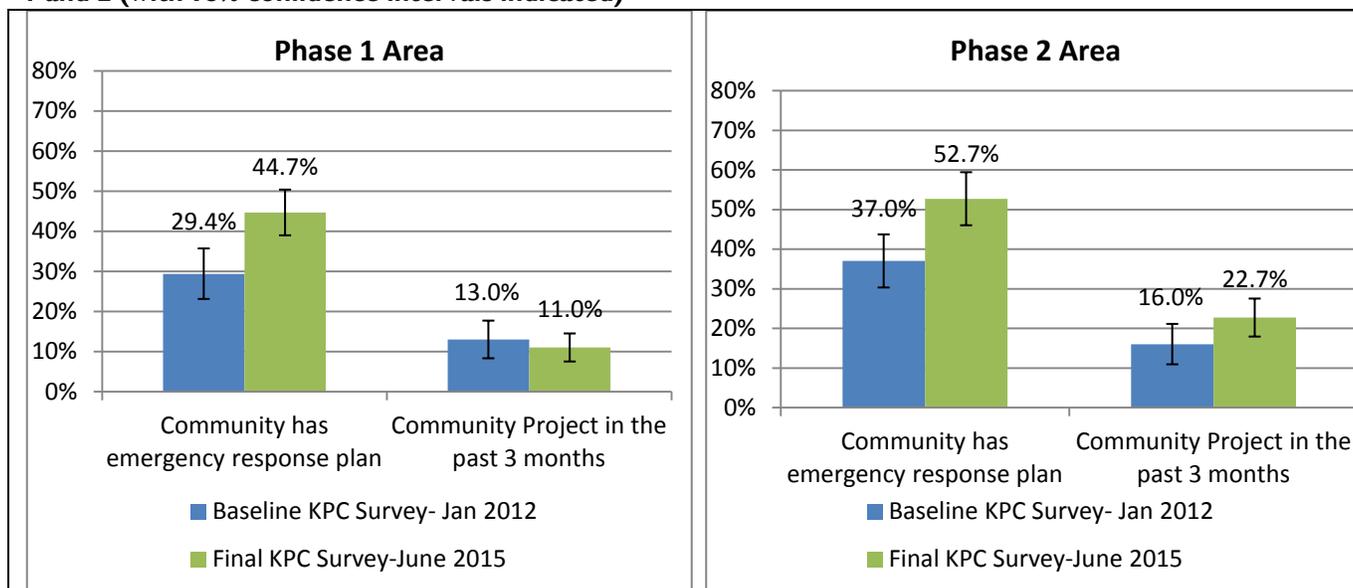
Findings. For the respondents in the Phase I Area, we see a statistically significant increase in the percentage of mothers who reported that their community had in place an emergency response system that would provide transport for them and/or their newborn child to the nearest health facility in the event of a difficult delivery or danger signs in pregnancy or during the postpartum period,⁶⁸ increasing from 29.4% at baseline to 44.7% at endline ($p=0.00$) (Figure 9).

From the baseline KPC survey in January 2012 to the September 2013 mini-KPC survey, we see an important and statistically significant increase in the percentage of mothers who reported that in the previous 90 days their community had worked together to solve a problem or make a community improvement, from 13.0% to 66.0% ($p=0.00$) (data not shown). But at the time of the endline KPC survey, only 11.0% of the mothers from Phase I indicated their community had worked together to resolve a problem, a significant decrease from the findings of the September 2013 mini-KPC ($p=0.00$) and effectively unchanged from baseline (Figure 9). We also see a statistically significant increase in the percentage of mothers in the Phase 2 Area who reported that their community had in place an emergency response system, increasing from 37.0% at baseline to 52.7% at endline ($p=0.00$) (Figure 12). From the baseline KPC survey to the endline KPC survey, we see a significant increase in the percentage of mothers in the Phase 2 Area who reported that in the previous 90 days their community had worked together to solve a problem or make a community improvement, from 16.0% to 22.7% ($p=0.05$).

⁶⁷ The full report of the "Operational Research Assessing the Ability of CBIO + Care Groups to Increase Community Solidarity and Problem-Solving Ability and Align Communities' Perceived Epidemiological Priorities with the Actual Priorities" can be found in Appendix 10. Findings are drawn from the January 2012 baseline KPC survey; mini-KPC surveys conducted in September 2013 and February 2014 in the Phase I Area; and the June 2015 endline KPC survey. The details of the methods can be found in the full report.

⁶⁸We assessed community solidarity using two indicators: (1) the percentage of mothers of children 0-23 months of age who reported that their community has in place an emergency response plan that would provide transport for them and/or their newborn child to the nearest health facility in the event of a difficult delivery or if danger signs appeared during the pregnancy or during the postpartum period, and (2) the percentage of mothers of children 0-23 months of age who report that their community has worked together to solve a community problem or make a community improvement in the previous 3 months.

Figure 9. Coverage of indicators of social solidarity from baseline and endline KPC surveys in Phase Areas 1 and 2 (with 95% confidence intervals indicated)



We see significantly more mothers in the Phase 2 Area reporting that their community has in place an emergency response system than those in the Phase 1 Area communities: 52.7% of the mothers from Phase 2 Area communities versus 44.7% of the mothers from Phase 1 Area communities ($p=0.05$). However, this finding is not corroborated by a comparison of the percentage changes from baseline to endline for this indicator in the two Phase Areas, as it increased by 52.0% in Phase 1 Area compared to 42.4% in Phase 2 Area (though this difference is not statistically significant). We also see significantly more mothers in the Phase 2 Area reporting that their community had worked together in the previous 90 days to resolve a problem than those in the Phase 1 Area: 22.7% of the mothers in the Phase 2 Area compared to only 11.0% of the mothers in the Phase 1 Area ($p=0.00$). This is corroborated by a comparison of the percentage increases from baseline to endline for this indicator for the two Phase Areas: the percentage increase for Phase 2 Area was 41.8% compared to a decrease of -15.4% in Phase 1 Area ($p=0.00$).

Discussion. The findings indicate that the Project was successful in increasing community solidarity as defined by the indicators, with significant increases in mothers of children younger than 2 years of age in both Phase Areas as indicated by reporting that their community had an emergency response plan in place, and a significant increase in mothers in Phase 2 Area reporting that their community had worked together in the previous 90 days to resolve a problem or make a community improvement. However, our hypothesis that we would see a higher coverage of emergency transport plans and community problem-solving projects in the Phase 1 Area compared to Phase 2 Area at the end of the Project was not borne out. As with other indicators for which we saw superior outcomes in the Phase 2 Area, this may be explained by (1) the phenomenon that first- and second-year improvements are often easier to achieve as projects access the “low-hanging fruit” (in this case, communities ready to engage in problem-solving projects), with incremental changes becoming more difficult later on; and (2) by the beginning of Phase 2 Project staff were more seasoned, especially in community mobilization, and project systems and methods had been improved. Also, Phase 1 Area communities may have already resolved their most pressing problems with community improvement projects completed during Phase 1. In addition, they may feel that their remaining problems are not resolvable with available resources. If communities do not have that many problems to solve and they can solve them during the first two years of the Project’s interventions, then a “dosage effect” may not be operative in this case.

Figure 10. Example of community project: construction of the Casa Materna in Pett, Santa Eulalia with volunteer community labor



The significant increase detected in communities with emergency response plans in place is an important achievement and almost certainly contributed the Project's lowering of the maternal mortality ratio in the Phase I Area communities from 524 deaths/100,000 live births in Project Year 1 (October 2011-September 2012) to 221 in Project Year 4 (October 2014-May 2015). This drop in maternal mortality was accompanied by the emergency transport over the four years of the Project of 84 women with complications in pregnancy, delivery, or part-partum to the *Casas Maternas* and from the *Casas Maternas* to the MSPAS referral hospital in Huehuetenango, with 82 successful outcomes.

Limitations. Community problem-solving and improvement projects could have been affected by Christmas and Easter holiday

preparations and celebrations, which fell into the 90-day recall period of the baseline and endline KPC surveys.

The indicators were imperfectly defined, as the women interviewed may not have known if their community had an emergency transport plan or if the community had completed a problem-solving/improvement project in the previous 90 days. There were 10 women interviewed from each community and if, say, only half were aware of the emergency response plan or project it would give the appearance of only 50% coverage of the indicator when in fact that community had fulfilled both community solidarity indicators, leading to under-capture of the true coverage. Instead, community leaders who were more knowledgeable about these matters could have been interviewed, and the indicators could have been re-defined so they measured the percentage of communities who had established transport systems or completed projects – not the percentage of women interviewed.

Finally, the quantitative data was not corroborated by qualitative research to better understand the facilitators and impediments to community solidarity.

Conclusions. There is quantitative evidence that the CBIO + CG methodology increased community solidarity as defined by the two Project indicators, particularly for the establishment of emergency response systems. When this data is correlated with the vital events data concerning maternal mortality and the contribution of the *Casas Maternas* to reducing maternal mortality, it would appear that the increase in communities with emergency response systems contributed to this reduction and was a strong indication of increased community solidarity.

III. C.2. What were the key strategies and factors, including management issues, that contributed to what worked or did not work?

III.C.2.i. Final Evaluation Question: What were the key contextual and management factors affecting implementation?⁶⁹

The following factors contributed positively to the CSP implementation:

Strong project field leadership and field staff. Curamericas/Guatemala Director, Dr. Mario Valdez, has worked with indigenous Mayans in the Western Highlands for over 20 years and has gained tremendous respect among local communities. He has a deep understanding of participatory, empowering, community-owned approaches to improving the health of women and children. Dr. Valdez' leadership, vision, and execution as well as the project staff's determination and fortitude despite challenging environments were the most significant contributions to the achievement of the CSP results.

Recruitment of a multidisciplinary Project team, consisting of public health professionals, social workers, nurses, teachers, secretaries, an agronomist, and accountants contributed to a rich environment of diverse backgrounds and perspectives for program planning and problem-solving. Intensive pre-service training of staff on the Project methodology unified and equipped the staff. The CSP intentionally recruited local Mayan men and women; this strategy was crucial for the generation of local confidence, trust, and buy-in from beneficiary families and community leaders.

The formation of Micro-Regional Committees has been central to foster inter-community solidarity to advocate for resources for rural Mayan communities. Similarly, the mobilization of Community Health Committees and Care Groups has been integral to educating individuals on their rights as Guatemala citizens and empowering them to take ownership of their community's health.

The network of relationships of both Curamericas/Guatemala Program Manager Dr. Mario Valdez and Operational Research Coordinator Dr. Henry Perry were invaluable for the recruitment and formation of a high-caliber, experienced Operational Research Advisory Committee. Dr. Danilo Rodriguez, as the head of MSPAS activities in the Department of San Marcos provided invaluable guidance to ensure that we were harmonizing our work with MSPAS priorities, and Dr. Fernando Gomez, chief MSPAS epidemiologist for the Department of Huehuetenango provided access to departmental data and served as the Project's advocate among the MSPAS departmental staff in the Department of Huehuetenango.

Effective collaborations and partnerships. The close coordination ultimately achieved with the PEC Ambulatory Nurses of both Curamericas/Guatemala and ADIVES was an important contributor to the success of the Project. They provided community-based antenatal and postnatal care, treatment of sick children, vitamin A supplementation and deworming, family planning, and immunizations via routine community visits and periodic immunization campaigns among other health care services, including cold chain management and supply of vaccines and micronutrients from the MSPAS. The District of the MSPAS office in the municipality of San Miguel Acatán is a forward-thinking leader who recognized the potential of CBIO + CG and was able to exercise an unusual degree of autonomy, enabling the Project to establish exemplary inter-organizational communication and coordination with his staff that facilitated Project execution in that municipality. Near the time of the Project's conclusion, his office embraced the *Casa Materna* model and plans to convert two of their MSPAS Health Posts into modified *Casa Maternas* staffed with MSPAS Auxiliary Nurses.

The strategic alliances established with other donors, non-governmental organizations as well as local health actors were important to the Project's achievements. These include the Ronald McDonald Charities, that contributed to the construction and operations of the *Casas Maternas*, and Medicines for Humanity, that

⁶⁹ The findings below are drawn from qualitative individual and group interviews conducted with CSP Project staff in July 2015 by the final evaluation leader Ramiro Llanque, MD, MPH. Staff interviewed included Dr. Mario Valdez, Project Director; the municipal coordinators; the *Casa Materna* Nurse Supervisors and *Casa Materna* staff; *Educadoras* and *Educadora* Supervisors; Institutional Facilitators, and Project M & E staff. Other findings are from Dr. Llanque's investigation and observations of the Project context.

contributed community pharmacies (*botiquines*) with essential medicines and supplies for the *Casas Maternas* functioning, particularly oxytocin.

The following contextual and management factors hindered progress towards CSP implementation:

The rugged terrain. Although the landscape is lovely to look at, the rugged terrain and extremely remote isolated nature of the Project territory create a formidable challenge to achieving high levels of coverage of Project interventions and to the capacity of beneficiaries to access health facilities. This also creates a major obstacle for transporting people to medical facilities, especially in the event of medical emergencies, especially since the local roads are unpaved and very treacherous. The difficult terrain also challenged the work of the *Educadoras*, who often lacked sufficient time working in their assigned communities due to the travel time needed to access them.

Challenges working with the Guatemalan Ministry of Health (MSPAS). The Guatemalan health system has impeded the CSP due to its segmented and centralized nature, giving decision-making authority to national leaders and leaving little autonomy at the local district (municipal) level, at which the project had to coordinate on a daily basis. Historically, it has unfortunately been the case that central government authorities have lacked interest in the general welfare of rural and indigenous populations.

The ongoing challenges of partnering with MSPAS were further exacerbated because the country has recently gone through a chaotic political period marked by corruption scandals that

included high-level officials of MSPAS and touched the local health system. This was felt locally when MSPAS clinics in the project area were forced to shut down for periods when personnel had not been paid for months. (On one occasion people of the town of San Miguel Acatán stormed the clinic and forced it to open, demanding services). PEC vaccine stock outs became more frequent and lasted longer. The most serious local manifestation happened when MSPAS abruptly closed the PEC program over the entire country in late 2014. The loss of this critical part of our integrated rural health system cut off preventive and treatment health services in the communities through the loss of the Ambulatory Nurses who provided these services.

Strong traditional Mayan culture. Traditional Mayan culture was often itself an impediment to the Project. Much of the population relies on traditional healing practices rather than modern medicine and health facilities, and traditional healers (*Curanderos*) and *Comadronas* (traditional midwives) often become the *de facto* medical practitioners of their communities. In addition, changing behaviors to encourage health facility deliveries and improved child feeding practices is impeded by the traditional strong preference for home deliveries and powerful ancient beliefs rooted in the ancient Mayan cosmivision (world view) that they are “the people of corn” and that corn tortillas alone suffice as human nutrition, even for children. The inability of the majority of the Mayan women (and a notable proportion of the Mayan men as well) to speak Spanish also presents challenges to Project implementation. The Mayan languages are oral and not written, impeding the ability to convey written information or create written learning aids, which is further compounded by the widespread illiteracy in Spanish even for those who speak it.

Figure 11. Typical challenging terrain of Project service area



Other challenges. Other formidable challenges exist. In addition to traditional culture, modern influences are also impeding the adoption of proper child feeding practices, particularly the ready availability of cheap junk food and soda for sale in small stores in every village. Persistent male chauvinism often impedes community mobilization and keeps women from attending Self-Help Groups or using the *Casas Maternas*.

Communities are often divided along religious or political lines, which impedes the cultivation of the trust and community solidarity on which CBIO + CG relies. The initial suspicion of the Project by many communities, who have a deep mistrust of outsiders rooted in recent civil war atrocities carried out by outsiders against the Mayan communities, often led to preliminary resistance and rejection of Project activities by community leaders and families. The time required to generate a foundation of trust in this context is very time-consuming and delays the full implementation of project interventions. Nonetheless, once a foundation of trust is established, it becomes a powerful force for building implementation momentum.

III.C.2.ii. Operational research question 1: What are the lessons learned in implementing the CBIO + CG methodology?

*End of Phase 1 Research: Linking of the community-based, impact-oriented methodology with Care-Groups: An approach to effective primary health care programming*⁷⁰

Findings. The Curamericas/Guatemala staff believes that the CBIO + CG methodology is an effective and sustainable approach to rural healthcare in the Guatemalan context and strongly recommends that the MSPAS adopt and scale up the approach. The most frequently cited advantages were: (1) the ability to identify the most pressing local health needs; (2) the promotion of community involvement; (3) the focus on health *impacts* (i.e., actual changes in mortality); (4) the recruitment of community health volunteers (e.g., Care Group Volunteers) to play a major role; and (5) the methodology's flexibility in adapting to different contexts. Some of the more important disadvantages cited include (1) the large time investment required by the methodology (particularly for community confidence building and for data collection and management), (2) the challenges in overcoming migration (when community members leave for seasonal work or relocate to the United States), (3) community disunity, and (4) the challenges associated with coordinating all relevant stakeholders, especially the MSPAS, municipal governments, and community leaders. One of the most frequently mentioned recommendations was to improve coordination and communication with collaborators and partners, including the separate Curamericas/Guatemala staff implementing the Extension of Coverage Program (PEC) and the local district offices of MSPAS. Specific recommendations in this area included improving the coordination of transportation for the *Educadoras*, who faced the challenge of covering 5 to 8 assigned communities sprawled over difficult mountainous terrain.

A key finding was that most of the challenges and problems cited were not about the CBIO + CG methodology per se but rather about the specific rural Guatemalan context in which the methodology was being implemented. Nearly all Curamericas/ Guatemala staff mentioned the challenges associated with the Guatemalan male dominant (*machismo*) culture, which affects participation of women in the Project's activities. The informants recommended that the Project work more with men, who play a dominant role in family health decisions. It was also frequently mentioned that while trust in the Project was relatively high in the majority of the communities, in some communities, however, there is relatively low trust, a legacy of the atrocities of the long civil war that created a deep-rooted suspicion towards outsiders.

The MSPAS staff in the focus group were not convinced that the project can provide the communities with the self-motivation required to sustain behavior changes and health impacts. In the focus group discussion with MSPAS staff it was discussed that MSPAS rarely invests in the sort of large projects (i.e., resource intensive projects) that the CBIO + CG methodology calls for. Others pointed out that the government does not have the organization or administrative abilities to manage a large-scale implementation of the CBIO + CG

⁷⁰ The full "End-of-Phase I Operational Research Report" can be found in Appendix II. The findings of this report are drawn from written questionnaires completed by Curamericas/Guatemala and MSPAS staff; individual and group interviews with Curamericas/ Guatemala staff; and a focus group discussion with local MSPAS staff, all conducted in the Phase I Area in July 2013. Details of the methodology of this investigation can be found in the full report.

model. Finally, respondents pointed to the MSPAS's current and past projects and noted that their overall poor quality is emblematic of their inability to institute high-quality, large-scale programs. But when asked on a self-administered questionnaire if they believed that the MSPAS *should* adopt the methodology, every one of the MSPAS respondents said yes. Respondents referred to the moral obligations of the government to address the health situation in the rural communities and the ways in which the CBIO + CG methodology is superior to alternative approaches. They pointed to the strong results achieved by the Project and its ability to efficiently provide quality care to a large number of people. The most common reason for doubting that the Ministry could adopt the methodology had to do with the available funds, or lack thereof, for supporting a large program utilizing CBIO+ CG. Both MSPAS and Curamericas/Guatemala staff emphasized the need to improve data exchange and communication between them to optimize their mutual effectiveness.

