



# Mother-To-Mother: Evaluation of The Sustainability of A Peer Model to Communicate Nutrition Messages in Mozambique

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## Summary

### BACKGROUND

Over the past twenty-five years, Africa had experienced the smallest relative decrease of child undernutrition in any world region. Many aid organizations were redirecting efforts and resources to supporting community - based initiatives such as Community Health Work (CHW).

### AIM / OBJECTIVES

While peer models showed short term hope, there was limited long-term evidence. The study expounded upon an evaluation on a health promotion program using the Care Group Model.

The objective of this research was to examine the sustainability of health gains associated with the use of CHWs via a Care Group Model as a health promotion strategy in the USAID-funded Child Survival Program in Mozambique five years after the program ended.

### METHODOLOGY

The program was implemented from 2005 to 2010 in Sofala Province, Mozambique. The present study extended the 2010 evaluation through additional data collection in 2015 with 506 participants in th study. Data analysis was done using SPSS and Anthro for behavioral and Anthropometric data entries respectively. Frequencies, Chi-square, Cross - tabulations, and measures of central tendency (i.e., mean) were calculated using SPSS.

Initial evaluation of the program, consisted of baseline and endline questionnaires of knowledge, practices, and coverage (KPC questionnaires) this was conducted in February 2006 and June 2010, respectively. This second endline study was conducted in July 2015

### RESULTS

The data collected showed that, statistically, significant program gains were sustained in 10 out of the 13 indicators during the follow-up period from 2010 to 2015. Non reverted to their 2005 level nor below.



**The total number of direct beneficiaries in the Manga district at the end of the project in 2010 was 7,200 women. The original Care Group Model program was implemented from 2005 to 2010 by Food for the Hungry / Mozambique (FH/M) in Sofala Province.**

## CONCLUSION

**Without any external financial support or training, Care Group Volunteers remained important sources of information for community residents and program impact largely sustainable.**

*Key words:* Child malnutrition, evaluation, Care Group Model, sustainability

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## Introduction

Despite the important progress made in reducing the global burden of undernutrition in the last decade, the nutritional state of the world is, in many aspects, deplorable. According to the World Health Organization, 5.9 million children under the age of five died in 2015. Particularly children in sub-Saharan Africa were 14 times more likely to die before their 5th birthday than children in developed world [1].

Undernutrition has been a substantial barrier to reducing under-five mortality and reaching Millennium Development Goal as nutrition - related factors contribute to approximately 45% of deaths. Over the past twenty - five years, Africa has experienced the smallest relative decrease of any world region in child undernutrition, as measured by a poor child growth.

Between 1990 and 2014, under-weight prevalence on the continent decreased from 23% to 16%. Thus, while Asia, Latin America and the Caribbean would most likely meet their Millennium Development Goal related to underweight. Africa has fallen short of meeting about half of the targeted reduction in underweight children [4].

In Mozambique, while there has been a drop in under - five mortality from 233 per 1,000 live births in 1990 to 87 per 1,000 in 2013, the nutritional status of young children has remained poor, with 43% stunted and 16% underweight [5].

Children living in rural areas of the country notwithstanding were more likely to experience malnutrition. Compared to their counterparts living in urban areas, children living in northern and central

areas of the country were nutritionally worse off than those living in southern Mozambique [6].

In addition, to these geographic factors, socio-cultural factors also contribute to malnutrition in Mozambique. These include poverty, access to improved sanitation and safe water, and mother's education level.

In 2011, stunting was reported in 51% of children in the poorest quintile and in 24% of children in the richest quintile. Stunting was reported in 47% of children with no toilet facility compared to 12% of those with flush toilets. In addition, 47% of children whose mothers had no formal education were stunted compared with 27% of those whose mothers had secondary education or more [6].

By then, many bilateral and multilateral aid organizations were redirecting efforts and resources to supporting community-based initiatives. Among the community-based initiatives supported by these donor organizations was the use of Community Health Workers (CHWs) [7, 8].

Health promotion interventions delivered by CHWs were specifically considered a promising way to reach out to women and children in rural communities. In resource-poor nations, where gender role segregation was more prominent, there was need to give more emphasis to women with greater influence on family health matters. In such settings, women play major roles in childcare, food selection and preparation, hygiene and sanitation [8,9,10].