Figure 12 Curamericas/Guatemala *Educadoras* in Calhuitz recording results of child growth monitoring



Discussion. A key finding is that the Curamericas/Guatemala staff informants had few, if any, critiques of the CBIO + Care Group methodology as a service platform. Not only did they display a very impressive theoretical understanding of CBIO + Care Group principles and procedures (which testifies to the intensive training they received), they also embraced it wholeheartedly despite the challenges they cited, namely, the time necessary for processing voluminous project M&E data; the challenge that in- and out-migration pose to the methodology; and the always-necessary painstaking work of generating community trust and confidence. Instead, the preoccupations of the staff focused heavily on the challenges presented by the specific

context in which they were working: (1) the challenge of transportation over difficult terrain; (2) the challenge of communicating and coordinating with co-workers and collaborators to implement the integrated health system; (3) the challenge of building trust in a very low-trust environment still scarred by the atrocities of the 30-year civil war; and (4) the challenge of overcoming the influence of male dominance (*machismo*) that impedes the participation of women of reproductive age who are central to Project success. Recommendations of the staff thus focused on these context-specific issues and few if any recommendations were made to improve the methodology itself.

While the focus group responses of MSPAS staff members indicate a skepticism apparently colored by marked differences in organizational culture, history and expectations, they also indicated in the questionnaire an appreciation of the methodology's strengths and expressed support for its adoption by MSPAS. This potential grassroots support for CBIO + CG among MSPAS line staff could bode well for its ultimate integration into MSPAS programs.

Limitations. There are three specific limitations to our evaluation and the operational research study. The first is that the face-to-face key informant interviews were carried out only with the Curamericas/Guatemala and MSPAS staff from the San Sebastián Coatán municipality. Although staff from the other two municipalities completed the written questionnaire, this still excludes valuable information related to CBIO + CG improvements in different contexts. The second weakness is that this report was prepared at the completion of Phase I of the Project and is thus more likely to include concerns and improvements related to this stage. Ideally, this kind of assessment would be done after a pilot phase, during program planning, or during the endline program evaluation. Finally, the interviews, focus groups and questionnaire responses were coded and analyzed by a single person.

Conclusions: The Curamericas/Guatemala staff have an impressive theoretical and practical understanding of the CBIO + Care Group methodology and a clear appreciation of both its strengths and challenges. A conviction that its many advantages – such as the ability to do data-driven decision-making – far outweigh the disadvantages – such as the time needed to gather and analyze that data. Local MSPAS staff members also appreciate the advantages of the methodology, revealing a grassroots support that bodes well for eventual integration of the methodology into MSPAS programming, which will require winning similar support the MSPAS high-level decision-makers. Finally, this assessment has shown that the success of the methodology depends a great deal on community mobilization and trust-building as well as the ability of implementers to identify and overcome challenges specific to the local context. These local challenges can seriously impede CBIO + CG implementation if not confronted effectively.

*End of Phase 2 Research: Interviews with community-level project staff, Educadoras, and municipal Ministry of Public Health and Social Welfare Staff*⁷¹

Findings. Most findings of the end of Phase 2 research duplicated and confirmed those of the research carried out at the end of Phase 1 and will not be repeated here. The *Educadoras* requested secure data management software and training on the use of technology to increase the efficiency of data entry, analysis, and reporting. The *Educadoras* also prioritized including adolescents and men in Project activities in order to expand the reach and acceptance of the health lessons of the Self-Help Groups and home visitations.

The MSPAS informants hold the view that CBIO + CG effectively engages the community in health care delivery, increases the community members' responsibility for and engagement in improving their own health, and facilitates communication between the communities and Curamericas/Guatemala CBIO + CG staff and volunteers. The MSPAS staff also agrees that the CBIO + CG methodology is low cost and sustainable because voluntary community participation, including peer education (through the Care Groups) contains no costs. That said, the MSPAS informants acknowledge that the Government of Guatemala would still need to augment its low health care spending to fully implement the CBIO + CG methodology nationally. The shortage of health workers supported by the MSPAS is also perceived by the MSPAS informants to be a major limitation to bringing CBIO + CG to scale.

Discussion. The recommendations of both groups of informants for improving implementation of CBIO+CG and integrating the methodology into the work of the MSPAS revealed the interconnectedness of (1) communication (between the Project and the community), (2) understanding (by the community of the methodology), (3) trust (of the community in the Project and in its methodology), and (4) participation (by community members in Project/CBIO + CG activities), and (5) the necessity of all four of these elements to work together to achieve the intended impact of CBIO + CG. There appears to be a causal chain: when the communities do not understand the methodology – often because of inadequate communication – they do not trust it, and when they do not trust it, they do not want to participate. If the community members do not participate – for example, in Care Groups, Self-Help Groups, Community Health Committees, or *asambleas* – this impedes the impact that CBIO + CG can have on the communities. The CBIO + CG manual and its training guide do not currently provide a systematic process for achieving all four elements – communication, understanding, trust, and participation. However, individual *Educadoras* have learned on the job how to excel in achieving one or more of these elements. In order for MSPAS to successfully implement CBIO + CG, the MSPAS staff will also need to understand these connections between communication, understanding, trust and participation, and how to increase these elements when they are lacking.

There appears to be strong municipality-level MSPAS support for CBIO + CG, and the limiting factor to the MSPAS implementing CBIO + CG is the lack of higher-level ministerial support, compounded by the current national political crisis. In response to these systems-level challenges, the municipal (district) MSPAS staff, Curamericas-Guatemala, and local municipal governments and the communities should explore task-

⁷¹ The full “End-of-Phase 2 Operational Research Report” can be found in Appendix 12. The end-of-Phase 2 findings are drawn from group interviews with both Curamericas/Guatemala staff and MSPAS staff conducted in all three municipalities and both Phase Areas in May 2015. Details of the methodology of this investigation can be found in the full report.

sharing and creative financing strategies (shared, private sector, and/or income generation) to make implementation of CBIO + CG more feasible and sustainable in the absence of top-down ministerial support. To do this, the local MSPAS, Curamericas, the municipalities, and the communities (including municipality governments and civil society) will need to develop a shared ownership of CBIO + CG.

Limitations. First, the potential of self-selection bias exists because only willing and available MSPAS staff members were interviewed, rather than a randomly selected sample of staff. Second, there is a risk that meanings were lost in translation when the group interview transcripts were translated from Spanish to English for analysis.

Conclusion. In a setting constrained by low government spending on health care and challenged by cultural barriers, particularly male dominance (*machismo*), CBIO + CG provides the communities and local MSPAS staff an opportunity to work together to empower the communities to improve their hygiene, nutrition, and health. Now that many communities are comfortable with the health care and education provided through CBIO + CG and are recognizing and appreciating the health impact achieved through this approach, the communities and the local MSPAS should be supported to continue using the CBIO + CG framework for health care delivery. Building the communities' trust and establishing CBIO + CG as a health care framework are processes that take time. The findings show that this trust-building requires a foundation of clear and effective communication with the communities, and ways should be found to further improve this communication. Lastly, a formal process for field staff to share lessons learned in generating community trust should be implemented, and the lessons learned should be aggregated and formalized into a protocol or process to strengthen the CBIO + CG methodology.

*End of Phase 2 research: from the qualitative analysis of Care Group implementation*⁷²

Findings. Logistics and Implementation: The women stated that facilitators of the success of the Care Group cascade included: community leadership, which informed women of the time and place of Self-Help Group meetings; increased bridging social capital from CFs, *Comunicadoras*, and Self-Help Group participants to community leadership; and increased bonding social capital among the Care Group cascade participants. Some barriers they cited to implementation of the model and attendance included: lack of time, distance of travel required to attend (often walking and often carrying a toddler and/or infant), opportunity costs of attending, disapproving husbands, religious and familial obligations, desire for financial payment (for attending), and belief among some women that they already knew how to take good care of their children.

Training materials used to train Care Group Volunteers were generally very favorably received. Informants expressed the importance of continuing the interactive group learning methods, the graphics and role-playing. CFs and *Comunicadoras* stressed the ease of teaching using the same methodology through which they themselves learned, and doing their own teaching promptly after learning the material themselves while the lessons were still fresh in their minds. All informants requested they be given instructional materials to bring home to serve as reminders, and the use of even more laminated graphical instructional aids was requested. CFs asked for more materials, including more drawings, manuals and guidebooks. *Comunicadoras* asked for more durable materials and for graphic materials that they could give to the Self-Help Group participants, which could serve as reminders of behavior changes previously learned. Some participants asked for more training on new topics, while others asked for repeated training on old topics. No participants asked for fewer trainings. Some asked for medicines to be dispensed at the household level by Care Group Volunteers.

Incorporation of the Care Group methodology with the CBIO methodology: CFs and *Comunicadoras* expressed that doing home visits to their assigned households increased trust among Self-Help Group participants, which

⁷² The full report from the report, "Qualitative Analysis of Care Groups," can be found in Appendix 9. The findings are drawn from interviews with Community Facilitators and focus group discussions with *Comunicadoras* and Self-Help Group participants conducted in both Phase Areas in May 2015. Details of the methodology of this investigation can be found in the full report.

in turn increased learning and health behavior change. Trust gained among those participating in Care Groups and Self-Help Groups also greatly facilitated collection of vital events data. The Care Group cascade proved to be an effective method to train participants to collect vital events.

Discussion: The findings confirm many of the findings of the Women's Empowerment study, which revealed that community leaders are an important facilitator of women's participation in the Care Group cascade (as well as of other community meetings and activities), and that impediments to women's participation include controlling husbands and the burden of household responsibilities (and therefore the opportunity cost of participation). The findings also echo the findings of the Vital Events study: the cost of travel in money and/or time, be it by foot or by motorized vehicle, presents a barrier to both Care Group participation as well as the seeking of health services. When looking at impediments to women's participation, the women's need to work (usually as a migrant agricultural laborer away from home) and interference from controlling/*machista* husbands were the prime impediments cited, which may imply that the poorest and most repressed women are not being reached and that efforts must be made to reduce these impediments to their participation.

The findings also validate the effectiveness of the pedagogical methodology used by the Care Group Cascade, with its hands-on participatory learning, just-in-time training, and especially the use of graphic learning aids of which even more are desired. An important finding is that the Care Group training methodology does not rely on gifted instructors but rather on the fidelity of the application of the teaching mode, which enhances its replicability and ease of implementation.

Last, the findings confirm that the trust-building process vital to the success of the CBIO + Care Group methodology extends to the home visits of the CFs and *Comunicadoras* and that this, in turn, greatly facilitates their collection of vital events.

Limitations: First, the potential of self-selection bias exists because only willing and available MSPAS staff members were interviewed, rather than a randomly selected sample of staff. Second, there is a risk that meanings were lost in translation when the group interview transcripts were translated from Spanish to English for analysis.

Conclusions: The facilitators and barriers to Care Group participation are the same identified in the women's empowerment study, and so the future success of this methodology in this context will depend on strengthening those facilitators – such as supportive community leadership – and reducing certain barriers, particularly the resistance of controlling husbands, allowing women breaks from the burden of their household duties, and facilitating transportation. Increased use and distribution of graphic learning aids to participants at all levels of the Care Group cascade is also needed. More women should be educated via home visitation, especially those not coming to Self-Help Group meetings, to ensure that the most marginalized women are being reached.

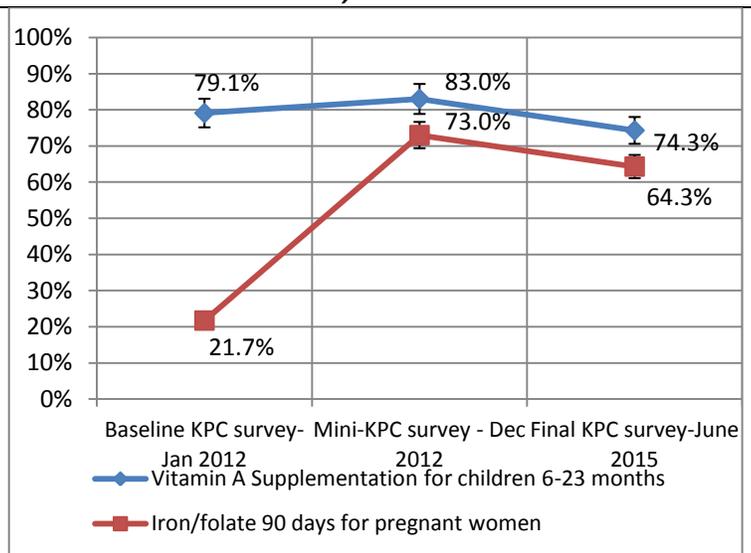
In addition, accurate vital events data, essential to the CBIO + CG methodology, rely to a great degree on trust-building at the household level, which the *Comunicadoras* foster through their home visitations. In other words, the trust nurtured at the household level is the foundation on which the methodology's data-driven vital events-based decision-making is based.

III.C.2.iii. Final Evaluation Question: How did integration of the Extension of Coverage Program (PEC) contribute to the project's results? What were the lessons learned in integrating the PEC and collaborating with MSPAS?

Integration of the Extension of Coverage Program (PEC): effects on Project outcomes and lessons learned⁷³

Quantitative Findings. Monitoring of project outputs (see Table 3) and the results of the mini-KPC surveys administered in the Phase I Area between December 2012 and February 2014 revealed substantial and often statistically significant increases in the mid-term coverage of indicators for PEC-provided services during PYs 2 and 3. For example, the percentage of children with symptoms of pneumonia who were treated by a health professional increased from 26.0% at baseline (January 2012) to 40.4% in February 2014 ($p=0.00$); the percentage of pregnant women receiving iron/folate increased from 21.7% at baseline to 73.0% in December 2012 ($p=0.00$); and vitamin A supplementation for children 6-23 months of age increased slightly from 79.1% at baseline to 83.0% in December 2012 (change not significant). But when PEC was terminated in October 2014, the Project area lost the Ambulatory Nurses who provided essential health services, limiting the project's coverage of family planning, micronutrients (vitamin A, iron/folate), treatment for diarrhea and pneumonia, and immunizations. As a result, the data from the endline KPC survey revealed (1) drops in coverage (from baseline coverage and/or from the coverages observed by the mini-KPCs in PYs 3 and 4) for key PEC-provided services; and (2) failure to reach expected end-of project goals for many PEC-provided services (Figures 13 and 14).

Figure 13. Changes in coverage of vitamin A supplementation for children 6-23 months of age and iron/folate for pregnant women, Phase I Area (95% confidence intervals shown)



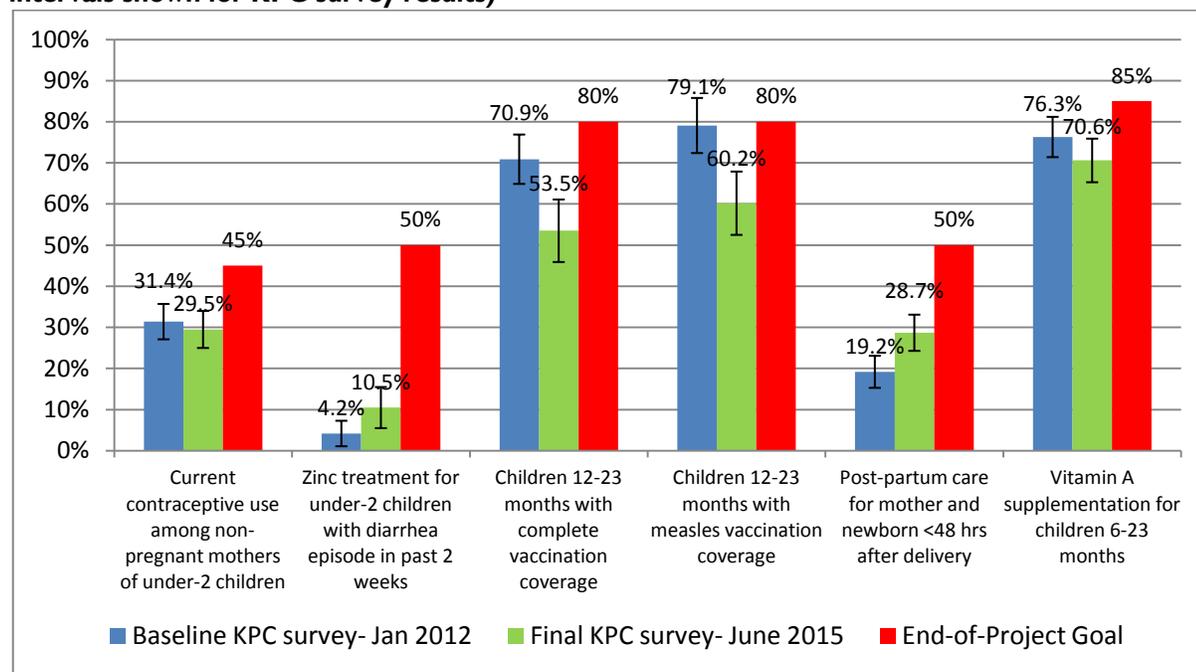
The December 2012 mini-KPC survey (in PY 2) showed an interim increase to 83.0% of the coverage of vitamin A for children 6-23 months in the Phase I Area (up from baseline KPC of 79.1%) but the endline KPC survey in June 2015 showed coverage dropping almost 10% to 74.3% (the change from December 2012 to endline being significant at $p=0.01$) (Figure 13). The December 2012 mini-KPC also showed a coverage of 73.0% for iron/folate among pregnant women in the Phase I Area, up from 21.7% at baseline. But the endline KPC survey showed that it, too, had subsequently dropped almost 10% to 64.3% (the change from December 2012 to endline being significant at $p=0.02$).

Loss of PEC services apparently contributed to less than expected coverage of postpartum care; no improvement in coverage of vitamin A supplementation for children 6-23 months or contraceptive use

among non-pregnant women; poor endline coverage of zinc treatment of diarrhea episodes in children; statistically significant declines from baseline to endline in coverage of child immunizations ($p=0.00$ for both immunization indicators); and the failure to reach the expected end-of-project levels of coverage for all of these indicators (Figure 14).

⁷³ The full report of the integration of PEC into the CSP can be found in Appendix 13. The findings presented are drawn from (1) interviews with Curamericas/Guatemala staff and MSPAS staff (both at the municipal and departmental levels) conducted by Dr. Ramiro Llanque in August 2015; (2) data from the baseline and endline KPC surveys, and from mini-KPC surveys conducted in the Phase I Area in December 2012, March 2013, June 2013, and February 2014; and (3) from a review of documents concerning the origin, implementation, and outcomes of the PEC. Details of the methodology of this investigation can be found in the full report.

Figure 14: Coverage of indicators negatively influenced by closure of PEC, both Phase Areas combined, comparison of results of baseline and endline KPC surveys and end-of-project goals (95% confidence intervals shown for KPC survey results)



With MSPAS cutting off both the supply of oxytocin for the *Casas Maternas* and the employment of Ambulatory Nurses who provided antenatal and postpartum care in the villages (along with many other primary health care services), some maternal/newborn service indicators seem to have been negatively affected in coverage and/or in quality. Endline coverage of postpartum care for mother and newborn within 48 hours of delivery was only 28.7% in the two Phase Areas combined. The percentage of mothers in the Phase I Area reporting at least three elements of Active Management of Third Stage of Labor (AMTSL) during their most recent delivery showed a statistically significant improvement from 9.4% at baseline to 20.0% at endline. But at endline, 28.7% of deliveries in the Phase I Area had occurred in a health facility, revealing a gap of 8.7%. Thus, approximately one-third of health facility deliveries at endline lacked full application of AMTSL due to the unavailability of oxytocin. In contrast, coverage of prompt treatment for children with symptoms of pneumonia continued to increase in the Phase I Area, from 40.4% as detected by the February 2014 mini-KPC survey to an endline coverage of 51.6%. This time period coincided with the addition of small pharmacies (*boutiquines*) equipped with antibiotics to the *Casas Maternas* and the initiation of the treatment of infections in children by the *Casa Materna* Auxiliary Nurses.

Qualitative Findings.⁷⁴ The PEC's impact has been constrained by chronic under-financing due to wavering political support.⁷⁵ Staff related that the program was plagued in recent years by erratic funding and cash flow, characterized by delayed payments by the MSPAS to the contracted NGO service providers (including Curamericas/Guatemala), with payment delays sometimes as much as 6-12 months. This often impeded services and created organizational cash flow challenges. Some informants stated that due to under-financing and delayed payments, some NGOs (including Curamericas/Guatemala) had to cut back on services provided.

Staff related that targets for expected services, specified in the contracts with MSPAS, were not coordinated with NGOs nor adjusted to reflect each jurisdiction's context. MSPAS dictated service targets through a top-down approach that was often unrealistic and that set up the providers for failure. Staff also related that the MSPAS seemed more concerned with paperwork and reporting than actual improvements in

⁷⁴ The following findings are from the interviews with Curamericas/Guatemala and MSPAS staff and the literature review.

⁷⁵ Castillo, Teresa, A. Ramirez, R. Flores, J. Arrevis, M. T. Lopez, y E. Caballeros. 2012. *PEC: Informe Situacional, Periodo 1997-2012*. Guatemala

the health of beneficiaries. “If it looked good on paper, MSPAS was satisfied” was a common type of comment heard. While the meeting or exceeding of service targets was rarely recognized, let alone rewarded, NGO contractors including Curamericas/Guatemala were regularly fined by MSPAS for minor irregularities in the voluminous reporting paperwork required through the national health information management system, SIGSA. These fines presented a serious organizational funding challenge to Curamericas/Guatemala as the fines could not be paid with grant funds.

The model integrating the CBIO + CG methodology, the PEC program of MSPAS, and the *Casa Maternas* requires intensive teamwork between the staff of the four “legs” of the service platform, requiring clear and regular communication and investing the time necessary to rationalize services to avoid duplication and wasted effort. A cruel irony was that not long after this intra- and inter-organizational teamwork had finally been achieved, PEC was abruptly terminated.

Discussion. The quantitative data support the conclusion that while initially PEC helped the Project increase coverage of key health professional-provided primary care services and commodities, as was intended by the integrated service model, its termination clearly negatively impacted final results in many crucial indicators, especially the coverage of childhood immunizations. The earlier success of PEC in increasing immunization coverage was revealed by the already-high baseline coverages for children 12-23 months of age detected by the January 2012 KPC survey (79.1% coverage of measles immunization and 70.9% coverage of complete immunization regimen in the combined Phase Areas). At end of project, due to the loss of PEC-provided immunization services, those coverages had dropped dangerously in the combined Phase Areas to 60.2% for measles immunization and to only 53.5% for the complete immunization regimen. A new cohort of children was going un-immunized.

Quality of service was affected as well as coverage, revealed by the loss of oxytocin from PEC for the *Casas Maternas*, hindering their capacity to provide high-quality deliveries characterized by AMTSL and the use of uterotonic drugs (drugs that cause contraction of the uterus). Given that postpartum hemorrhage was the cause of 82% of maternal deaths in the Project area between October 2011 and May 2015, this loss of oxytocin was a serious blow. Fortunately, the Project was able to secure an alternative supply in early 2015 from Medicines for Humanity.

That said, it appears that the *Casas Maternas* played a vital role by fulfilling at least some of the demand for many services that PEC could no longer fulfill, particularly for maternal/newborn care services. In addition, the equipping of the *Casa Maternas* during this time with small pharmacies (*boutiquines*) – also funded by Medicines for Humanity – enabled the staff of the three operating *Casas Maternas* to treat 988 children during Project Year 4 (Oct 2014- May 2015), many for pneumonia, apparently at least partially filling the gap created by the loss of PEC.

There are other findings in the operational research from this post-PEC period that suggest the possibility of broader and even deeper impacts of the loss of PEC. Neonatal and post-neonatal mortality appear to have increased markedly from PY3 to PY4 in the Phase I Area (see Vital Events Study, above). While the reasons for this are uncertain and the apparent increase may be a result of greatly improved capture of neonatal deaths, this spike in mortality also coincided exactly with the loss of the curative and preventive services of PEC. In addition, as already noted in the Nutrition Study, above, there is evidence that underweight and wasting in children younger than 2 years of age may have increased between November 2014 and June 2015, a time frame which coincides with the loss of PEC services for treatment of pneumonia and diarrhea, which both can affect these nutrition indicators.

Lastly, the differing organizational cultures of Curamericas/Guatemala and MSPAS appear to affect the smooth implementation of PEC, with MSPAS’ top-down bureaucracy, characterized by authoritarian management, excessive focus on outputs rather than outcomes, and voluminous paperwork contrasting starkly with Curamericas/Guatemala’s focus on community engagement and achieving demonstrable impacts on community health.

Limitations. The Curamericas/Guatemala PEC staff had been terminated in November 2014 when the PEC funding ended and were not available to be interviewed to obtain their first-hand perspectives of the PEC program.

Conclusions. A key lesson learned was that the CSP was successful in achieving significant improvements in maternal/newborn care and treatment of children with symptoms of pneumonia partly as a result of the *Casas Maternas* and their *boutiquines* fulfilling some of the demand the Project created, particularly in the post-PEC period. This supports the *Casas Maternas* current evolution towards becoming community mini-clinics providing a range of accessible and culturally acceptable primary care services. That said, it is not clear if the *Casas Maternas* alone can fill the service gap created by the loss of PEC. The integration of PEC and the *Casa Maternas* into CBIO + Care Groups is meant to provide critical fulfillment of the demand for accessible and culturally acceptable services. The initial contributions of PEC to Project outcomes and the detrimental effects of its loss may indicate that PEC (or its equivalent) is still needed to fulfill an important role in the health system. If PEC is reinstated by the new administration of the Government of Guatemala – as appears may happen – the problems staff cited in its administration by MSPAS must be resolved and coordination and communication between Curamericas/Guatemala and MSPAS – and among Curamericas/Guatemala staff as well – will need to be further strengthened to optimize the service model.

III.C.2.iv. Operational research questions: What are the barriers to giving birth in facilities? Are the *Casas Maternas* easily accessible and perceived as helpful? What are the benefits/continuing challenges with the *Casas Maternas*? Is there any possibility of using the *Casas Maternas* for postnatal care or other maternal health services along the continuum of care?

*Casas Maternas in the rural highlands of Guatemala: a mixed methods case study of their introduction, utilization, and equity of utilization by an indigenous population?*⁷⁶

Findings. The demographic characteristics of the population in the 21 partner communities of the two *Casas Maternas* in the municipality of San Sebastián Coatán that were included in this study area were very similar to those in the 11 non-partner communities in San Sebastián Coatán except that non-partner communities were considerably further away from a *Casa Materna*.⁷⁷ The mean distance of a respondent's community to the nearest *Casa Materna* was 4 km by road for those living in partner communities compared to 8 km for those living in non-partner communities ($p < 0.01$). This was expected as the *Casas Maternas* are strategically located to be in proximity to their partner communities.

Among the 275 women interviewed who had given birth in the municipality during a 12-month period (April 2013-March 2014), 70% of those who lived in a partner community compared to only 30% of those who lived in a non-partner community delivered in a health facility (*Casa Materna*, MSPAS or private clinics, or hospital). Using data from the 50 women in the five partner communities who had participated in the Project's baseline KPC survey in January 2012 (only a small portion of the 300 total Phase I respondents in this survey), and comparing these with the results for the 189 women in the 21 partner communities in the 2014 survey, the percentage of women from partner communities giving birth in health facilities increased from 32% to 70%, significant at $p < 0.001$ (Table 12). This is, to be sure a crude comparison since the 2012 data shown in Table 12 are not from a representative sample of the partner communities included in our study.

⁷⁶ The full report of the "Mixed-Methods Case Study of Two *Casas Maternas*" can be found in Appendix 14. The findings are drawn from: (1) a household survey of nearly all women (275 of 321) who had given birth between 1 April 2013 and 31 March 2015 in the study area (the 32 Phase I Area communities of the municipality of San Sebastián Coatán); (2) key informant interviews with 22 of these same women; and (3) focus group discussions with members of the Micro-Regional Committees of the *Casas Maternas* in Calhuitz and Santo Domingo and with *Comadronas* integrated into the operation of those *Casas Maternas*. The study area included (1) 21 partner communities of the two *Casa Materna* micro-regions (8 from the Calhuitz *Casa Materna* micro-region and 13 from the Santo Domingo *Casa Materna* micro-region); and (2) 11 non-partner communities. Details of the methodology of this investigation can be found in the full report.

⁷⁷ See Section II.D. Intervention Details, *Casas Maternas* for a definition of "partner" and "non-partner" communities.

Table 12. Utilization of health facilities (including *Casas Maternas*) for deliveries by community group and year (2012-2014)

Community group and data source	Percentage of deliveries taking place in a health facility	n	95% confidence interval	p-value
Women in 5 partner communities, 2012 ^a	32.0%	16/50	(20.2% - 45.8%)	<0.001 ^c
Women in 21 partner communities, 2014 ^b	69.8%	132/189	(65.4% - 74.0%)	

^aWomen with a child younger than 2 years of age in 5 partner communities participating in a January 2012 baseline household survey of the broader program area (this is a sub-sample of the total women surveyed).

^bWomen in the 21 partner communities who gave birth during the study period (April 2013-March 2014) who were interviewed in September 2014.

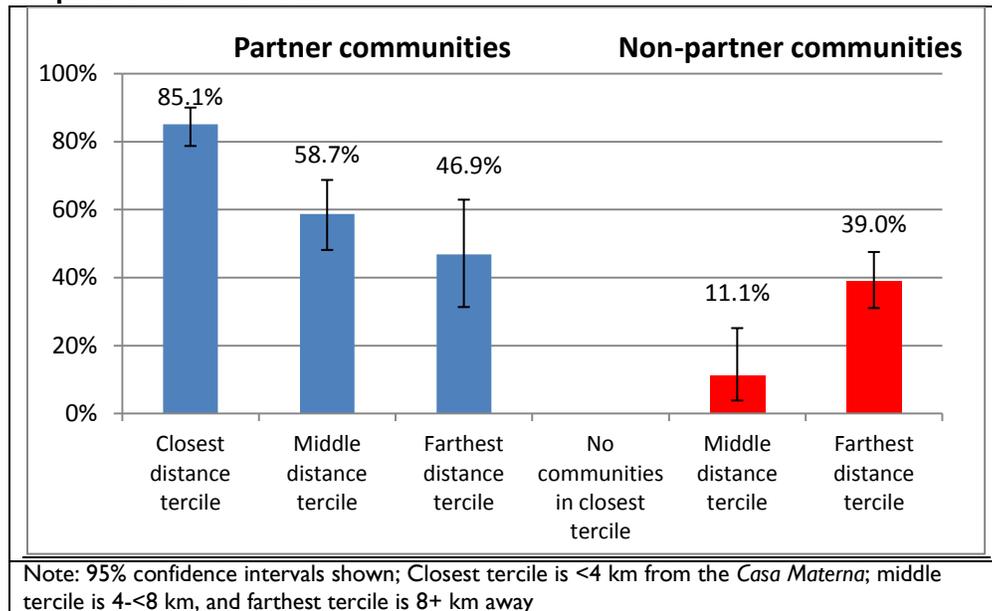
^cThe p-value describes the level of statistical significance of the difference in the two percentages reported in the table.

In partner communities, 54% (103/189) of all deliveries occurred in a *Casa Materna* compared to only 17% (15/86) in the non-partner communities. The great majority of facility deliveries in the partner communities occurred in a *Casa Materna* (103/132, or 78.0% of all health facility deliveries). The percentages of deliveries in the partner communities that occurred in a hospital or clinic (7% and 8%, respectively) were only marginally higher than the percentages in non-partner communities (6% and 7%). This confirms that the difference in health facility delivery coverage between the partner and non-partner communities was largely due to the much higher utilization of the *Casas Maternas* in the partner communities.

Equity of health facility utilization was assessed by determining the socioeconomic characteristics of those who used a health facility for delivery with the socioeconomic characteristics of women who delivered at home. The level of education of mothers and their household wealth was similar among users and non-users, indicating equity in use of the health facilities. There was a suggestion of a modest effect of increased facility utilization among women in only one of the wealthier quintiles, with the difference between the lowest and 4th quintile reaching statistical significance ($p < .01$) (see Figures 1 and 2 in Appendix 14).

We also compared distance from the nearest *Casa Materna* among users and non-users. The findings show a strong effect of distance from the *Casa Materna* on birth location for the respondents from the partner communities (Figure 15). For all the partner communities in the study area, the greater the distance, the lower the facility delivery coverage rate: for the women living in the closest tercile (less than 4 kilometers from the nearest *Casa Materna*), facility delivery coverage was 85.1%. It then declined to 58.7% for those in the middle distance tercile (4-8 kilometers distance) and to 46.9% for those in the farthest tercile (over 8 kilometers away). But among the non-partner communities, none of the women giving birth lived within 3 km of a *Casa Materna*, and for the intermediate and most distant groups, facility delivery rates were actually higher among the most distant group (39.0% of deliveries) because women were more likely to obtain a facility delivery at the Calhuitz *Casa Materna*. This *Casa Materna* has been in operation since 2009, 3 years before the current Project began to function had had built up a reputation among more distant communities for providing high-quality maternity care. Almost one-quarter of the births in the most-distant tercile of the non-partner communities occurred at the Calhuitz *Casa Materna*.

Figure 15. Coverage of health facility deliveries by distance tercile and by partner versus non-partner communities



Qualitative Findings. Women interviewed for the study indicated that many people were involved in the process of decision making about the birthing place, and these women themselves were generally not the final decision makers. People identified as playing an important role in making the final decision included: (1) the *Comadrona*, who was found to be one of the best supporters of the *Casa Materna* and a strong motivator for women to have their deliveries there, and (2) the husband, who usually played a central role in the decision-making process. In some settings, the respondents reported that the husband acted as a facilitator by supporting his wife in her decision to use the *Casa Materna* while in others the husband prohibited a facility delivery due to cultural traditions such as *machismo* (a cultural tradition that embraces the subjugation of women by men and is expressed in attitudes, behaviors, and decisions). In still other settings, the husband played a more neutral role and placed the decision making in someone else's hands, such as an elder female family member (often the mother-in-law). Other factors such as cultural traditions encouraging home deliveries and previous successful home deliveries played an important role in preventing use of the *Casa Materna*.

Geographic distance to the *Casa Materna* was also found to be an influential factor affecting delivery location. The perceived far distance, as well as the lack of (or high cost of) transportation influenced the decision for some women. Some women reported that the *Casa Materna* was too far away to reach during labor, and travel at night or during the rainy season was also considered particularly difficult. Perception of distance in some cases was more important than actual distance: some perceived that the *Casa Materna* was close to their community even when the community was more than 8 km from the *Casa Materna*.

Informants reported that when a woman goes into labor, the *Comadrona* is contacted and then comes to the home. She then either attends the woman's birth at home or accompanies her to the *Casa Materna* with her husband and family members, depending on the family's decision. In the partner communities, the *Comadrona* is considered as part of the team but is not formally a member of the staff of the *Casa Materna*.

Women who perceived that the *Casas Maternas* provide high-quality care reported feeling more comfortable giving birth at a *Casa Materna*. Community leaders and *Comadronas* also reported feeling comfortable working with the *Casa Materna* staff because of the quality of care that they provide. Staff of the *Casa Materna* reported that the participation of the *Comadronas* during the delivery process was helpful and contributed to good outcomes. Respondents from both in-depth and group interviews agreed that the *Casas Maternas* provide a good quality of care. The cleanliness of the *Casas Maternas* was often cited. One Micro-

Regional Committee member stated: “In the past our children were born into filth; now they are born in cleanliness.” Some of the respondents did recommend that the *Casas Maternas* provide sonography.

Discussion. The purpose of the present study was (1) to examine whether *Casas Maternas* have contributed to increasing health facility deliveries in an equitable manner in the 32 communities of the Phase I Area of the municipality of San Sebastian Coatán and (2) to determine what factors have influenced the use of the *Casa Materna* by women in these communities. Our findings clearly indicate that there is a relatively high rate of utilization of the *Casas Maternas*, and this rate has been increasing. By March 2014, 54% of women living in the Calhuitz partner communities were giving birth at the Calhuitz *Casa Materna*. The Santo Domingo *Casa Materna*, during the first year of operations (April 2013-March 2014) was the location of 55% of the births among women living in the Santo Domingo partner communities. These findings are particularly impressive in light of the low overall percentage of births taking place at facilities in the overwhelmingly indigenous Department of Huehuetenango (21%) and the low percentage of facility births among indigenous women in the country as a whole (29%).⁷⁸ *Casas Maternas* are clearly expanding health facility utilization for childbirth in the Curamericas program area in this underserved area of the Department of Huehuetenango.