CHW programs can significantly impact on rates of child and newborn mortality. They have been successfully utilized to promote exclusive breast feeding, distribute family planning supplies including



birth control pills and condoms, supervise antiretroviral therapy for HIV patients, provide rapid diagnostic tests for malaria, and encourage the use of mosquito bed nets, among others [7, 11].

A certain type of CHW program, utilizing participatory groups of mothers, known as the Care Group Model, had shown specific promise in Mozambique (see Methods for full description). There is evidence that Care Groups can reduce childhood undernutrition and reduce the prevalence of diarrhea, in turn, reducing under-5 mortality [12, 13, 14].

The Care Group Model (CGM) has also been proven effective at increasing coverage for high impact interventions including antenatal care visits, tetanus toxoid vaccination, multiple micronutrient supplementation, complementary feeding, hand washing with soap, oral rehydration therapy, oral antibiotics for pneumonia, and malaria treatment [15].

While peer models have shown promise in the short term, there is limited evidence related to the sustainability of impacts [16]. Conducting longer-term outcome evaluation research will add to the findings and recommendations for public health, and contribute to a movement toward creating a broader understanding of global sustainability of health promotion efforts. Therefore, the objective of this research was to examine the sustainability of health gains associated with the use of CHWs via a Care Group Model as a health promotion strategy in the USAID-funded Child Survival Program in Mozambique five years after the program ended [13,14].

## Materials and Methodology

The original Care Group Model program was implemented from 2005 to 2010 by Food for the Hungry / Mozambique (FH/M) in Sofala Province. Detailed methods and procedures were described elsewhere [12,13].

Program services (Peer Education sessions via Care Group Volunteers) were first introduced in 2005 in “Area A” which consisted of four rural districts in the province: Caia, Chemba, Manga, and Marringue. It was later introduced in “Area B” which included additional neighboring districts.

These districts had high levels of undernutrition and low access to health services or child-survival programming. The majority of residents were

subsistence farmers. Pregnant women and mothers of children younger than 24 months old were organized into groups of 12 and asked to nominate a Care Group Volunteer (CGV) for each group to promote health behaviors to other mothers. These behaviors were focused on nutrition and health promotion:

- a. Promoting breastfeeding
- b. Vitamin supplementation
- c. Food safety
- d. Correct preparation of oral re-hydration therapy
- e. Promoting deworming
- f. Hand washing
- g. and when to seek medical care).