The data also show that within this context of poverty and limited education, equity in the provision of health facility deliveries with respect to relative wealth and education was achieved. But the data also clearly demonstrate that actual and/or perceived distance from the *Casa Materna* strongly affects utilization for women in the partner communities. Living in a partner community within 4 km (2.5 miles) of a *Casa Materna* greatly increased the likelihood that a woman would deliver in the *Casa Materna* and benefit from a clean and safe health facility delivery. The qualitative data supports this finding, as women who did not use the *Casa Materna* often cited the perceived or real distance and cost of transportation as barriers. The findings all show that despite this barrier, many women from distant non-partner communities did not perceive this distance as a barrier and utilized the *Casas Maternas*. These are communities in which the Project has been able to motivate community leaders to actively promote *Casa Materna* use. This indicates at least one avenue to overcome the barrier of distance.

The literature on *Casas Maternas* in the Americas is limited, but there are two recent examples in which similar approaches have been tried unsuccessfully.^{79,80} In both, community engagement and community ownership were absent, suggesting that these factors are particularly important for explaining the success of the Curamericas *Casas Maternas*. A key qualitative finding was that the outreach component of the Curamericas program (visiting all homes for promotion of healthy behaviors and appropriate utilization of health facilities) has encouraged mothers to deliver in facilities. Perhaps even more importantly, the processes of community engagement and community participation established for the operation of the *Casas Maternas* (construction and management of the facility) have contributed to making the community a stakeholder and have encouraged utilization. The community’s perception of a high quality of services provided in the *Casas Maternas* – that women are treated with respect, that the care is culturally appropriate, and that the care is of good medical quality – has been another contributory factor to the program’s success. Finally, the *Comadronas* appear to have played an important role in influencing women to give birth in a *Casa Materna*, with the qualitative data from our study demonstrating that the strong encouragement of health facility deliveries by the *Comadronas* was decisive for many women.

The findings from this case study provide strong evidence of a surprisingly high level of use of *Casas Maternas* in the study area, and utilization is increasing.⁸¹ We offer the following as reasons why we think that the *Casa Materna* approach as developed and implemented by Curamericas is achieving acceptance. (1) A high quality of services is being provided in these *Casas Maternas*. (2) The services are much closer to families than

⁷⁸ SEGEPLAN. National Survey of Maternal/Child Health 2008- 2009. Guatemala City, Guatemala: Serviprensa and Ministerio de Salud Publica y Asistencia Social 2009.

⁷⁹ Ruiz MJ, van Dijk MG, Berdichevsky K, Munguia A, Burks C, Garcia SG. Barriers to the use of maternity waiting homes in indigenous regions of Guatemala: a study of users' and community members' perceptions. *Culture, health & sexuality* 2013; **15**(2): 205-18.

⁸⁰ Tucker K, Ochoa H, Garcia R, Sievwright K, Chambliss A, Baker MC. The acceptability and feasibility of an intercultural birth center in the highlands of Chiapas, Mexico. *BMC Pregnancy Childbirth* 2013; **13**: 94.

⁸¹ At the time of this writing (January 2016), 65% of all deliveries in the micro-regions with *Casas Maternas* were taking place in a *Casa Materna*.

those provided at government facilities. (3) *Comadronas* continue to play an important role in maternity care, and they seem to be enthusiastic in supporting the use of the *Casa Materna* for four reasons: (i) they are not losing any income by promoting the use of the *Casa Materna*, (ii) they continue to play an important role in providing support to the mother and her family and in participating the delivery itself, (iii) they do not suffer the risk of being blamed for any complication that might arise, and (iv) they are beginning to realize that delivery in a *Casa Materna* is in the best interest of the mother and her child. (4) The outreach portion of the Project (visiting all homes for promotion of healthy behaviors and appropriate utilization of health facilities) has encouraged mothers. And, (5) community engagement and community participation have made the community a stakeholder and has encouraged utilization.

Limitations. Our study has several limitations. First, it would have benefitted from stronger baseline data regarding the characteristics of women using health facilities prior to the introduction of the *Casas Maternas* to better assess whether improvements in equity as well as coverage had occurred. Second, because the number of surveyed respondents was limited (n=275), the ability to detect statistically significant differences among variables influencing *Casa Materna* utilization was limited. A final limitation is that in the translation of interview questions and answers from Spanish to *Chuj*, then back to Spanish, and finally to English, some important meanings could have been lost, despite having bilingual Spanish/*Chuj* and Spanish/English staff performing the translation.

Conclusion. Working with communities to establish *Casas Maternas* that provide high-quality, respectful, culturally appropriate and readily accessible maternity care in an isolated mountainous area of Guatemala where most births are still attended at home by traditional birth attendants (*Comadronas*) provides a promising approach to reducing maternal mortality at low cost. Over half of the deliveries in the partner communities are now taking place in a *Casa Materna*. The uptake of this service, when carried out with strong community collaboration, is equitable but is not able to fully overcome geographic barriers for those who live at greater distances. *Casas Maternas* also provide opportunities for *Comadronas* to continue in their traditional role of supporting mothers at the time of childbirth.

The approach developed by Curamericas in the rural highlands of Guatemala to expanding access to respectful, culturally appropriate facility-based childbirth is now gaining attention in other similar areas of the country, and plans are underway to develop *Casas Maternas* elsewhere. The *Casa Materna* model developed by Curamericas in Guatemala offers an important example of community engagement with health systems, promotion of equity in health systems utilization, and community empowerment

If the *Casas Maternas* are to expand to scale and continue for the longer term, they must consistently provide high-quality, respectful and readily accessible maternity care in a clean and safe environment. They will also need to recognize the essential role of community involvement in planning and building the *Casas Maternas* as well as the vital role that *Comadronas* can play as cultural mediators and champions of facility delivery. Reducing maternal mortality will also require prompt recognition of complications and prompt transport to a referral facility. The approach is worthy of consideration for broader application in Guatemala and beyond.

III.C.2.v. Operational research question 2: How can Comadronas transition into an effective new role in maternity care that improves the quality of care provided to mothers in the project area and that respects cultural traditions and expectations?

*Integrating Comadronas into the Casas Maternas and the rural health system*⁸²

Findings: *Comadronas* who were integrated into *Casa Materna* services expressed a very positive perception of the *Casa Materna*, stating that it helps women and is appropriate for all deliveries. They feel it is a good alternative to the MSPAS clinics and hospital, as those facilities are distant and expensive to utilize due to transportation costs and medical fees. The *Casa Materna* handles complications of childbirth more safely and efficiently than a *Comadrona* can, including the facilitation of referrals and emergency transport. They think it is a clean, safe place to have a delivery, and they believe the staff of the *Casa Materna* is an asset, especially when complications arise. In addition, they stated that they are proud of the fact that the number of maternal deaths has greatly diminished. In the past, the day of childbirth was often called the woman's "death day" (*día de muerte*), but now this is no longer the case.

Comadronas now feel that they are a part of a broader team of health care providers working together to provide maternity care in the area. They related that delivering a baby is now not the job of just the Auxiliary Nurses (staffing the *Casa Materna*) or just the *Comadrona*, but a job that requires teamwork. The majority mentioned doing prenatal uterine palpation to check the position of the baby and uterine massage immediately after the delivery to help prevent hemorrhage. A few described the prayers that they perform in order to protect the woman and child.

The *Comadronas* initially feared that the *Casas Maternas* would take away their work; but now they understand differently. In many ways the work of the *Comadronas* has not changed since they still monitor the pregnant women as closely as before and they still utilize the training they received from both MSPAS and Curamericas in exchange for their customary modest fee from the family (or payment in kind with food if the family has no money). What has changed is the location of delivery and the *Comadronas* assisting in the delivery as part of the *Casa Materna* team. The *Comadronas* related that in a home delivery they are alone and have many responsibilities during the delivery, needing to attend to both the mother and the neonate, whereas at the *Casa Materna* there is a team of people who support each other and share the work. It removes a great deal of pressure, and the *Comadrona* feels better knowing that if there is a complication, she will have support and not receive the blame if something goes wrong.

The *Comadronas* report spending a lot of time and energy trying to convince women to deliver in the *Casa Materna*. Some said that they would not work with a woman unless she agrees to deliver at the *Casa Materna*. However, the *Comadronas* also said that the decision to go to the *Casa Materna* is ultimately made by the woman and her family; if they say no, there is nothing more the *Comadrona* can do and the *Comadrona* must resign herself to this decision. The *Comadronas* report that some women actually feel it is preferable to die at home than to go to the *Casa Materna*. When there is a complication in a home delivery, the family may at that point decide to go to a *Casa Materna* but it may be too late and the woman dies at home.

⁸² This section combines the findings of two studies, "The Changing Role of the Comadronas," carried out in August 2013 near the end of Phase I of the Project, and "Assessment of the Transition of *Comadronas* into a New Role of Collaboration with *Casas Maternas*," carried out in June 2015 near the end of Phase 2. The full report of the first study can be found in Appendix 16. The research was preceded in July 2013 by a census of the *Comadronas* in the Phase I Area. A summary of the results of this census can be found in Appendix 15. The census was used to identify and individually interview 36 *Comadronas* from the Phase I Area to understand their attitudes towards the *Casas Maternas* and to see if the Project had been successful in redefining their role and integrating them into the *Casa Materna* team. Twenty were from San Sebastián Coatán and 15 of these 20 were integrated into the operation of the *Casas Maternas* in Calhuitz or Santo Domingo. Another sixteen were from San Miguel Acatán (10) and Santa Eulalia (6) where, at that time, there was no functioning *Casa Materna*. Details of the methodology of this investigation can be found in the full report. The full report of the second study can be found in Appendix 17. This was a similar qualitative study of *Comadrona* integration, but carried out at the end of the Project. Four group interviews were conducted with a total of 28 *Comadronas* from both Phase Areas, most of whom were integrated into the operations of a *Casa Materna*. Details of the methodology of this investigation can be found in the full report.

Figure 17. Comadrona who is integrated into the operation of the Santo Domingo Casa Materna



When asked how they felt regarding the integration of their roles with formally trained health worker, the *Comadronas* reported feeling good about the trend toward integration. They reported a sense of teamwork and equality. The *Comadronas* and Auxiliary Nurses learn from each other; neither is more important than the other. Also, in the communities, the *Comadronas* now have more interaction with the Ambulatory Nurses of the Extension of Coverage Program (PEC) during prenatal checkups, and they feel satisfied with their interaction and the support they receive from these nurses. However, in the end-of-project *Comadrona* study, many *Comadronas* reported problems working with some MSPAS staff, who often treated them with threats and disrespect and who denigrated the *Casas Maternas*.

Comadronas participating in focus group discussions for the end-of-project study and who were integrated into the *Casas Maternas* understood the value of sonography for verifying the position of the baby, especially during difficult deliveries, and expressed that the *Casa Maternas* should be equipped with ultrasound machines. Also, many *Comadronas* report that they experience poverty and food insecurity.

The *Comadronas* participating in the study at the completion of Phase I who were not yet integrated into the *Casas Maternas* felt that that the *Casa Materna* serves only for complicated deliveries such as prolonged labor or breach position. However, if the delivery appears normal and the woman is in good health, it was their opinion that the birth should still take place at home. However, all responded that they would be willing to bring a pregnant woman to a *Casa Materna* or a MSPAS clinic if there is a complication.

Discussion: The responses of the *Comadronas* confirm the Project's success in integrating them into the operation of the *Casa Materna*. The result is a win-win outcome for both mothers and *Comadronas*: maternal deaths are declining, *Comadronas* continue with their traditional support of women during childbirth (and continue to receive their traditional fees paid by the family), and women and their families are able to have a delivery experience that respects their cultural beliefs and practices. *Comadronas* feel supported, part of a team of equals, and relieved of the burden of having deliveries resting on their shoulders alone. Through their strong encouragement of the use of the *Casas Maternas*, many *Comadronas* have become important allies in the effort to increase health facility deliveries. However, despite their best efforts these *Comadronas* still frequently encounter resistance to health facility deliveries by women and their families.

A key finding is a clear difference in the perception of the *Casa Materna* between the integrated *Comadronas* and those not yet integrated. There is thus an apparent dose-response relationship to the *Casa Materna*: the more interaction *Comadronas* have with the *Casa Materna*, the more positive is their perception and their willingness to bring women there to deliver.

The strategy of providing training to *Comadronas* in performing clean and safe deliveries well before there was an operational *Casa Materna* prepared the *Comadronas* for integration once the *Casas Maternas* became operational. It accustomed them to working with health professionals, helped them accept a positive role for health facilities, and provided them with the skills they needed to work in the *Casa Materna* with the other members of the team, and it gave them a better understanding of the limits of their abilities. That said, despite the training MSPAS staff had given the *Comadronas*, the MSPAS staff working relationship with the

Comadronas appears to be strained and some MSPAS staff lack understanding of and harbor suspicion about the *Casas Maternas*.

Limitations: For both studies, the interviews were conducted in the local Mayan language spoken by the *Comadronas* (Chuj, Q'anjobal or Akateko) and the transcripts were translated first into Spanish and then into English, with a great potential for loss of meaning in translation. Also, the transcripts were coded and analyzed by only one researcher

Conclusion: The findings provide a ringing endorsement of our strategy to redefine the role of the *Comadrona* in the rural health system by training them and integrating them into the *Casas Maternas*. Rather than marginalizing *Comadronas* and eliminating them from the birthing process, Curamericas has been able to affirm the important traditional role of *Comadronas* and incorporate them as part of the team of providers. The *Comadronas* understand and accept their new role, and they feel accepted by the *Casa Materna* staff as important members of a team. The end-of-project study confirmed that *Comadronas* have been able to become incorporated into the services of the new Tuzlaj *Casa Materna* in the municipality of San Miguel Acatán (which opened in May 2014), showing that the integration of the *Comadronas* into the *Casas* is replicable with a potential to go to a larger scale. But it should be noted that their integration into the formal MSPAS health system will require that MSPAS facilities fully accept and understand the changed role of the *Comadronas* and provide the same high quality, respectful, and culturally acceptable services as do the *Casas Maternas*.

The presence of the “dose-response” relationship mentioned above suggests that in areas still lacking a *Casa Materna*, more can be done to expose *Comadronas* to the *Casas Maternas*, such as facilitating dialogue between them and *Comadronas* who are already working with the *Casas Maternas*, as well as arranging visits and observations of deliveries in which *Comadronas* are part of the birthing team.

We have to recognize the limits of the influence the *Comadronas* have in persuading families to utilize the *Casas Maternas*. Cultural attitudes and perceptions that encourage home deliveries still present a major barrier to access and utilization of the services provided by *Casas Maternas*, even when *Comadronas* strongly encourage *Casa Materna* utilization. Increasing *Casa Materna* use will require changing these traditional attitudes and perceptions, and this takes time.

The findings also support our strategy of coordinating with the MSPAS to train *Comadronas* long before there is an operational *Casa Materna* to prepare them for eventual integration.

III.C.3. Which elements of the project have been or are likely to be sustained or expanded (e.g., through institutionalization or policies)?

III.C.3.i. Operational research question 3: How does the cost-effectiveness of the CBIO + CG methodology as implemented by Curamericas/Global in Guatemala compare to that of other Guatemala maternal and child health programs using different methodologies.

Costs of the combined CBIO + CG + Casa Materna program⁸³

Methods. The costs of Project activities have been met with primarily with USAID funds (for the community-based child survival activities) and with funds from the Ronald McDonald House Charities (for the *Casa Materna* program). These are summarized in Table 13. For calculation of programs costs, we have used only the in-country Guatemala expenses (\$1,515,075), which account for 75.6% of the total funds that were available to operate the Project. We then calculated the annual cost per beneficiary and annual cost per capita for each year of the Project. Then, we calculated the same statistics for the entire 4 years of project operations (Table 13).⁸⁴

Table 13. Population served, program expenses, and costs per capita and per beneficiary

Project year	Number of beneficiaries and total population		Funds provided by USAID	Funds provided by Ronald McDonald House Charities	Total Project expenses	Annualized cost per beneficiary and annualized cost per capita
	Phase 1 Area	Phase 2 Area				
Oct 2011- Sept 2015	WRA person-years: 43,596	WRA person-years: 37,296	\$1,647,031 (Total)	\$384,645 (Total)	\$2,031,676 (Total)	Annualized cost per beneficiary: \$12.41
	U-5 person-years: 27,039	U-5 person-years: 13,163				
	Total beneficiary person-years: 70,545	Total beneficiary person-years: 50,459				
	Total population person-years: 173,532	Total population person-years: 87,494	\$1,303,715 (Field only)	\$211,360 (Field only)	\$1,515,075 (Field only)	Annualized cost per capita: \$5.80

Notes: WRA: women of reproductive age; U-5: children younger than 5 years of age; Total expenses: Curamericas headquarters expenses + Guatemala field expenses; Field expenses: expenses for field operations in Guatemala; Annual cost per capita is the average cost per person for the entire population (of all age groups); Total number of person years are calculated by adding up the populations for each year of program participation.

⁸³The purpose of this report is to summarize the costs incurred by Curamericas in implementing this Child Survival Project from October 2011 through September 2015 and to report the annual costs of the Project, including the costs of the *Casas Maternas*, on both a per beneficiary basis (women of reproductive age + children younger than 5 years of age) and on a per capita basis (using the entire population of all age groups and sexes). Part of the reason for this is to determine the feasibility of the adoption of this approach by the Government of Guatemala and the local capacity for long-term sustainability of the CBIO + CG + *Casa Materna* model. The full cost analysis report can be found in Appendix 18. The findings were drawn from an analysis of (1) Project expenditures of funds from USAID and Ronald McDonald House Charities for the implementation of CBIO + Care Groups and the *Casas Maternas* from October 2011 through September 2015, and (2) the population data of the Project's communities as determined by annually updated community censuses per the CBIO methodology. It should be noted that we were not able to assess the cost per life saved and the cost per DALY averted as originally planned using LiST and vital events data. The LiST analysis (estimating lives saved based on expansion of coverage of evidence-based interventions) produced what in our opinion was an underestimate of the maternal, newborn and child lives saved by the Project, and the vital events data collected by the Project, as we have already seen, did not demonstrate any overall decline in under-5 mortality. Consequently a cost-per-beneficiary and cost-per-capita approach was utilized for the cost analysis.

⁸⁴ We did not include the value of in-kind contributions, such as the volunteer labor of the communities to construct the *Casas Maternas* or the land and building materials provided by the municipal governments and the communities, as we were attempting to calculate the actual cash resources that would be required beyond these cost-sharing contributions which are an integral part of our model.

Findings. The total CBIO + CG + *Casa Materna* package costs \$12.41 per beneficiary per year or \$5.80 per capita per year (Table 13). Most (86.0%) of the expenses are for the CBIO + CG package, and the remaining 14.0% is for the construction and operation of the *Casas Maternas*. These findings were relatively consistent each year over the 4 years of Project operations.

Discussion. What is the value achieved for this investment? We have strong indications that maternal mortality has declined. We have strong evidence of improvement in childhood nutritional status. We also have strong evidence that women and their communities are now more engaged in improving their health and are more empowered to improve their lives before the Project began, and we can also reasonably conclude that the level of trust between the community and health services has improved substantially since the Project began, as has the satisfaction of communities members with the Project's activities.

The analysis of our vital events revealed that the Project had a far superior capture of child mortality than MSPAS. What is the value of having a strong, functioning, and high-quality accurate vital events registration system? One could make the case that this in itself could justify the expenditure involved if the data are shared with the community to engage them in improving their health, if they provide a means for registration of births and deaths with the national civil registration system of vital events, and if they are used for surveillance purposes to detect disease outbreaks and trends in morbidity and mortality. For example, we detected 48 neonatal deaths in the three Project municipalities in 2014, while MSPAS detected only 7, enabling us to reveal an urgent local health priority that otherwise might have gone undetected

The high level of maternal mortality in this area and the effectiveness of the overall approach in reducing maternal mortality alone would probably justify the entire project cost, if not more. The return on investment of improving childhood nutrition alone is also probably worth the entire project cost as well.

A system such as the one developed by Curamericas (that involves CBIO + CG + *Casas Maternas*) is likely to increase the return on its investment the longer it is in operation. This is a health system that takes time to mature and that is geared for the long haul to yield strong returns (in terms of health improvement) on investment. So the value that has been demonstrated at a cost of less than \$6 per capita seems to be very beneficial.

Is \$5.60 per capita per year a sustainable expense for health services within the Guatemala context? Guatemala's total national health expenditure per capita for health care, including both public and private sources, is US\$222 at present.⁸⁵ The Government of Guatemala currently spends US\$84 per capita for health care nationally.⁸⁶ Thus, it appears that \$6 per capita per year for high-risk difficult-to-reach populations that are national priorities for health improvement would be an investment that should be readily affordable within the Guatemalan context. Our findings show that only a modest increase in public expenditure on health could produce enormous long-term benefits for the rural indigenous population. The main barrier appears to be generating the needed political rather than finding the needed financial resources.

Conclusion. The CBIO + CG + *Casa Materna* approach developed by Curamericas in the mountains of Huehuetenango for an indigenous population with high maternal and child mortality costs only US\$12.41 per mother and child beneficiary and only US\$5.80 per capita for the entire population. Such a level of expenditure should be easily affordable for the Guatemalan government and sustainable for long-term investment with in-country resources. Given the health and social benefits demonstrated elsewhere in this evaluation, such an investment is a sound one.

⁸⁵ World Bank. Health expenditure per capita (current US\$). 2015. <http://data.worldbank.org/indicator/SH.XPD.PCAP> (accessed 2 December 2015).

⁸⁶ WHO. Health expenditure per capita, all countries, selected years: Estimates by country. 2015. <http://apps.who.int/gho/data/node.main.78?lang=en> (accessed 2 December 2015).

III.C.3.ii. Final evaluation question: What are the prospects for the project being sustained and replicated after the end of the CSHGP grant and what factors will affect those prospects?

What aspects of the Project will be sustained and/or replicated? Though funding for the PEC program ended in October 2014 and funding for the CSHGP ended in October 2015, the Project continues on a reduced geographic scale in the four micro-regions of the four currently functioning *Casas Maternas*: in the Calhuitz and Santo Domingo micro-regions of the municipality of San Sebastián Coatán; in the Tuzlaj-Coya micro-region of the municipality of San Miguel Acatán; and in the Pett micro-region of the municipality of Santa Eulalia (whose *Casa Materna* became operational in October 2015). Funding from Ronald McDonald House Charities (RMHC) supports the work that continues following the termination of USAID funds. Despite the reduced geographic scale, the Project is still implementing in the 40 communities of these four micro-regions all of the activities developed during the CSP and its full CBIO + Care Group + *Casa Materna* service platform, though for the time being without PEC, for which Curamericas does not currently have the resources to replace. The ongoing activities at present include all aspects of CBIO, Care Groups, and the *Casas Maternas* already described, including our referrals of obstetric emergencies and emergency transport insurance scheme, the integration of PD/Hearth into Care Groups, our vital events registration and analysis, and the integration of the *Comadronas* in these 40 communities. Curamericas is maintaining its robust CBIO-based M&E system with data organized and analyzed by micro-region. With the support of Medicines for Humanity Curamericas is expanding *Casa Materna* services to include treatment of sick children to partially fill the service gap left by the closure of PEC.

The grassroots community capacity building of CBIO + CG + *Casas Maternas* will remain the foundation of the work of Curamericas. The CBIO approach places ownership in the hands of communities and promotes equity by ensuring that every beneficiary counts and every beneficiary is accounted for. The model enhances the capabilities of: (1) Community Health Committees to take proactive ownership over monitoring and improving community health; (2) Care Group Volunteers to perform community health surveillance of disease and vital events and to saturate communities with BCC messages aiming to create a sustained community demand of primary health care services and health household/family behaviors; and (3) *Comadronas* trained to provide crucial preventive care, recognize and refer emergencies as first responders, and link families with local health services, particularly those provided at *Casas Maternas*. These community-level human resources help direct community health improvements by acting as natural leaders in their villages, modeling proper health behaviors, creating linkages between communities and health facilities, and advancing new cultural norms of improved health and women's empowerment. In short, they are building community capacity for good health.

Over the next 2½ years Curamericas will expand its reach and replicate its model: the RMHC grant will be supporting the creation of three more micro-regions with *Casas Maternas*. This expansion will result in 7 micro-regions serving approximately 70 communities with a population of around 30,000 spread over at least three departments, providing a much larger and more visible presence for the model in the Western Highlands. This will enable Curamericas to further perfect and replicate the CBIO + Care Group + *Casa Materna* model, demonstrate its effectiveness at a larger scale, and learn how to adapt the model to varying contexts. The RMHC funding will end in March 2018, so there is an urgency to find a long-term model for sustainability that uses in-country Guatemalan resources.

Who is important for sustaining these activities? The actors who will sustain this Project over the long term include: (1) Curamericas/Guatemala through its vision, leadership and capacity-building; (2) the *Casa Materna* partner communities themselves and their Micro-Regional Committees for grassroots ownership of their health and for proving resources; (3) the municipal governments for their political and material support; (4) current and potential partner NGOs such as Medicines for Humanity for the resources and expertise they can bring; and, most of all, (5) MSPAS for its support for the Curamericas model and for adapting it for replication on a national scale within the government health system. Curamericas will tap into the organizational and training capacities it has nurtured at the community level in working with Community Health Committees, Micro-Regional Committees, Community Facilitators, and *Comunicadoras*, and it will continue to build this grassroots capacity in every community in the new micro-regions. Curamericas will capitalize on the alliances established with the municipal governments who have already provided land and materials for the

Casas Maternas. The partnership with Medicines for Humanity will be especially critical at this stage as the *Casas Maternas* with their *boutiquines* evolve into community clinics (*Centros de Asistencia Permanente Rural*, or Permanent Rural Health Centers), enabling them to at least partially fill the service gaps left by the termination of PEC.

To support this work, Curamericas/Guatemala has hired a Sustainability Coordinator who is tasked with facilitating the linkages between communities and with the government at municipal, district, and department levels to enhance long-term sustainability. This will include regular meetings and communication to disseminate lessons learned. The contributions in labor, land, and materials of the communities and municipal governments have provided more than half the construction cost required for the currently functioning *Casas Maternas*. Curamericas will explore new ways to leverage cost-sharing among stakeholders. An Annual Stakeholder Retreat will be held as well as quarterly joint coordination meetings among local stakeholders to discuss modes of collaboration and work plans.

But ultimately, Curamericas will need the support of MSPAS as a full partner in the creation a truly equitable and sustainable national rural health system that meets the needs of indigenous women and children.

What barriers to sustainability and replication exist and how will they be addressed? The Extension of Coverage (PEC) program was a vital “leg” of the integrated model for rural health service developed in the Project area, but PEC was a casualty of the tumultuous changes in the national political environment: the virtual collapse of the national government in 2015 under the weight of charges of pervasive mismanagement and high-level corruption. The effects of this crisis on the local health system have been described above. Changes in this macro-environment will be needed in order to attain serious, high-level MSPAS support. A new government that has pledged to eliminate the corruption has just taken office, but there is no new strong leadership emerging yet from MSPAS.

That said, we are extremely optimistic. We are proactively utilizing our alliances with municipal governments and with MSPAS at both municipal and departmental levels to pilot alternative models of partnerships and by working bottom-up at the grassroots level. Examples of this are the following:

(1) In the municipality of San Miguel Acatán Curamericas has won the support of the MSPAS leadership and staff, who understand and appreciate the CBIO + CG + *Casa Maternas* model. In a bold move unusual for Guatemala’s top-down bureaucracy, the MSPAS team there is taking the initiative of converting two of its Health Posts (a community “mini-clinic” that had been used by the PEC Ambulatory Nurses) into a *Casa Materna*, staffed by MSPAS Auxiliary Nurses, with the new partner communities contributing labor and materials to the retrofitting of the Health Posts. This is a development that had not been anticipated but seems to be a very promising grassroots model for integration with MSPAS, as it builds on its existing local staff and infrastructure, a development which Curamericas will actively support.

(2) In the municipalities of San Sebastián Coatán and Santa Eulalia, the newly-elected *alcaldes* (literally meaning “mayors” but in this context more the equivalent of a county commissioner in the U.S.), impressed with Project’s results, are pledging to expand municipal support. In San Sebastián Coatán, the *alcalde* has pledged to donate an ambulance for the use of the two *Casas Maternas* in his municipality; and in Santa Eulalia, the municipal government and municipal MSPAS office are discussing a new model whereby they would jointly assume oversight and support of their municipality’s new *Casa Materna* in Pett.

(3) Curamericas has allies at the departmental level of MSPAS, particularly in the nearby Department of San Marcos where Dr. Danilo Rodriguez, the Departmental Coordinator, serves on the Project’s Operational Research Advisory Committee. He has pledged full departmental MSPAS support, including staff and commodities, for a new micro-region and *Casa Materna* in the municipality of Comitancillo (located in the Department of San Marcos), built on the foundation of CBIO + Care Groups. A *Casa Materna* will be constructed there in 2016. Curamericas will closely monitor and document this work as it will serve as another laboratory to pilot the integration of its model of service delivery into the MSPAS at a departmental level.

(4) In San Juan La Laguna, located on Lake Atitlán in the Department of Sololá, the local *alcalde* has taken the initiative to form a new micro-region, with plans to convert a currently unused community-owned clinic into a *Casa Materna*. Curamericas is currently providing training and technical support for the mobilization of communities to create a micro-region.

(5) The new national government takes office in January 2016 and hopefully will provide “fresh air” to the toxic political environment. Curamericas has initiated preliminary contacts with persons who are soon to take high positions at MSPAS. They have signaled a commitment to re-instate the PEC program. Curamericas/Guatemala will lead a concerted outreach campaign beginning in April 2016 at both the departmental and national level for stronger support for community-based programming in health. Since MSPAS will, at least for now, continue to be a top-down bureaucracy dominated by policy-makers in Guatemala City, Curamericas/Guatemala will target these new decision-makers, offering its integrated CBIO + CG + *Casa Materna* + PEC model as the basis for an improved, just and lasting rural health system for isolated indigenous populations.

IV. DISCUSSION AND RECOMMENDATIONS

IV.A. Main conclusions

- This operational research study provides support for the effectiveness of the CBIO + CG methodology as implemented by Curamericas/Guatemala in the Department of Huehuetenango Project Area, in producing major and statistically significant improvements from baseline to endline in (1) key evidence-based interventions designed to address epidemiological priorities; (2) the reduction of maternal mortality; (3) the reduction in stunting in children younger than 2 years of age; and (4) the empowerment of women and communities to improve their own health, particularly when operating in the context of an integrated rural health system that includes *Casas Maternas* and the Extension of Coverage Program (PEC).
- But the results also show that the CBIO + Care Group methodology is dependent on the presence of government-supported outreach services to provide such services as treatment of children with symptoms of pneumonia, immunizations, vitamin A distribution and family planning services. The *Casas Maternas* were able to expand the scope of its services to partially compensate for the loss of the government-supported PEC program.
- The Care Group methodology provides an ideal community-based platform for health education. It also provides a platform onto which PD/Hearth workshops can be readily established. The PD/Hearth intervention confirmed that even in the apparently food insecure Project context there are available and affordable nutritious foods that can alleviate under-nutrition if properly included in a child’s diet.
- CBIO + Care Groups, when enhanced by the *Casas Maternas*, can achieve important reductions in maternal mortality and in neonatal deaths from birth asphyxia, particularly in the partner communities of the *Casa Materna* micro-regions. Working with communities to establish *Casas Maternas* that provide high-quality, culturally appropriate and readily accessible maternity care provides a promising approach to reducing maternal mortality at low cost.
- The CBIO + Care Group system of vital events collection and verbal autopsies provide an important step forward in measuring child and maternal mortality and in determining causes of death as well as social/geographic barriers to obtaining needed services.
- The lack of physically accessible and culturally acceptable government health services combined with the challenging mountainous geography, endemic poverty, lack of affordable transportation and strong

traditional cultural beliefs all contribute to maternal and child mortality and strengthens the case for (1) the *Casas Maternas*, (2) community case management of childhood pneumonia (i.e., the training of community-level workers to diagnose and treat pneumonia, as recommended throughout the world by WHO and UNICEF), 3) the provision of misoprostol by community-level workers to pregnant women who plan to deliver at home (as now widely recommended throughout the world); and (4) the development of emergency transportation networks and insurance schemes to defray transportation costs for women who develop obstetrical complications, neonates in distress, and children ill with pneumonia who must be quickly transported from their home to a *Casa Materna* or other health facility.

- Ways will need to be found to reduce the specific barriers identified to women's empowerment and autonomy, as well as to reinforce the facilitators that were identified. This should include greater attention to (1) reaching men and husbands; (2) enlisting community leaders; and (3) empowering women economically with sources of their own income. The Care Group methodology, as implemented by the Project, contributed to increased empowerment of its female participants, increased community capacity, and improved self-reported health behavior change. The CBIO + CG methodology also increases community solidarity, particularly as manifested by the establishment of emergency response systems that can contribute to reductions in maternal mortality.
- The Curamericas/Guatemala field staff demonstrated an impressive theoretical and practical understanding of the CBIO + Care Group methodology and a conviction that its many advantages far outweigh the disadvantages. Local MSPAS staff also appreciated the advantages of the methodology. This grassroots support bodes well for eventual integration of the methodology into MSPAS programming, which will nevertheless require winning similar support from MSPAS at higher-levels of decision-making. The success of the methodology depends heavily on community trust-building and the ability of implementers to identify and overcome challenges specific to the local context, particularly male dominance (*machismo*).
- The findings support the Curamericas strategy to redefine the role of the *Comadrona* in the rural health system by training them and integrating them into the *Casas Maternas*. Cultural attitudes and perceptions that encourage home deliveries still present a major barrier to access and utilization of the services provided by *Casas Maternas* despite the strong encouragement of the *Comadronas*.
- The equipping of the *Casas Maternas* with small pharmacies (*boutiquines*) has enabled them to partially fill the gap created by the loss of PEC and supports their evolution to becoming general-purpose community-based primary health care clinics.
- The CBIO + CG + *Casa Materna* approach as developed by Curamericas in the mountains of Huehuetenango for an indigenous population with high maternal and child mortality costs each year only US\$12.41 per mother and child beneficiary and only US\$5.80 per capita for the entire population. Such a level of expenditure should be easily affordable for the Guatemalan government and should be sustainable for long-term investment with in-country resources.

IV.B. Summary of evidence

- The Project has produced significant improvements from baseline to endline KPC surveys in the population coverage of the large majority of outcome indicators in both Phase Areas (1 and 2), particularly in the maternal/newborn care indicators. Superior outcomes were achieved in the Phase I Area for half of the outcome indicators. However, indicators of coverage of PEC services (e.g., immunizations and vitamin A supplementation for children) did not show improvements in either Phase Area due to the loss of PEC services at the beginning of PY4.
- In the Phase I Area, the maternal mortality ratio declined from 524 maternal deaths per 100,000 live births in PY1 (based on 7 maternal deaths) and 740 in PY2 (10 maternal deaths) to 221 in PY4 (3 maternal deaths, annualized), with the *Casas Maternas* contributing strongly to this decline. And in PY4, 12-59 mortality was nearly eliminated. Unfortunately, the vital events data indicated a sharp increase in neonatal and post-neonatal mortality in PY4, particularly in the Phase I Area. The reasons for this are unclear but are most likely artefactual and either represent inconsistencies in the reporting of stillbirths versus early neonatal deaths or they represent an enhanced capacity to register neonatal deaths, though we cannot rule out the effects of the termination of the PEC program.
- In the Phase I Area, the prevalence of stunting was reduced from 74% to 39% over the course of the Project. Evidence for reductions in underweight and wasting was not conclusive.
- For the combined Phase Areas over the four years of the Project, postpartum hemorrhage accounted for 82% of maternal deaths and birth asphyxia accounted for 52% of neonatal deaths. However, from PY1 through PY4, birth asphyxia decreased significantly from 77% of neonatal deaths in PY1 (Phase I Area) to 41% in PY4 (both Phase Areas combined). Pneumonia is by far the leading cause of death among under-5 children (41% of all under-5 deaths). Other leading causes of under-5 mortality were birth asphyxia (23%), diarrhea (13%) and complications of prematurity (10%). Together, these four causes accounted for 87% of all under-5 deaths over the four years of the Project.
- In the combined Phase Areas (1 and 2), 94% of maternal deaths and 95% of neonatal deaths were associated with home deliveries: 62% of maternal deaths occurred at home and another 26% *en route* to a health facility after the woman had delivered at home; and 88% of neonatal deaths occurred at home. In addition, 85% of all under-5 deaths occurred at home. These numbers reflect a persistent reluctance or inability of families to bring women with complications in pregnancy, delivery or postpartum, neonates in distress, or children with symptoms of pneumonia to health facilities for timely treatment due to distance, cost, and preference for traditional practices and/or fear of disrespectful or poor technical quality of treatment at MSPAS clinics.
- By mid-2014, 55% of women living in the Calhuitz and Santo Domingo partner communities (that supported a *Casa Materna*) were giving birth at a *Casa Materna* and 70% in a health facility (*Casa Materna*, clinic, or hospital). In the 26 partner communities of the three operating *Casas Maternas*, the MMR dropped from 508 in PY1 to 0 in PY4, contributing greatly to the overall decline in the MMR achieved in the Phase I Area.
- The findings indicate notable improvement in women's empowerment, measured by significant increases in women's participation in community meetings and women's decision-making autonomy, especially with respect to birth control and place of delivery. But the context still one of male domination that represents a stubborn impediment to women's autonomy. The family context remains one of male control, with its traditional sense of male authority over women, male economic control over the household, and male control of female mobility.