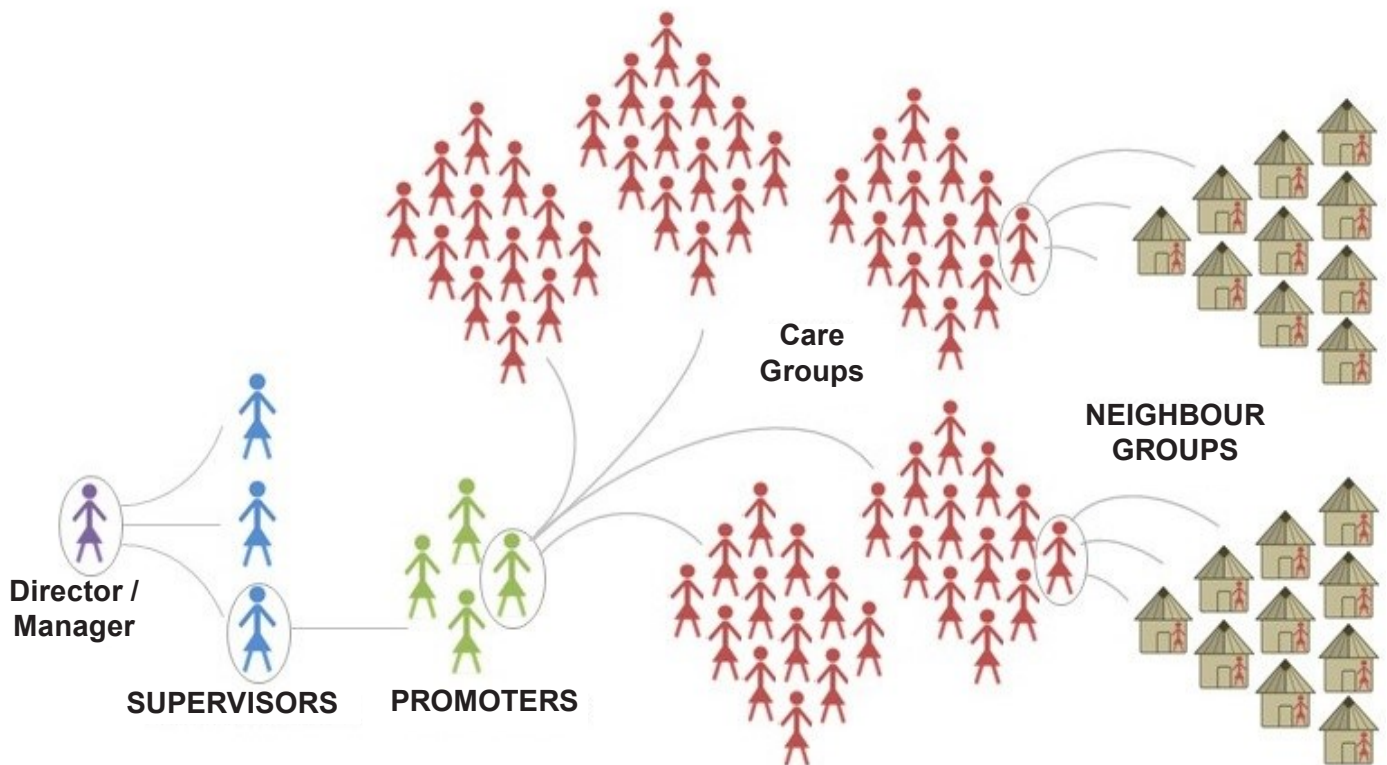
CGVs met bi-weekly with a salaried promoter to be trained in health education topics and skills. Each salaried promoter was responsible for between four and nine Care Groups and each group consisted of ten to 15 CGVs who would do outreach with ten to 15 mothers in the community (*Figure 1*).

Initial evaluation of the program, was described by Perry and colleagues (2013), consisting baseline and endline questionnaires of knowledge, practices and coverage (KPC questionnaires). The baseline and endline questionnaires were conducted with approximately 200 beneficiaries (women) in Area A. Anthropometric data was collected from approximately 300 children at both time points (2006 and 2010) [14].

Since the termination of the Care Groups in 2010, the women who had worked as CGVs received no additional training in the health topics included in the original program. There were no additional programmatic inputs for CGVs after the end of the Care Group program in 2010. Whether the CGVs maintained their roles in the community, continued providing health education to their neighbors, or were valued sources of information is unknown.

The present study extended the 2010 evaluation (“Endline 1”) through additional data collection in 2015 (“Endline 2”) with women who had been registered beneficiaries of the program in one district of Area A. Only the Manga district of Area A was included in the present Endline 2 study, primarily due to logistical and security concerns in other districts.

The total number of direct beneficiaries in the Manga district at the end of the project in 2010 was 7,200 women. To detect the sustainability of health gains from



the implementation of the project, the formula provided by Fleiss was used to determine sample size. Assuming approximately 50% of the participants gave birth in the four years prior to the survey, a simple random sample required 309 respondents from across the district. This was increased to 500 to accommodate an estimated 5% non-response rate and for sufficient power in analysis of *anthropometric* measures [17].

The interview methodology replicated the 2010 Endline 1 study [12] for full description). Mothers in each household completed a 72-item KPC questionnaire in Portuguese (the local language) and *anthropometric* measures were collected from children using scales and tape measures. The questionnaire assessed feeding practices, vitamin A supplementation, deworming, nutritional monitoring, and care of children with diarrheal diseases. Medical cards held by the mothers regarding the medical history of the child index were used to confirm responses. The questionnaire and *anthropometric* data used in this study was collected by trained staff of a non-governmental organization that was involved with the original Care

Group Model intervention. Staff were trained in the use of *anthropometric* measurement tools, ethical considerations of human subjects research and simple survey research methodology.