- The Care Group training cascade empowered women to make positive health behavior changes for themselves and for their families. Learning the theoretical basis of new health behaviors was key to the practice of the behavior and to women's sense of empowerment, which increased their social status, reduced their timidity and fear, and increased their self-esteem and decision-making autonomy.
- The Project was successful in increasing community involvement and solidarity, with significant increases in mothers of children younger than 2 years of age in the communities of both Phase Areas reporting that their community had an emergency transportation plan in place.
- The Curamericas/Guatemala staff had few critiques of the CBIO + Care Group methodology. Instead, their preoccupations focused heavily on the challenges presented by the specific context of the Project, particularly building trust with communities in a very low-trust environment and overcoming the influence of male dominance (*machismo*). The local MSPAS staff understands and supports the methodology despite their skepticism that MSPAS can adopt it.
- The *Comadronas* understand and accept their new role in the rural health system and their integration into the operation of the *Casas Maternas*. They feel accepted by the *Casa Materna* staff as valued members of a team, and they are crucial for encouraging women to deliver in the *Casas Maternas*.
- The total CBIO + CG + *Casa Materna* package costs \$12.41 per beneficiary per year or \$5.80 per capita per year.

IV.C. Limitations of the study

The limitations of specific investigations are detailed in their respective parts of the report. The limitations of the overall operational research effort include the following: (1) The CSP was too brief to allow sufficient time for the CBIO + Care Group Methodology to achieve its full impact and to perfect the vital events collection system. (2) The study lacked adequate comparison areas wholly outside the Project service area that were good geographical and demographic matches with the Project area, and the Project lacked the resources to conduct baseline, midline, and final evaluations in such comparison areas outside the Project service area. (3) We were not able to obtain comparison data concerning intervention coverages and nutritional status of children younger than 2 years of age for the Department of Huehuetenango as a whole. (4) The far superior capture of under-5 deaths by the Project compared to MSPAS rendered the comparisons of under-5 mortality in the Project municipalities with other municipalities of limited value, testifying more to the difference in vital events capture than to the effectiveness of the CBIO + CG methodology as compared to MSPAS's service platform. (5) Some indicators of health behaviors and empowerment were imperfectly defined, limiting their value (e.g., women's decision-making participation and community solidarity). And finally, (6) there may have been spill-over between Phase Areas during the first two years of Project operations, and the rapidly achieved results in the Phase 2 Area may have been due to the early strong impact of Care Groups as a results of more-seasoned staff executing a methodology improved by the Phase I Formative Research and field experience in the Phase I Area.

IV.D Comparison of results with other research

In the *Casa Materna* case study (p. 56) we cite two recent studies of similar approaches that were both unsuccessful.^{87, 88} The study by Tucker et. al. of an attempted *Casa Materna* in the Mexican state of Chiapas is particularly instructive. The region is not far from and very similar to our Project area, being rural,

⁸⁷ Ruiz MJ, van Dijk MG, Berdichevsky K, Munguia A, Burks C, Garcia SG. Barriers to the use of maternity waiting homes in indigenous regions of Guatemala: a study of users' and community members' perceptions. *Culture, health & sexuality* 2013; **15**(2): 205-18.

⁸⁸ Tucker K, Ochoa H, Garcia R, Sievwright K, Chambliss A, Baker MC. The acceptability and feasibility of an intercultural birth center in the highlands of Chiapas, Mexico. *BMC Pregnancy Childbirth* 2013; **13**: 94.

mountainous, and populated by indigent Mayan people with poor access to health services and a long history of discrimination and marginalization. In stark contrast to our *Casas Maternas*, the edifice was constructed by the Mexican government without consulting with the local communities for whom they were intended and without their participation in the construction. Little community outreach was done by the staff of the *Casas Maternas* there, and they were not local or Mayan. The local *Comadronas* were not contacted, let alone integrated into the functioning of the *Casa Materna*. As a result almost no local women chose to deliver in the *Casa Materna*, and when interviewed for the study the women showed little understanding of its purpose and low trust in its services. The Tucker study serves to show how necessary it is to create *Casas Maternas* on the foundation of CPIO + Care Groups to mobilize community engagement, trust and partnership from the outset. Another recent study in a nearby Mayan region of Chiapas interviewed Mayan women who cited the following barriers to their having a health facility delivery: restrictive clinic hours; excessive costs; geographic distance; lack of service in their language; and invasive and offensive medical practices.⁸⁹ Key facilitators they cited included the presence of their family and their *Comadrona* and receiving services in their language. The *Comadronas* interviewed for their study reported feeling excluded and not part of the care team. Our *Casas Maternas* with their respectful, affordable, accessible, culturally adapted services, available 24/7, and integration of *Comadronas* clearly address all of these barriers and facilitators.

A global theme to which the Project and its *Casas Maternas* respond is respectful and culturally appropriate maternal care. A recent review synthesizing the qualitative evidence regarding facilitators and barriers to facility-based deliveries in low- and middle-income countries concluded that women and their families in many settings have come to believe that “childbirth has become medicalized and dehumanized” and that they avoid facilities because of a fear of undesirable procedures as well as fear of disrespectful and abusive care.⁹⁰ Another recent review classified the abuse into seven domains: (1) physical abuse, (2) sexual abuse, (3) verbal abuse, (4) stigma and discrimination, (5) failure to meet professional standards of care, (6) poor rapport between women and providers, and (7) health system conditions and constraints.⁹¹ Accordingly, in 2014 the World Health Organization released a statement on the prevention and elimination of disrespect and abuse during facility-based childbirth that has been endorsed by leading organizations around the world involved in women’s health, recognizing the right of every woman to dignified, respectful health care.⁹²

Our verbal autopsies clearly indicated that one of the main reasons cited by families for not bringing women with complications in delivery or bringing sick children to health facilities is the expectation of disrespectful and discriminatory treatment. A recent study in a nearby area of the Western Highlands confirmed this pervasive disrespect and abuse of indigenous women by non-indigenous health facility staff.⁹³ Our *Casas Maternas*, with their respectful, culturally-appropriate services provided in the women’s native language are clearly responding to this issue, not only through their “de-medicalization”/humanization of services, but also by providing high-quality care, which was repeatedly cited by the women participating in the *Casa Materna* study as a key reason they chose to be delivered in the *Casa Materna*.

A number of publications in scientific journals are anticipated based on this report. The findings from this operational research will add to the emerging, but still limited, evidence regarding the effectiveness of the CPIO and Care Group approaches, approaches to engaging communities in improving their health, and approaches to working with marginalized, underserved, and isolated populations.

⁸⁹ Ibanez-Cuevas, M. et.al. Labor and delivery service use: indigenous women’s preference and the health sector response in the Chiapas Highlands of Mexico. *International Journal for Equity in Health* (2015). 14:156.

⁹⁰ Bohren MA. et. al. Facilitators and barriers to facility-based delivery in low- and middle-income countries: a qualitative evidence synthesis. *Reproductive health* 2014; 11(1): 71.

⁹¹ Bohren MA, Vogel JP, Hunter EC, et al. The Mistreatment of Women during Childbirth in Health Facilities Globally: A Mixed-Methods Systematic Review. *PLoS Med* 2015; 12(6): e1001847.

⁹² WHO. The Prevention and Elimination of Disrespect and Abuse during Facility-based Childbirth. 2014. http://apps.who.int/iris/bitstream/10665/134588/1/WHO_RHR_14.23_eng.pdf?ua=1&ua=1 (accessed 19 December 2015).

⁹³ Peca, Emily. Disrespectful and abusive maternity care in the Western Highlands of Guatemala: who is most vulnerable? . <https://cdn2.sph.harvard.edu/wp-content/uploads/sites/32/2015/12/Peca.pdf> (accessed 13 January 2016).

IV.E. Implications of the results/programmatic and policy recommendations

1. The CBIO + Care Group + *Casa Materna* model of rural health service should be continued in the Project area and expanded to other parts of Guatemala where the context is similar. The Government of Guatemala in partnership with municipal governments should try to scale up within its existing health system a modified version of the CBIO + Care Group + *Casa Materna* model.
2. Further efforts should be undertaken to improve the model's ability to empower indigenous women and mitigate male dominance by enlisting partners with expertise in this area and integrating their methods into the model while methodically testing for effectiveness. Men must be directly targeted in these interventions. Men within the communities themselves should be identified who can function as "positive deviance" role models for other men.
3. The model's ability to reduce maternal and child mortality (especially from the prime causes we have detected, namely postpartum hemorrhage and ARI/pneumonia) should be strengthened by (1) converting *Casas Maternas* into full-service culturally appropriate and physically accessible rural clinics; (2) authorizing community-case management of ARI/pneumonia (emphasizing case detection, first-line treatment and immediate referral of complications utilizing the Community Facilitators and the Care Group infrastructure); and (3) authorizing the distribution by trained community health workers of misoprostol to pregnant women delivering at home in order to reduce the risk of postpartum hemorrhage.
4. The Project's well-developed vital events registration system needs further support to ensure the complete capture of all vital events in the Project population. It has the potential of serving as a model for strengthening vital events registration throughout the country – not only for civil registration purposes but also for local program planning and monitoring.
5. With further refinement and ongoing efforts, the Project can provide leadership in Guatemala and beyond in creating "bottom-up" community-oriented models for achieving public health. Such approaches as alternatives to "top-down" programs are greatly needed not only in Guatemala but throughout the world. As demonstrated in this report, the effectiveness as well as the cost-effectiveness of the CBIO + CG + *Casa Materna* approach in improving maternal and child health as well as in achieving community and women's empowerment make it an important strategy for further development and broader implementation not only in Guatemala but in other low-income settings.

V. APPENDICES

Appendix 1. Complete list of project outcome indicators

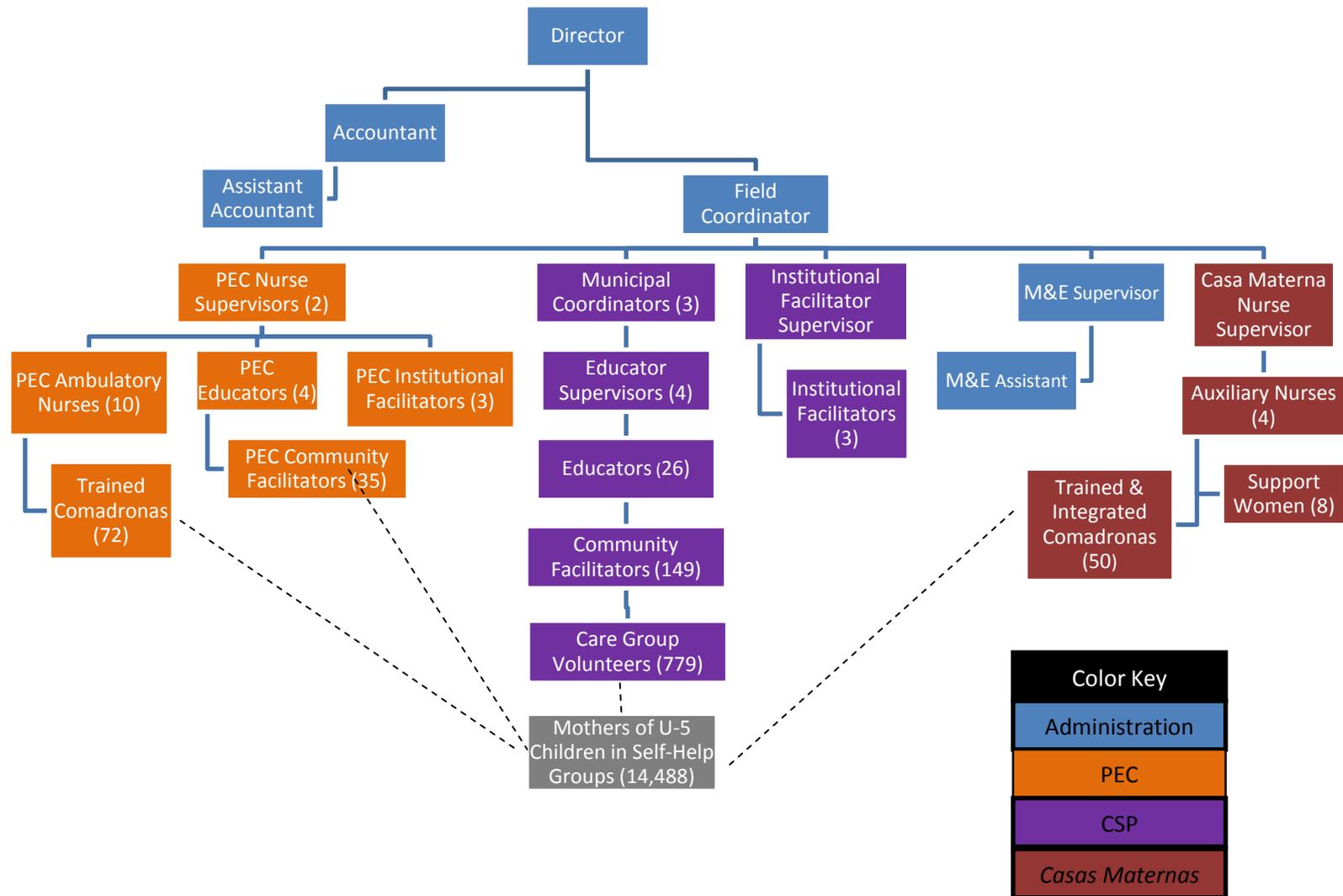
Maternal and Newborn Care (35% LOE)
Quality Antenatal Care: Percentage of mothers of children age 0-23 months who had four or more antenatal visits with a skilled provider (doctor, nurse, professional midwife)
Tetanus Toxoid: Percentage of mothers with children age 0-23 months who received at least 2 tetanus toxoid vaccinations before the birth of their youngest child
Iron Tablets for Pregnant Women: Percentage of mothers of children age 0-23 months who took iron tablets or syrup for at least 90 days before the birth of their youngest child
Knowledge of Danger Signs during Pregnancy: Percentage of mothers of children 0-23 months who knew at least two danger signs during pregnancy
Skilled Birth Attendant: Percentage of children age 0-23 months whose births were attended by skilled personnel (doctor, nurse, professional midwife)
Essential Newborn Care: Percentage of children age 0-23 who received all three elements of essential newborn care: thermal protection immediately after birth, clean cord care, and immediate and exclusive breastfeeding
Active Management of Third Stage of Labor (AMTSL): Percentage of mothers of children age 0-23 months who received AMTSL during their most recent delivery: uterotonic drug; uterine massage; controlled cord traction
Knowledge of Maternal Danger Signs During Delivery: Percentage of mothers of children 0-23 months who know at least two danger signs during delivery
Postpartum Visit for the Mother and Newborn: Percentage of mothers of children age 0-23 and children age 0-23 months who received a postpartum visit from an appropriate trained health worker within two days after the birth of the youngest child
Knowledge of Postpartum Danger Signs: Percentage of mothers of children age 0-23 months who knew at least two postpartum danger signs
Knowledge of Neonatal Danger Signs: Percentage of mothers of children age 0-23 who know at least two neonatal danger signs
Vitamin A Supplementation for Mother: Percentage of mothers of children 0-23 months who received Vitamin A supplementation with 2 months postpartum
Knowledge of Risk Associated with Birth to Pregnancy Intervals Less than 24 Months: Percentage of mothers of children 0-23 months who know at least two risks of having a birth to pregnancy interval of less than 24 months
Current Contraceptive Use Among Mothers of Young Children: Percentage of non-pregnant mothers of children age 0-23 months who are using a modern contraceptive method
Breastfeeding and Child Nutrition (30% LOE)
Exclusive breastfeeding (0-5 months): Percent of infants aged 0-5 months who were given breast milk only in the 24 hours preceding survey
Vitamin A Supplementation for Child: Percentage of children age 6-23 months who received a dose of Vitamin A in the last 6 months: card verified or mother's recall
IYCF practice indicator (6-23 months): Percent of infants and young children aged 6-23 months fed according to a minimum of appropriate feeding practices
Underweight: Percentage of children age 0-23 months who are underweight (<2 SD for the median weight for age, according to WHO/NCHS reference population)
Acute Respiratory Infections (15% LOE)
Appropriate Care Seeking for Pneumonia: Percentage of children age 0-23 months with chest-related cough and fast and/or difficult breathing in the last two weeks who were taken to an appropriate health provider
Diarrhea Prevention and Case Management (15% LOE)
ORT Use During a Diarrheal Episode: Percentage of children age 0-23 months with diarrhea in the last two weeks who received oral rehydration solution and/or recommended home fluids
Increased fluid intake during a diarrheal episode: Percent of children 0-23 months with diarrhea in the last two weeks who were offered more fluids during the illness
Increased food intake during a diarrheal episode: Percent of children 0-23 months with diarrhea in the last two weeks who were offered the same amount or more food during the illness
Zinc Treatment for Diarrhea: Percent of children 0-23 months with diarrhea in the last two weeks who were treated with zinc supplements

Safe Water Storage: Percent of households that store water safely
Safe Feces Disposal: Percentage of households that disposed of the youngest child's feces safely the last time s/he passed stool
Hand washing at Critical Times: Percent of mothers who wash their hands with soap before food preparation, before feeding children, after defecation, and after attending to a child who has defecated
Appropriate Hand Washing Station: Percentage of mothers of children age 0-23 months who live in households with soap, water, and recipient at a designated place for hand washing
Regular Point of Use Water Treatment: Percentage of households of children age 0-23 months that treat water effectively and regularly
Childhood Immunization (5% LOE)
Measles Immunization: Percentage of children aged 12-23 months who received Measles vaccination by the time of the survey (card verified)
Vaccination Coverage: Percentage of children aged 12-23 months who received all required antigens and doses by the time of the survey- BCG, PENTA1-3, Polio1-3, and Measles (card verified)
Women's Empowerment
Decision-Making re: ARI Treatment: Percentage of ARI episodes in 0-23 months old children in the past two weeks in which either the mother or the mother jointly with another person decided the care-seeking and/or treatment
Decision-Making re: Location of Delivery and Birth Attendant: Percentage of households with children 0-23 months in which either the mother or the mother jointly with another person decided the location and birth attendant of her last delivery
Control of Money for Purchasing Food for Children: Percentage of mothers of children 0-23 months who indicate that they do not need to ask for the money needed to buy the food necessary to meet the minimum acceptable feeding practices for infants and young children
Decision-Making re: Contraception: Percentage of households with children 0-23 months in which either the mother or the mother jointly with her husband/partner (or another person) would practice contraception and, if so, the method to be used
Women's Participation in Community Meetings: Percentage of mothers of 0-23 month old children who report that in the past 3 months they both attended and expressed their opinion at a community meeting
Community Support of Maternal and Child Health and Community Solidarity
Community OE Response Plan: Percentage of mothers of children 0-23 months old who report that their community has in place an emergency response plan that would provide transport for them and/or their newborn child to the nearest health facility in the event of a difficult delivery or danger signs in pregnancy or during the postpartum period
Care Group Activity: Percentage of mothers of children 0-23 months old who report that in the past month they have either been a Care Group volunteer, participated in a Care Group meeting, or have been instructed by a Care Group member
Community Solidarity: Percentage of mothers of 0-23 month old children who report that their community has worked together to solve a community problem or make a community improvement in the past 3 months