## Data Analysis

Data were entered into statistical software databases, SPSS (*Version 21*) and WHO *anthropometric* software Anthro (*Version 3.2.2*) and reviewed for range and consistency. SPSS and Anthro were used for behavioral and *anthropometric* data entries respectively. Frequencies, *chi-square*, cross-tabulations, and measures of central tendency (i.e., mean) were calculated using SPSS. Anthro was used to calculate the percentage underweight or undernutrition (weight-for-age).

All study methods were reviewed and approved for compliance with ethical standards by the Institutional Review Board at the authors' university in the United States. Informed consent was obtained from all research participants, with at least one week's notice given to all potential participants to consider their decision regarding participation.



## RESULTS

A total of 517 participants completed questionnaires. Out of these group, 11 were removed due to incomplete data or data collection errors and three cases were males, leaving 506 respondent-child dyads for analysis. Among all participants, 93.2% were the biological mother of the “index child” referred to in the questionnaire. The mean age of respondents was 27.2 years (range 14 – 62 years) and the mean age of index children was 23.4 months (range 0 - 60.5 months). Among respondents, 63% reported having attended a school (either including or past Grade 1). Among the participants interviewed, 93.7% said they have access to safe drinking water from a pipe and tap. 84.6% said they purified their water.

When asked about their hand washing practices, 85.4% washed hands with soap or ash before preparing food, 69.2% after defecating, 63.4% before feeding children, and 38.7% after taking care of a child’s stool. In addition, 66.4% said they had a place for hand washing, 78.4% reported using latrines, diapers, or potty, and 13% said the child defecated outside the house or in an open field.

### Sharing Health Messages by CGV

Among all participants, 60.7% said they had received at least one in-home visit from a CGV in the last two weeks. Almost 60% said they had received at least one in-home visit from a CGV during labor, delivery, and/or the postpartum period.

When asked about sources of health information 66.6% of respondents said they had received nutrition and health advice from a CGV and 63.6% said they see CGVs as a general source of health information. When asked if the person who takes care of the child in the absence of the mother had received any health message from a CGV, 57% said that person had also heard health information from a CGV.

### Nutritional Outcomes

In 2006, 25.9% of index children in the study were underweight. This was cut by nearly one-third during the program period (to 17.8%) and an additional small decrease (to 15.8%) was seen in the follow-up period between the 2010 and 2015 endline studies. Thus, the *anthropometric* improvements made during

the program period were maintained after the externally funded program ended. See Table 1 for comparisons of 2006, 2010, and 2015 data for this and all subsequent indicators.

### Feeding Practices

All gains achieved during the program period from 2006 to 2010 in the five indicators related to feeding practices were maintained during the follow-up period through 2015 with statistical significance. From 2006 to 2015, exclusive breastfeeding of infants less than 6 months old increased by 173%. Feeding of babies age 9-23 months at least three meals per day increased by 145%. Addition of oil to the weaning food of babies age 6-23 months increased by 154% and consumption of Vitamin A-rich foods in this age group increased by 127%. Adequate feeding of babies less than 2 years old who had diarrhea in the past two weeks increased by 161%.

### Vitamin A Supplementation, Deworming, and Nutritional Monitoring

Provision of vitamin A capsules to children ages 12-23 months increased by 14.1% from 2006 to 2015. Use of deworming medication for children ages 12-23 months significantly increased by 166% from 2006 to 2015. A slight decrease was seen in the proportion of children who were weighed in the past four months from 2010 to 2015. Although the 2005 to 2015 difference showed an increase in this proportion from Baseline to the Endline 2 data collection, the increase was not statistically significant.

### Diarrheal Disease and Management

The proportion of children age 0-23 months with diarrhea in the previous two weeks who had been given Oral Rehydration Solution (ORS) or recommended home fluids decreased between the first and second endline studies. Although the cumulative 2006 to 2015 difference for this indicator showed an overall increase from Baseline to the Endline 2 data collection of 19%, the increase was not statistically significant. From 2006 to 2015, there was a statistically significant 102% increase in the proportion of respondents who



could verbally describe how to correctly prepare ORS. There was a statistically significant 2,850% increase in the proportion of respondents who reported that they washed their hands correctly at four appropriate times (before preparing food, before eating, after defecating, and after attending to a child who has defecated) and a

statistically significant increase of 82% in the proportion of respondents who reported using effective methods of water purification.

*Table 1* shows the sustained improvements in several nutritional and behavioral indicators between the Baseline, Endline 1, and Endline 2 measurements.

**Table 1:** Baseline, Endline 1 and 2, and Difference Measures in Nutritional and Behavioral Outcomes

	Area A	Area Sub-A (Manga district)	Difference 2006- 2010	Percentage points (% change)	Difference 2010-2015 Percentage points(% change)	Difference 2006-2015 Percentage points (% change)
	Baseline (2006)% (95%CI)	Endline 1 (2010)% (95%CI)	Endline 2 (2015)% (95% CI)			
Children 0-23 m who were underweight (WAZ < -2.0 SD)	25.9(22.1-29.7)	17.8(14.5-21.0)	15.8(11.6-20.0)	-8.1(-31.3%)	-2.0(-11.2%)	-10.1(-39.0%)
Infants 0-5 m who were fed only breast milk in the last 24 hours	23.9(11.1-36.7)	74.5(61.5-87.4)	65.3(54.6-76.1)	+50.6(+211.7%)	-9.2(-12.3%)	+41.4(+173.2%)
Children 9-23 m who received food other than liquids at least 3 times/day	31.2(22.4-40.0)	75.7(67.7-87.4)	76.3(69.6-83.0)	+44.5(+142.6%)	+0.6(+0.8%)	+45.1(+144.6%)
Children 6-23 m with oil added to their weaning food	36.2(27.7-44.5)	86.9(81.3-92.5)	91.9(88.1-95.7)	+50.7(+140.1%)	+5.0(+5.6%)	+55.7(+153.9%)
Children 6-23 m who consumed at least one Vitamin A-rich food in the previous day	30.5(22.5-38.5)	58.7(50.7-66.6)	69.2(62.8-75.5)	+28.1(+92.5%)	+10.5(+17.9%)	+38.7(+126.9%)
Children 0-23 m with diarrhea in the last 2 weeks who were offered the same amount of, or more, food during the illness	32.4(20.9-43.8)	83.3(71.6-95.1)	84.6(70.7-98.5)	+51.0(+157.4%)	+1.3(+1.6%)	+52.2(+161.1%)



**Table 1: Baseline, Endline 1 and 2, and Difference Measures in Nutritional and Behavioral Outcome**

Children 12-23 m who received one Vitamin A capsule in the past 6 months (card-confirmed or mother's report)	82.2(74.2-90.3)	93.6(88.6-98.7)	93.8(89.7-98.0)	+11.4(+13.9%)	+0.2(+0.2%)	+11.6(+14.1%)
Children 12-23 m who received deworming medication in the last 6 months (mother's report)	28.6(18.7-38.4)	78.7(69.2-88.2)	76.0(68.6-83.3)	+50.1(+175.2%)	-2.7(-3.4%)	+47.4(+165.7%)
Children 0-23 m who were weighed in the last 4 months (card-confirmed)	73.1(66.0-80.1)	88.2(83.3-93.1)	83.3(78.9-87.7)	+15.2(+20.8%)	-4.9(-5.6%)	+10.2(+14.0%)
Children 0-23 m with diarrhea in the last 2 weeks who received ORS and/or RHF	58.0(46.0-69.9)	93.3(85.8-100.9)	69.2(51.5-87.0)	+35.4(+61.0%)	-24.1(-25.8%)	+11.2(+19.3%)
Mothers of children 0-23 m who could correctly prepare ORS	43.5(36.1-50.9)	84.7(79.6-89.8)	87.9(83.5-92.2)	+41.2(+94.7%)	+3.2(+3.8%)	+44.4(+102.1)
Mothers of children 0-23 m who reported that they wash their hands with soap/ash before preparing food, before eating, after defecating, and after attending to a child who has defecated	1.0(-0.4-2.4)	50.5(43.3-57.7)	29.2			
<b>(23.3-35.2)</b>	+49.5(+4,950%)	-21.3(-42.2%)	+28.2(+2,820%)			
Mothers of children 0-23 m who reported that they purify their water using any effective method (by boiling or using point-of-use water purification)	41.1(31.2-50.9)	85.4(79.8-91.1)	74.7(69.0-80.3)	+44.3(+107.8%)	-10.7(12.5%)	+33.6(+81.8%)

*Note: Bold type indicates statistical significance ( $p < 0.05$ ).*



## Discussion

These data show that, the health gains documented in 2010 were largely sustained over the follow-up period from 2010 to 2015. In fact, statistically significant program gains were maintained in 10 of the 13 health indicators re-measured in 2015 and no indicators reverted to their 2006 level or below. These findings suggested that the Care Group Model may be used in future for both improving and sustaining health status achievements.