Appendix 2. Project results framework

Results Framework :				
GOAL/IMPACT: Improved health and nutrition and mortality reduction in US children and WRA				
STRATEGIC OBJECTIVE: Major improvements in access, coverage, and quality of proven high-impact interventions				
RESULTS/OUTCOMES				
<i>Increased ACCESS to high-impact, evidence-based interventions</i>	<i>Improved EQUITY for most vulnerable beneficiaries</i>	<i>Increased DEMAND for critical health behaviors and services</i>	<i>Increased QUALITY of health education and services</i>	<i>Improved SUSTAINABILITY of health improvements</i>
CROSS-CUTTING STRATEGIES/ACTIVITIES				
<ul style="list-style-type: none"> - Construct <i>Casa Materna</i> birth centers - Bring preventive education and health services to households and link communities to Ministry of Public Health and Social Welfare (MSPAS) services - Establish community-based emergency response system (ERS) 	<ul style="list-style-type: none"> - Implement the Community-Based, Impact-Oriented + Care Group (CBIO+CG) methodologies to identify all beneficiaries, target the most vulnerable, and ensure beneficiaries receive culturally-appropriate, evidence-based health education and interventions 	<ul style="list-style-type: none"> - Intensive health education and behavior change communication (BCC) through routine home visitation by Care Group Volunteers (CGVs) to create demand for critical health behaviors and services - Positive Deviance activities to appropriately tailor BCC messages 	<ul style="list-style-type: none"> - Incorporate procedures for quality assurance (QA) and continuous quality improvement (CQI) into all activities - Capacity building trainings for Curamericas/Guatemala, Community Health Systems, and MSPAS staff - Consistently update and use the Community Vital Events Register (CR) 	<ul style="list-style-type: none"> - Develop social capital through creation of Community Health Committees (CHCs) and Care Groups (CGs) - Enhance coordination with MPHSW, USAID, World Health Organization, CHCs, and NGO stakeholders through regular meetings and retreats
INTERVENTION-SPECIFIC STRATEGIES/ACTIVITIES				
<i>Maternal and Newborn Care</i>				
<ul style="list-style-type: none"> - Construct 3 <i>Casa Materna</i> centers - Provide maternal and neonatal care (MNC), antenatal care (ANC) and postpartum care (PPC) services for women - Provide MPHSW-supplied condoms to improve pregnancy spacing - Refer to MPHSW for family planning services and management of MNC complications 	<ul style="list-style-type: none"> - Community Facilitators (CFs) and CGVs will use the CR to identify and monitor pregnant/postpartum women and neonates who need MNC and family planning services 	<ul style="list-style-type: none"> - Health Educators (HEs), <i>Comadronas</i>, and CGVs will convey consistent health messages to women and families on the importance of obtaining four ANC visits, pregnancy spacing, health facility deliveries, and postpartum care 	<ul style="list-style-type: none"> - Train CFs and <i>Comadronas</i> in home-based lifesaving skills (HBLSS) to improve mother and child care - Train staff in CQI and QA activities as they relate to MNC 	<ul style="list-style-type: none"> - Long-term improvement of MPHSW supply chain management system to ensure commodities are readily available - Establishment of community ERS
<i>Nutrition</i>				
<ul style="list-style-type: none"> - Provide iron tablets and vitamin A during routine home visitation - Identify food insecure households and under-nourished children and refer them to MPHSW health posts or the Chicken Program (whereby families receive education and egg-laying hens) for care 	<ul style="list-style-type: none"> - CFs and CGVs will use the CR to identify as early as possible children with insufficient growth progress and women with insufficient iron and vitamin A supplementation; intake forms and the CR are reviewed monthly to identify women/children needing supplements 	<ul style="list-style-type: none"> - Educate women about child feeding and breastfeeding practices and supplemental iron - <i>Comadronas</i> and CGVs will be educated on proper nutrition and will discourage detrimental practices 	<ul style="list-style-type: none"> - Train staff in CQI and QA activities - Improve quality of MSPAS malnutrition data through regular beneficiary monitoring 	<ul style="list-style-type: none"> - Train MPHSW staff in prevention, identification, and treatment of under-nutrition
<i>Control of Pneumonia</i>				
<ul style="list-style-type: none"> - Identify cases of suspected pneumonia to be referred to MSPAS health facility 	<ul style="list-style-type: none"> - CFs and CGVs will use the CR to identify as early as possible cases of ARI and track treatment 	<ul style="list-style-type: none"> - CGVs will educate caretakers about the seriousness and signs of ARIs and the need for urgent treatment 	<ul style="list-style-type: none"> - Train staff in CQI and QA activities as they relate to control of pneumonia 	<ul style="list-style-type: none"> - Trainings to improve skills of MPHSW health workers in Standard Case Management (SCM), supply chain management, and early detection and treatment of ARIs
<i>Control of Diarrheal Disease</i>				
<ul style="list-style-type: none"> - Distribute zinc supplements, oral rehydration salt (ORS) packets and liquid chlorine (for water purification) to households - Educate households on how to create their own hand washing stations - Refer cases of severe diarrhea 	<ul style="list-style-type: none"> - CFs and CGVs will use the CR to identify as early as possible suspected cases of diarrheal disease and monitor treatment 	<ul style="list-style-type: none"> - Educate households on diarrhea danger signs and prompt care, proper water storage and treatment, and proper hand washing behaviors - Health Committees will promote proper hygiene behaviors 	<ul style="list-style-type: none"> - Train staff in CQI and QA activities related to control of diarrheal disease 	<ul style="list-style-type: none"> - Health facility capacity building trainings on long-term supply chain management to ensure that MSPAS drugs reach appropriate health posts regularly to prevent shortage or stock-out of diarrhea treatment supplies
<i>Immunizations</i>				
<ul style="list-style-type: none"> - Care Group Volunteers (CGVs) will refer children needing immunizations to the MPHSW for vaccinations 	<ul style="list-style-type: none"> - CGVs will regularly review the CR to identify those who fall behind on scheduled immunizations 	<ul style="list-style-type: none"> - CGVs will educate caretakers on the importance of timely child immunizations 	<ul style="list-style-type: none"> - Staff will be trained in CQI and QA activities related to immunizations 	<ul style="list-style-type: none"> - Capacity building trainings of MSPAS staff to improve immunization supply management system

Appendix 3. Organizational and community staffing, Curamericas/Guatemala Integrated Project, both Phase Areas



Appendix 4. Institutional Review Board (IRB) approval for operational research



COMITÉ NACIONAL DE ETICA EN SALUD

COMITÉ NACIONAL DE ÉTICA EN SALUD DICTAMEN

No. Resolución 23-12
Fecha: 17 de abril 2012

Evaluación del Impacto del Programa de Salud Materno Infantil Basado en las Comunidad en los Municipios de San Sebastián Coatán, San Miguel Acatán, y Santa Eulalia en el Departamento de Huehuetenango, Guatemala, 2012-2015

Investigador Principal:

Henry Perry, Curamericas

Investigador Asociado:

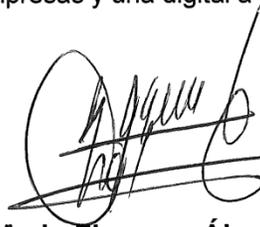
Dr. Mario Valdez

Colaborador:

Dr. Danilo Rodríguez Hernández,

DICTAMEN: Aprobado

Se considera que el estudio cumple con los requisitos técnicos y éticos para ser aprobado, se le solicita que si no se finaliza en un año, se requiere nueva aprobación y al finalizar el estudio se socialice y se presenten dos copias impresas y una digital a éste Comité.



Dr. Mario Figueroa Álvarez
Presidente Comité Nacional de Ética



c.c. Archivo

Translation:

National Committee of Ethics in Health

National Committee of Ethics in Health
Ruling

Resolution No. 23-12
Date: April 17, 2012

Evaluation of the Impact of the Program of Community-Based Maternal-Child Health
in the Municipalities of San Sebastián Coatán, San Miguel Acatán, and Santa Eulalia,
in Huehuetenango Department, Guatemala, 2012-2015

Principal Investigator:
Henry Perry, Curamericas

Associate Investigator:
Dr. Mario Valdez

Collaborator:
Dr. Danilo Rodriguez Hernández

Ruling: Approved

It is determined that the study fulfills the technical and ethical requirements to be approved and it is asked that if the study is not completed in one year, that a new approval be obtained, and on completion of the study the results are disseminated and two printed copies are presented to this Committee.

(Signed)
Dr. Mario Figueroa Álvarez
President, National Ethics Committee

Appendix 5. Endline KPC report

A. The full KPC report can be found at: <https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-5-Results-of-End-of-Project-KPC-Survey.pdf>

B. Results of Difference in Difference (DID) Analysis of KPC results.

Table I. Percentage changes baseline to endline for project indicators for both Phase Areas, p-values for comparison of baseline to endline percentage changes for the two Phase Areas, and whether the data indicate a confirmation of the hypothesis of a superior outcome in the Phase I Area

Outcome Indicator	PHASE 1 AREA			PHASE 2 AREA			p-value-comparison of percentage change from baseline to endline KPC for Phase 1 vs. Phase 2*	Hypothesis confirmed*
	Baseline KPC (n=299) Pctg. (95% CI)	Endline KPC (n=300) Pctg. (95% CI)	Percentage change baseline vs. endline (95% CI)	Baseline KPC (n=300) Pctg. (95% CI)	Endline KPC (n=300) Pctg. (95% CI)	Percentage change baseline vs. endline (95% CI)		
Maternal/newborn care								
At least 4 Quality Antenatal Care Checks during most recent pregnancy	13.4% (8.7, 18.1)	65.0% (59.5, 70.5)	385.5% (384.9, 385.1)	6.3% (2.9, 9.7)	53.3% (47.4, 59.2)	746.0% (745.9, 746.1)	0.000	NO
Tetanus Toxoid Immunization during most recent pregnancy	63.2% (56.5, 69.9)	67.7% (62.8, 72.6)	7.1% (7.0, 7.2)	63.0% (56.3, 69.7)	62.3% (56.9, 67.7)	-1.1% (-1.2,-1.0)	0.294	NO
Iron/folate for at least 90 days during most recent pregnancy	21.7% (16.0, 27.4)	64.3% (58.7, 69.9)	196.3% (196.2, 196.4)	10.0% (5.8, 14.2)	26.3% (20.7, 31.9)	163.0% (162.9, 163.1)	0.000	YES
Knowledge of at least 2 danger signs during pregnancy	22.1% (16.3, 27.9)	78.3% (73.5, 83.1)	254.3% (254.2, 254.4)	21.3% (15.6, 27.0)	66.3% (60.8, 71.8)	211.3% (211.2, 211.4)	0.000	YES
Last delivery in health facility (hospital, clinic, or Casa Materna)	16.4% (11.3, 21.5)	28.7% (23.6, 33.8)	75.0% (74.9, 75.1)	6.7% (3.2, 10.2)	13.0% (9.2, 16.8)	94.0% (93.9, 94.1)	0.001	NO
Essential New born Care during last delivery (clean umbilical cord care, IBF, thermal care)	6.0% (2.7, 9.3)	39.0% (33.5, 44.5)	550.0% (549.9, 550.1)	5.0% (2.0, 8.0)	31.0% (25.8, 36.2)	520.0% (519.9, 520.1)	0.000	YES
Active Management of Third Stage of Labor during most recent delivery	9.4% (5.4, 13.4)	20.0% (15.5, 24.5)	112.7% (112.6, 112.8)	7.0% (3.5, 10.5)	11.0% (7.4, 14.6)	57.1% (57.0, 57.2)	0.000	YES
Knowledge of at least 2 danger signs during delivery	13.4% (8.7, 18.1)	66.3% (61.0, 71.6)	394.8% (394.6, 394.9)	13.3% (8.6, 18.0)	53.7% (48.1, 59.3)	303.7% (303.6,303.9)	0.000	YES
Postpartum visit for the mother and newborn within 48 hrs after delivery	22.4% (16.6, 28.2)	39.0% (33.2, 44.8)	74.1% (74.0, 74.2)	16.0% (10.9, 21.5)	18.3% (14.0, 22.6)	14.4% (14.2, 14.5)	0.000	YES
Knowledge of at least 2 postpartum danger signs	17.1% (11.9, 22.3)	66.3% (60.8, 71.8)	287.7% (287.6, 287.8)	18.7% (14.3, 25.1)	54.3% (48.5, 60.1)	190.4% (190.2, 190.4)	0.000	YES

Outcome Indicator	PHASE 1 AREA			PHASE 2 AREA			p-value-comparison of percentage change from baseline to baseline KPC for Phase 1 vs. Phase 2*	Hypothesis confirmed*
	Baseline KPC (n=299) Pctg. (95% CI)	Endline KPC (n=300) Pctg. (95% CI)	Percentage change baseline vs. endline (95% CI)	Baseline KPC (n=300) Pctg. (95% CI)	Endline KPC (n=300) Pctg. (95% CI)	Percentage change baseline vs. endline (95% CI)		
Maternal/newborn care								
Knowledge of at least 2 neonatal danger signs	27.4% (21.2, 33.6)	64.7% (59.2, 70.2)	136.1% (136.0, 136.2)	29.7% (23.4, 36.0)	58.7% (53.0, 64.4)	97.6% (97.5, 97.7)	0.000	YES
Knowledge of at least 2 risks associated with pregnancy intervals <24 Months	6.4% (3.0, 9.8)	46.7% (41.1, 52.3)	629.6% (629.6, 629.8)	12.0% (7.5, 16.5)	33.7% (28.4, 39.0)	180.8% (180.7, 180.9)	0.000	YES
Current modern contraceptive use among non-pregnant women	35.8% (29.1, 42.5)	34.0% (28.6, 39.4)	-5.0% (-5.1%, -4.9%)	27.0% (19.8, 32.2)	25.0% (20.1, 29.9)	-7.4% (-7.5, -7.3)	0.751	NO
Birth interval < 24m between most recent 2 deliveries	25.1% (18.8, 31.4)	18.7% (14.3, 23.1)	-25.5% (-25.6, -25.4)	25.7% (19.6, 31.8)	25.0% (20.1, 29.9)	-2.7% (-2.8, -2.6)	0.001	YES
Child nutrition								
Exclusive breastfeeding (children 0-5 months) in past 24 hrs	75.0% (63.7, 86.3)	82.0% (74.0, 90.0)	9.3% (9.2, 9.5)	79.2% (67.7, 90.7)	71.6% (61.8, 81.4)	-9.6% (-9.8, -9.4)	0.152	NO
Vitamin A Supplementation for Child 6-23 months in last 6 months	79.1% (72.4, 85.8)	74.3% (68.4, 80.2)	-6.1% (-6.2, -5.9)	73.7% (66.7, 80.7)	67.1% (60.9, 73.3)	-8.9% (-9.1, -8.8)	0.732	NO
Proper Infant Young Child Feeding (children 6-23 months)	53.0% (44.8, 61.2)	74.3% (68.4, 80.2)	40.2% (40.0, 40.3)	56.1% (48.2, 64.0)	65.3% (50.0, 71.6)	16.4% (16.2, 16.5)	0.010	YES
Treatment of pneumonia								
Children with cough and rapid/difficult breathing in the 2 weeks previous to the interview.	25.8% (19.7, 31.9)	20.7% (14.6, 26.8)	-19.8% (-19.8, -19.6)	26.0% (19.9, 32.1)	19.3% (13.2, 25.4)	-25.7% (-25.9, -25.6)	0.559	NO
Appropriate care seeking for child with symptoms of pneumonia/ARI	26.0% (14.0, 38.0)	51.6% (39.6, 63.6)	98.4% (98.2, 98.7)	20.5% (9.5, 31.5)	46.6% (35.6, 57.6)	127.3% (127.1, 127.5)	0.328	NO
Treatment and prevention of diarrhea								
Children with diarrhea episode in the 2 weeks preceding the interview	40.1% (33.3, 46.9)	34.3% (28.9, 39.7)	-14.4% (-14.6, -14.3)	39.8% (33.0, 46.6)	39.0% (32.2, 45.8)	-2.0% (-2.1, -1.8)	0.117	NO**
ORT use (or recommended home fluids) during a diarrheal episode	28.3% (18.4, 38.2)	40.8% (31.3, 50.3)	44.1% (43.9, 44.3)	30.5% (20.3, 40.7)	40.2% (31.3, 49.1)	31.8% (31.6, 32.0)	0.326	NO**
Increased fluid intake during a diarrheal episode	7.5% (1.7, 13.3)	18.4% (11.0, 25.8)	145.3% (145.2, 145.5)	7.6% (1.7, 13.5)	16.2% (9.6, 22.8)	113.1% (113.0, 113.3)	0.000	YES
Increased food intake during a diarrheal episode	0.0%	0.0%	0% (0%, 0%)	2.5% (-1.0, 6.0)	5.1% (1.1, 9.1)	104.0% (103.9, 104.1)	0.000	NO
Zinc Treatment for Diarrhea	6.7% (1.2, 12.2)	10.7% (4.8, 16.6)	59.7% (59.6, 59.8)	1.7% (-1.2, 4.6)	10.3% (7.4, 13.2)	505.9% (505.8, 506.0)	0.000	NO
Regular point of use water treatment	66.6% (60.1, 73.1)	97.7% (96.0, 99.4)	46.7% (46.6, 46.8)	58.3% (51.5, 65.1)	97.7% (95.9, 99.5)	67.6% (67.4, 67.7)	0.000	NO
Safe water storage	11.7% (7.2, 16.2)	28.0% (22.9, 33.1)	139.3% (139.2, 139.4)	10.3% (6.1, 14.5)	26.0% (21.0, 31.0)	152.4% (152.3, 152.5)	0.037	NO
Safe disposal of child's feces the last time he/she defecated	43.1% (36.2, 50.0)	45.0% (39.4, 50.6)	4.4% (4.2, 4.5)	38.7% (32.0, 45.4)	52.0% (46.3, 57.7)	34.4% (34.2, 34.5)	0.000	NO
Appropriate hand washing station n home (with water, soap, recipient)	2.3% (0.2, 4.4)	44.7% (39.1, 50.3)	1843.4% (1843.3, 1843.6)	2.3% (0.2, 4.4)	44.0% (38.4, 49.6)	1813.0% (1812.9, 1813.1)	0.000	YES

Outcome Indicator	PHASE 1 AREA			PHASE 2 AREA			p-value-comparison of percentage change from baseline to endline KPC for Phase 1 vs. Phase 2*	Hypothesis confirmed*
	Baseline KPC (n=299) Pctg. (95% CI)	Endline KPC (n=300) Pctg. (95% CI)	Percentage change baseline vs. endline (95% CI)	Baseline KPC (n=300) Pctg. (95% CI)	Endline KPC (n=300) Pctg. (95% CI)	Percentage change baseline vs. endline (95% CI)		
Maternal/newborn care								
Hand washing at the 4 critical times: after defecating, before preparing food, after cleaning a child, before feeding a child	1.3% (-0.3, 2.9)	34.0% (28.6, 39.4)	2515.4% (2515.3, 2515.5)	1.7% (-0.1, 3.5)	28.7% (18.3, 38.3)	1588.2% (1588.1, 1588.3)	0.000	YES
Childhood immunizations								
Measles Immunization children 12-23 months	79.3% (70.5, 88.1)	64.8% (56.4, 73.2)	-13.7% (-13.9, -13.6)	78.9% (70.8, 87.0)	55.5% (46.6, 64.4)	-29.6% (-29.8, -29.5)	0.159	NO
Complete vaccination coverage children 12-23 months (BCG, PENTA 1-3, polio 1-3, measles)	73.6% (64.0, 83.2)	56.6% (47.8, 65.4)	-27.2% (-27.3, -27.0)	68.7% (59.5, 77.9)	50.4% (41.4, 59.4)	-26.6% (-26.8, -26.4)	0.965	NO

* Hypothesis is confirmed if (1) the absolute change from baseline to endline for the Phase I Area is statistically significant in the desired direction (generally an increase except for diarrhea, ARI incidence, and percentage of women with short birth intervals); and (2) the percentage change from baseline to endline for the Phase I Area is significantly greater than the baseline to endline percentage change for the Phase 2 Area.