In the first study of the Care Group Model in Mozambique, researchers identified structural elements essential to the success of the Care Group Model during the active phase. [13, 14].

These included:

- (a) Delivering scale or large coverage health education delivered to all targeted households.
- (b) Employing a salaried promoter to oversee multiple Care Groups.
- (c) Recruiting volunteers to model health behaviors and provide health education to participants. The volunteers who delivered this peer counseling, modeled the key maternal and child health messages were selected by their peers (a group of 12 neighbors) and likely to be “hubs” in their social network. This approach was supported by research suggesting that, the use of nominated friends as health educators lead to an increase in adoption of health behaviors [18].
- (d) The power of the iterative and consistent nature of the Care Group Model. Meeting bi-weekly allowed for dozens of “doses” of information, allowing new information to be acquired gradually and repeatedly as needed [10].

The results of the first endline study in 2010 showed high levels of consistency among volunteers with 96% of Care Group Volunteers delivering services throughout the duration of the project.

To achieve evident-based reductions in maternal and child mortality, ensuring sustainability of those health gains will require approaches that are cost-effective, replicable, and sustainable over the longer term [14,19].

Therefore;

- i) engaging community members as the main stakeholders,
- ii). empowering women of child bearing age and care givers of young children,
- iii). reaching a high proportion of community members with simple but effective health education messages that encourage healthy behaviors,
- iv). appropriate use of health facilities, and assessing these activities are crucial steps.

While the Care Group Model seem likely successful in these areas, it had specific limitations. The baseline and endline studies were conducted in February 2006 and June 2010, respectively. This second endline study was conducted in July 2015. In Mozambique, the first harvest begins in February, whereas June and July are the end of the second harvest. The food stock starts depleting from July onward and thus July can be considered as a hunger period.

Therefore, there is a likelihood that the baseline survey was conducted when families were relatively better off, while both endline studies were conducted when food stocks were depleting. Rigor would have been improved if all data collection had occurred in the same month of each year.

However, it would be anticipated that data collection in the same months would have shown even greater improvements at both endpoints, as larger food stocks would likely improve outcomes. Another limitation related to data collection is that the three data collection periods represent three independent cross-sectional surveys. A longitudinal cohort study design may have yielded richer data.

However, identifying information was not collected at baseline, so this was not possible. Additionally, mothers of children in a certain age group were the target population, so the mothers “aged out” over time. It would have been ideal if data was also collected from the Care Group Volunteers themselves, rather than from participants only. Secondly, data from CGVs might have added important contextual information to aid our understanding of the sustainability and long-term impacts of the Care Group Model.

While we are unaware of any other health education programming delivered by other sources during the 2010-2015 period, it is possible that other





information sources influenced health behaviors. We are also unable to account for the impact of historical influences such as weather that may have impacted crop yield and quality, thus influencing nutrition.

The risk of selection bias was somehow mitigated by the use of a simple random sample within the Manga district. Apparently, Manga was only 1 of the 4 districts of Area A originally included in the 2010 Endline 1 study. It was possible that the differences between the sub-districts that were present could be confounding factors in those results. As common with all studies, the results might not be generalizable to groups that differ from that population culturally or demographically.

The use of a comparison group would also have improved this study as Mozambique as a whole and even many other parts of the world, saw improvement in those measures during that timeline.

For example;

- (a) The infant mortality rate in Mozambique has improved over the past several decades, from 180 per 1,000 live births in 1960 to 62 per 1,000 live births in 2015.
- b. The percentage of children under five years of age who experienced moderate and severe underweight was 26% in the 1990-1998 timeline.
- c. In contrast, that number was 18% in the 2003-2008 timeline and 15% in 2011.
- d. The vitamin A supplementation rate of children age six months to less than five years also improved, from 71% in 2002 to 83% in 2008 and over 95% in 2011 and 2014 [20-22].

## Conclusion

This study, together with the prior evaluation, suggested that, the Care Group Model was a promising approach to sustaining the impact of key maternal and child interventions while reducing under-5 years mortality in Sub-Saharan Africa.

Therefore, while limitations exist, the findings justify further exploration to:

- (a) Replicate the Care Group Model in other resource-strained communities, with a prospective cohort design for stronger evaluation, preferably with

data collection occurring in the same month each year,

- (b) Evaluate the knowledge level of the CGVs and the content of the information they deliver over time to determine fidelity.
- (c) Determine how the Care Group Model can be integrated into a local government health system to test the effectiveness of the model when implemented by a local program, rather than a charitable organization.

The findings of this second follow-up study point to the potential of the Care Group Model to reduce the negative impacts of a shortage of health personnel. To achieve the highest influence by scaling up the coverage of community-based health interventions if the Care Group Model could be integrated with the health service delivery. Like most aid-based programs, the official Care Group Model project ended once external donor support ended in 2010.

Charitable organizations rarely have funds to continue a project indefinitely, nor to link the project to the existing health system in the local area. However, embedding a project such as the Care Group Model into existing Ministry of Health systems would allow for delivery in a more sustainable and cost-effective manner. The results point to the need for tailoring the model into existing government health system to continue the support and training needed for effectiveness of these community health workers.

Further study is needed to determine the kind of inputs that should be shifted to assist local Ministries of Health and how that shift might influence the administration of health interventions, which is currently dominated by non-governmental organizations.

The consequences of high infant mortality and under-5 mortality rates were too dire not to explore programs that show promise and the problems are too widespread to consider programs that rely solely on external supports rather than empowerment of the local population. The Care Group Model provides an example of a project that involves the expertise of professionals with the power of the local population, creating opportunities for more effective and sustainable programming.



## References

1. **World Health Organization.(WHO).** [Internet]. Geneva: WHO; c2016. Children: Reducing Mortality; [cited 28 April 2017]. Available from: <http://www.who.int/mediacentre/factsheets/fs178/en>
- 2) **United Nations (UN).** UN Millennium Project [Internet]. New York: WHO; c2006 [cited 23 May 2016]. Available from: <http://www.unmillenniumproject.org/goals/>
- 3) **World Health Organization (WHO).** [Internet]. Geneva: WHO; c2016. Children: Reducing mortality. [cited 23 May 2016]. Available from: <http://www.who.int/mediacentre/factsheets/fs178/en/>
- 4) **World Health Organization (WHO).** [Internet]. Geneva: WHO; c2016: Underweight in children. [cited 24 May 2016]. Available from: [http://www.who.int/gho/mdg/poverty\\_hunger/underweight\\_text/en/](http://www.who.int/gho/mdg/poverty_hunger/underweight_text/en/)
- 5) **United Nations International Children Emergency Fund (UNICEF)** [Internet]. New York (UN); c2016. Mozambique: Statistics. 2013 Dec [cited 25 May 2016]. Available from: [http://www.unicef.org/infobycountry/mozambique\\_statistics.html](http://www.unicef.org/infobycountry/mozambique_statistics.html)
- 6) **Cardoso J, Allwright L, Salvucci V.** Characteristics and determinants of child malnutrition in Mozambique, 2003-11. Helsinki (United Nations University World Institute for Development Economics Research); 2016. [cited 16 April 2017]. Available from: <https://www.wider.unu.edu/sites/default/files/WP2016-147%20Cardoso%20et%20al.pdf>
- 7) **The MDG Health Alliance.** No more missed GDG4 opportunities: Optimizing existing health platforms for child survival. New York (UN); 2014. [cited 23 May 2016]. Available from: <http://www.healthenvoy.org/wp-content/uploads/2014/05/Community-Health-Workers.pdf>
- 8) **Perry H, Zulliger R.** How effective are CHWs? An overview of current evidence with recommendations for strengthening community health worker programs to accelerate progress in achieving the health-related millennium development goals. *Baltimore (Johns Hopkins Bloomberg School of Public Health); 2012.* [cited 23 May 2016]. Available from: [http://www.coregroup.org/storage/Program\\_Learning/Community\\_Health\\_Workers/review%20of%20chw%20effectiveness%20for%20mdgs-sept2012-condensedversion.pdf](http://www.coregroup.org/storage/Program_Learning/Community_Health_Workers/review%20of%20chw%20effectiveness%20for%20mdgs-sept2012-condensedversion.pdf)
- 9) **Darmstadt G, Bhutta Z, Cousens S, Adam T, Walker N, de Bernis L.** (2005). Neonatal survival 2: Evidence-based, cost-effective interventions: How many newborn babies can we save? *Lancet.* 2005;365(9463):977-988
- 10) **Voegele J, Villarreal M, Cooke R. Gender in agricultural livelihoods eSourcebook: Module 1.** Washington D.C.:The World Bank; 2009. [cited 23 May 2016]. Available from: <http://siteresources.worldbank.org/INTGENAGRLIVSOUBOOK/Resources/Module1.pdf>
- 11) **Perry H, Zulliger R, Rogers M.** Community health workers in low-, middle-, and high-income countries: An overview of their history, recent evolution, and current effectiveness. *Ann Rev Public Health.* 2014;35:399-421. [cited 1 April 2017]. Available from: <http://annualreviews.org/doi/pdf/10.1146/annurev-publhealth-032013-182354>
- 12) **Davis T, Wetzel C, Avilan E, Lopes C.** Reducing child global undernutrition at scale in Sofala Province, Mozambique, using care group volunteers to communicate health messages to mothers. *Glob Health Sci Pract.* 2013;1(1):35-51.
- 13) **Perry H, et al.** Care Groups I: An innovative community-based strategy for improving maternal, neonatal, and child health in resource-constrained settings.. *Glob Health Sci Pract.* 2015;3(3):358-369.
- 14) **Perry H, et al.** Care Groups II: A summary of the child survival outcomes achieved using volunteer community health workers in resource-constrained settings. *Glob Health Sci Pract.* 2015;3(3):370-381.