**Insufficient sample-size/power to detect significant difference

Appendix 6: Evaluation of the Project’s nutrition intervention

A. The full Nutrition Study report can be found at:

<https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-6-Analysis-of-Project-Nutrition-Intervention-and-Results.pdf>

B. Supplemental tables and figures.

Table I. Coverage of anthropometric “censuses” (“barridos”) by Phase Area

Date of census	No. of children 0-23 months of age who were weighed and measured		Total population of children 0-23 months of age (per CBIO Community Registers)		Pctg of children 0-23 months of age who were weighed and measured	
	Phase 1 Area communities	Phase 2 Area communities	Phase 1 Area communities	Phase 2 Area communities	Phase 1 Areas communities	Phase 2 Areas communities
June 2013	2,093	0	2,093	NA	100%	NA
Sept 2013	2,093	0	2,093	NA	100%	NA
Jan 2014	2,197	0	2,197	NA	100%	NA
Aug 2014	2,401	2,198	2,548	2,215	94%	99%
Nov 2014	2,194	2,051	2,367	2,147	93%	96%

Figure I. Changes in percentage of under-two children classified as stunted by Phase of community between January 2012 and June 2015 (data from KPC and household surveys and from anthropometric “censuses” (barridos))

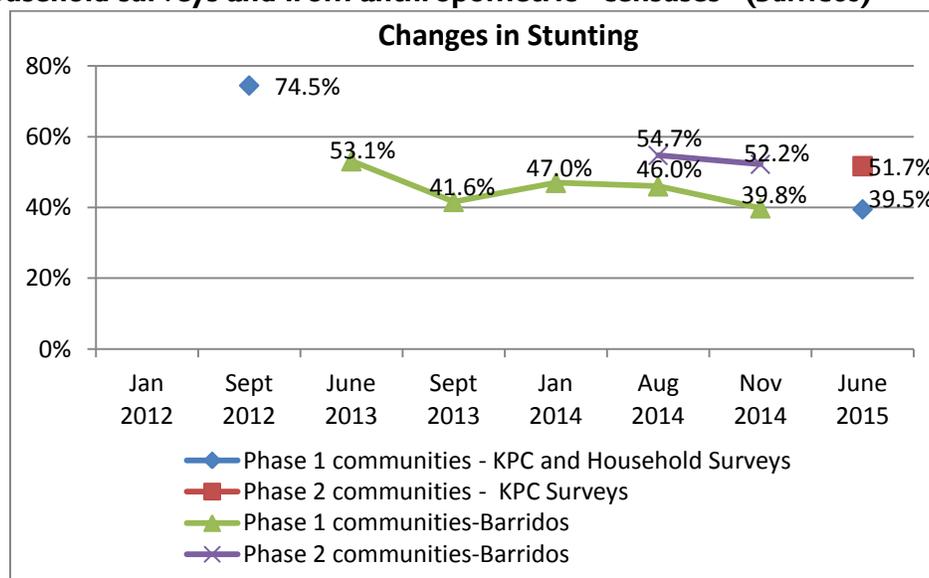


Figure 2. Changes in percentage of children younger than 2 years of age classified as underweight, by Phase Area of community, between January 2012 to June 2015, based on data from KPC and household surveys and from anthropometric “censuses” (barridos)

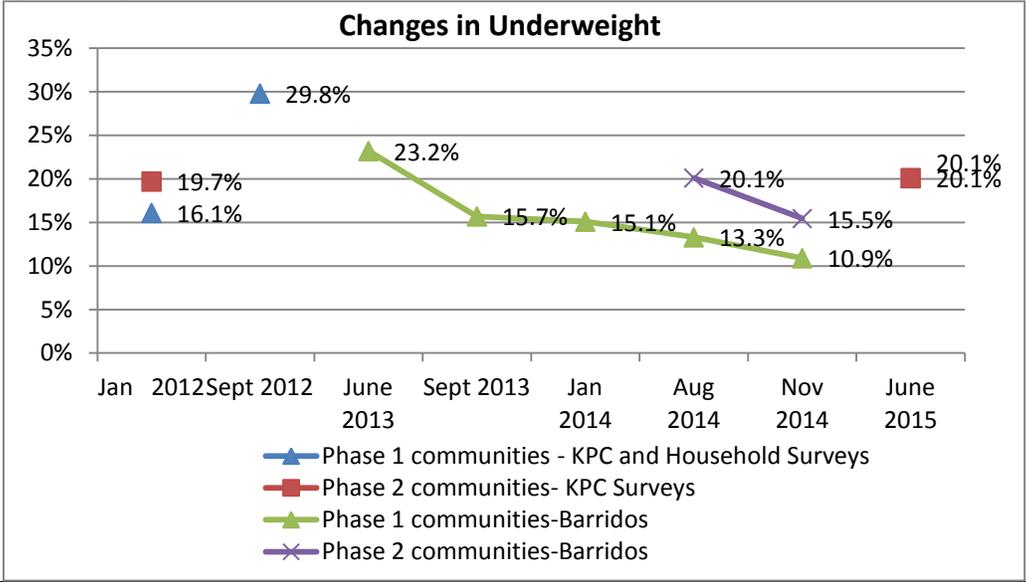
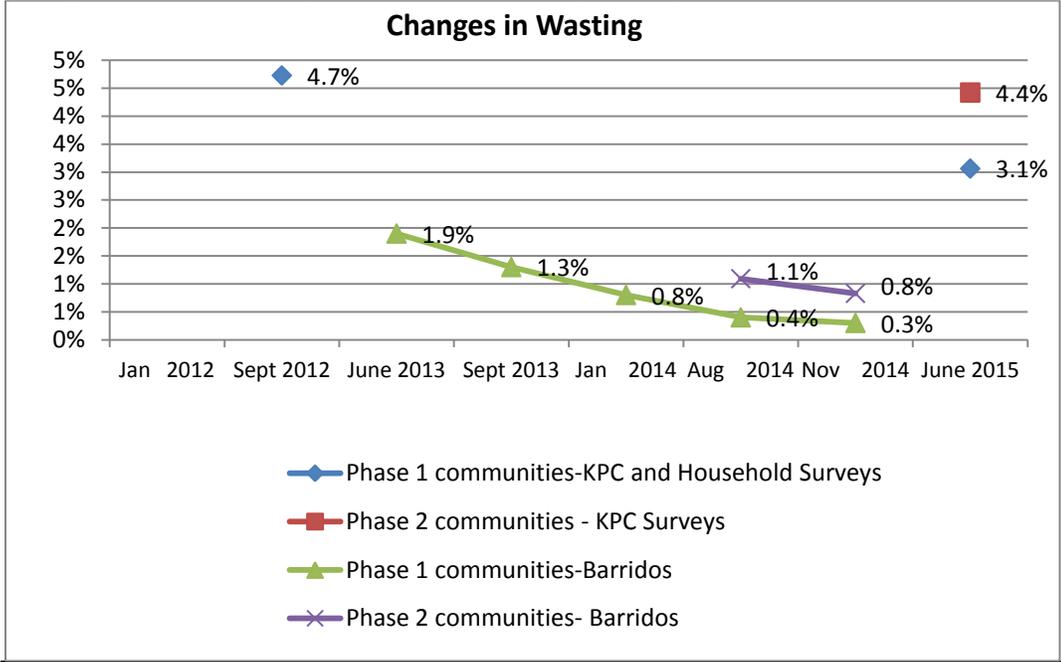


Figure 3 - Changes in percentage under-two children classified as wasted, by Phase of community, between January 2012 and June 2015 based on data from KPC and household surveys and from anthropometric “censuses” (barridos)



Appendix 7. Analysis of vital events data

The full Vital Events report can be found at:

<https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-7-Analysis-of-Project-Vital-Events.pdf>

Appendix 8. Operational research on women's empowerment

The full Women's Empowerment report can be found at:

<https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-8-Operational-Research-on-Womens-Empowerment.pdf>

Appendix 9. Qualitative analysis of Care Group implementation

The full Care Group study can be found at:

<https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-9-Qualitative-Analysis-of-Care-Group-Implementation.pdf>

Appendix 10. Assessing the ability of CBIO + Care Groups to increase community solidarity and to align the communities' perception of their health priorities with the actual epidemiological priorities

The full Community Solidarity study can be found at:

<https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-10-Assessment-of-Community-Solidarity-and-Perception-of-Health-Priorities.pdf> .

Appendix 11. End of Phase 1 Research. Linking of the community-based, impact-oriented methodology with Care Groups: An approach to effective primary health care programming

The full Phase 1 CBIO + Care Groups assessment study can be found at:

<https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-11-Phase-1-Assessment-of-CBIOCare-Group-Methodology.pdf>

Appendix 12. End of Phase 2 research on CBIO + Care Group advantages and disadvantages: Interviews with community-level Project staff, *Educadoras*, and Ministry of Public Health and Social Welfare municipality staff

The full end of Phase 2 CBIO + Care Groups study can be found at:

<https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-12-End-of-Project-Assessment-of-CBIOCare-Group-Methodology.pdf>

Appendix 13. Integration of Extension of Coverage Program (*Programa Extensión de Cobertura, or PEC*) into the Child Survival Project

The full PEC study can be found at:

<https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-13-Effects-of-the-Integration-of-the-Extension-of-Coverage-Program.pdf>

Appendix 14. TRACtion case study of the *Casas Maternas*

A. The full *Casa Materna* Case Study can be found at:

<https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-14-Casa-Materna-Case-Study.pdf>

B. Supplemental figures from the *Casa Materna* Case Study

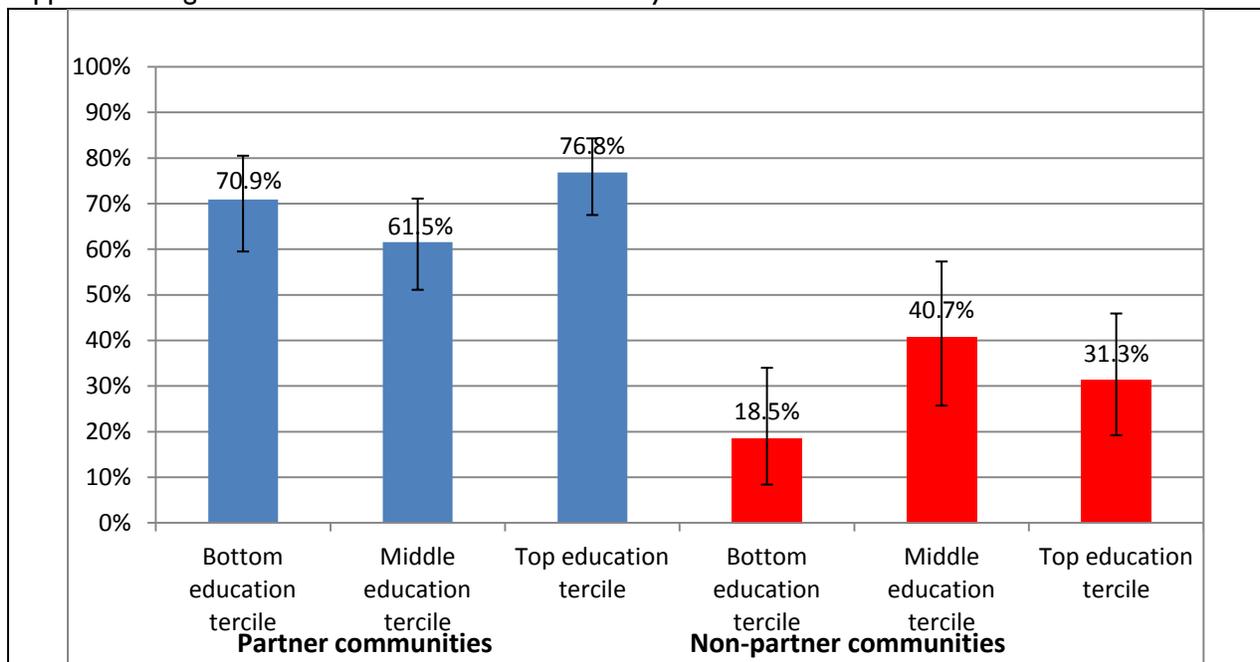


Figure 1. Percentage of deliveries occurring in health facility by education tertile and by partner versus non-partner communities

Note: 95% confidence intervals shown

The bottom education tertile is no education; the middle tertile is 1-3 years, and the top tertile is 4+ years

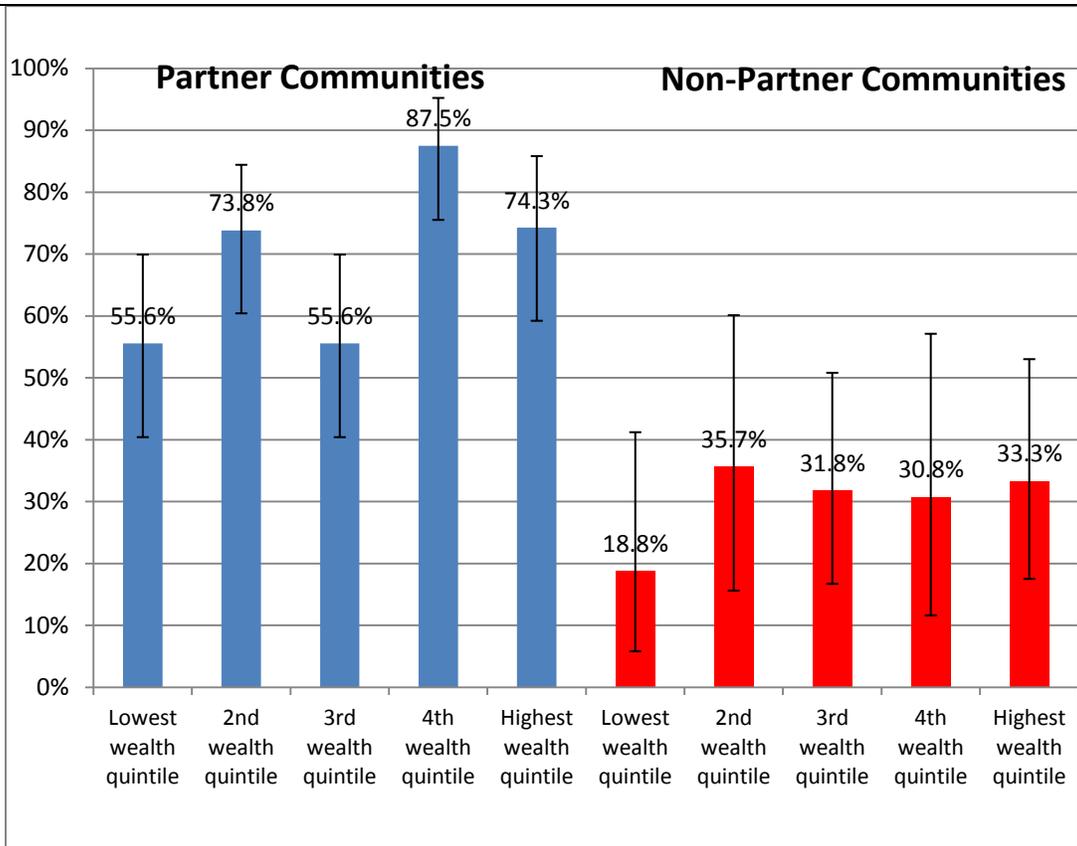


Figure 2. Wealth quintile of women obtaining a health facility delivery by their residence in a partner versus a non-partner community

Note: 95% confidence intervals shown

Appendix 15. Summary of census of *Comadronas*

A summary of the findings of the *Comadrona* census can be found at:

<https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-15-Comadrona-Census.pdf>

Appendix 16. Integrating *Comadronas* into the rural health system

The full Phase I *Comadrona* study can be found at:

<https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-16-Changing-Role-of-Comadronas.pdf>

Appendix 17. Assessment of the transition of *Comadronas* into a new role of collaboration with *casas maternas*

The full end of Phase 2 *Comadrona* study can be found at:

<https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-17-Assessment-of-Transition-of-Comadronas-into-New-Role.pdf>

Appendix 18. Cost study of the Child Survival Project

The full Cost Study can be found at:

<https://www.curamericas.org/wp-content/uploads/2016/01/Appendix-18-Cost-Analysis-of-CBIOCGCasa-Materna-Project.pdf>

Appendix 19. The CBIO “People’s Manual” (in Spanish)

<https://www.curamericas.org/wp-content/uploads/2016/01/MBCOI-POPULAR-FINAL-22-08-14.pdf>