- 15) **George CM**, et al. Evaluation of the effectiveness of care groups in expanding population coverage of key child survival interventions and reducing under-5 mortality: A comparative analysis using the lives saved tool (LiST). *BMC Public Health*. 2015;15(1):1.
- 16) **Naimoli J.F, Frymus, D.E, Quain, E.E, Roseman E.L.** Community and formal health system support for enhanced community health worker performance. A U.S. Government evidence summit. Washington D.C.: United States Agency for International Development (USAID); 2012. [cited 23 May 2016]. Available from: <https://www.usaid.gov/sites/default/files/documents/1864/CHW-Evidence-Summit-Final-Report.pdf>
- 17) **Fleiss JL, Levin B, Paik MC.** Statistical methods for rates and proportions, *3rd Ed.* Wiley-Interscience: Hoboken, NJ.
- 18) **Kim A**, et al. Social network targeting to maximize population behavior change: A cluster randomized controlled trial. *Lancet*. 2015;386(9989):145–153.
- 19) **Rosato M.** et al. Community participation: Lessons for maternal, newborn, and child health. *Lancet*. 2008; 372(9642): 962–971.
- 20) **United Nations International Children's Emergency Fund (UNICEF).** Improving child nutrition: The achievable imperative for global progress. United Nations: New York, NY. [cited 23 May 2016]. Available from: [http://data.unicef.org/corecode/uploads/document6/uploaded\\_pdfs/corecode/NutritionReport\\_April2013\\_Final\\_29.pdf](http://data.unicef.org/corecode/uploads/document6/uploaded_pdfs/corecode/NutritionReport_April2013_Final_29.pdf)
- 21) **United Nations International Children's Emergency Fund (UNICEF).** The state of the world's children, Special report, United Nations, New York, NY. [cited 23 May 2016]. Available from: [http://www.unicef.org/rightsite/sowc/pdfs/SOWC\\_Spec%20Ed\\_CRC\\_Main%20Report\\_EN\\_090409.pdf](http://www.unicef.org/rightsite/sowc/pdfs/SOWC_Spec%20Ed_CRC_Main%20Report_EN_090409.pdf)
- 22) **United Nations International Children's Emergency Fund (UNICEF).** The state of the world's children 2005: Childhood under threat. United Nations: New York, NY. [cited 23 May 2016]. Available from: <http://www.unicef.org/sowc05/english/sowc05.pdf>