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Trust in religious leaders and institutions as a mechanism for improving child malnutrition treatment adherence

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Trust in religious leaders and institutions as a mechanism for improving child malnutrition treatment adherence

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Abstract

Objectives: In the context of persistent child malnutrition in the Philippines, the objective of this study was to understand the effectiveness of one faith-based organization (FBO) in addressing moderate and severe acute malnutrition among children from households experiencing extreme poverty.

Setting: We retrospectively analyzed survey data collected by International Care Ministries (ICM) in 2012-2013 across 150 communities in eight provinces (Negros Oriental, Negros Occidental, Bohol, Palawan, Sarangani, South Cotabato, Sultan Kudarat, and Zamboanga del Norte) of the Philippines.

Participants: 1,219 children experiencing moderate acute malnutrition and severe acute malnutrition between the ages of 6 to 60 months

Intervention: A 16-week child malnutrition treatment program called Malnourished Child Outreach (MCO) offered by ICM in partnership with local religious leaders and institutions

Primary and secondary outcome measures: Program dropout and weight-for-height z-score (WHZ) at the end of the program for enrolled children were the two outcomes of interest. A logistic mixed-effects model was built to assess factors associated with program dropout, and a linear mixed-effects model for factors associated with WHZ at the end of the program

Results: Trust in religious leaders or institutions (-0·87; [95CI: -1·43, -0·26]) was negatively associated with program dropout, suggesting that with increasing levels of trust, decreasing proportions of children dropped out of treatment. Treatment adherence led to improved WHZ among participating children. Various measures of social capital, including trust in religious and public institutions, were not associated with WHZ at the end of the program.

Conclusions: By leveraging pre-existing trust in religious leaders and institutions among households experiencing extreme poverty, FBOs can promote adherence to high-quality child nutrition interventions among vulnerable populations.

Trial registration: None

Key Words

nutrition, children, faith-based organizations, social capital, Philippines

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Strengths and Limitations

- The study was conducted in a unique setting for examining the underlying mechanisms associated with adherence to malnutrition treatment delivered by both government and faith-based organizations to children in households experiencing extreme poverty
- The study clarifies the pathways through which structural social capital shapes nutrition outcomes in malnourished children who concurrently experience extreme poverty
- Multi-level modelling allows analyses to account for the hierarchal structure of variables that are present in the communities where the child malnutrition intervention described in this study took place
- While multiple factors were considered to examine adherence to child malnutrition treatment, the study could not account for all potential confounders within the complex social settings where the study was conducted

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Introduction

Faith-based organization (FBOs) play a critical role in delivering healthcare in low resource settings. Compared to public health facilities and providers, programs and interventions offered by FBOs may have increased geographic and socioeconomic coverage, greater social and physical capital, and more flexible governance and funding structures [1 ,2]. Additionally, many FBOs focus exclusively on serving poor and vulnerable people, addressing limited reach of public health systems [3 ,4].

Despite the critical role that faith-based organizations (FBOs) play in delivering healthcare in low resource settings, the capabilities and assets of these organization have been underused and underexplored [1 ,5]. FBOs have only recently been examined as key actors in public-private partnerships, with states, UN agencies, and funders, calling for a better understanding of their role [4 ,5]. There are various models of engagement between faith-based organizations and the public sector including: partnerships in large-scale community interventions, public funding for faith-based healthcare services, dually managed facilities, collaboration in global health campaigns, and alignment of priorities and service-level agreements [1 ,4]. While the description of these different types of public-partnerships are helpful in understanding the role that FBOs may play within these partnerships, there are gaps in evidence with regard to the quantity and distribution of faith-based service providers, the quality of care provided by these organizations, and the factors that contribute to the success of programs and interventions led by FBOs [1 ,4 ,5].

Turning to the Philippines, recent impressive national economic growth has not translated into a meaningful reduction in chronic and acute child malnutrition. According to the 2015 National Nutrition Survey, between 2013 and 2015, the national prevalence of under-five underweight increased from 20% to 21·5% and under-five stunting increased from 30·3% to 33·4% [6 ,7]. Prevalence of under-five wasting decreased slightly from 8·0% to 7·1% over this time period [8]. Concurrently, an estimated 8.1% of the total population lived in extreme poverty in 2015 [9], which represented a high national-level prevalence of poverty when compared to neighbouring Asia-Pacific countries [10].

Achieving universal healthcare with an emphasis on health equity is a core mandate for the Department of Health in the Philippines. However, gaps remain in service provision for households that simultaneously experience extreme poverty and child malnutrition, which is especially problematic in cases of moderate acute malnutrition (MAM) and severe acute malnutrition (SAM). Where such service gaps exist, civil society organizations including FBOs, in addition to multi-lateral institutions, such as the World Food Programme and UNICEF, may step in to provide complementary care. Notably, there is increasing attention and interest in the longstanding role of faith-based organizations in delivering healthcare to complement existing public healthcare infrastructure [1 ,3 ,11].

Trust, social relationships, cooperation, and reciprocity, or *social capital*, play a critical role in the well-being of income poor households [12 ,13]. Social capital is theorized to have both an internal (via bonding relationships between members of a group) [14] and an external (via bridging connections to external supports beyond a group) function [15]. In terms of external functionality, trust in healthcare providers and institutions is an important mechanism underlying healthcare decisions and treatment adherence [16]. Additionally, trust in healthcare personnel, a facility, or the healthcare system more broadly is often cited as a determinant of health seeking behaviour and connected with positive health outcomes [17-19]. What is less clear is how trust in healthcare facilities or FBOs interacts with other structural and socioeconomic barriers to influence healthcare access and use for households that experience extreme poverty. Moreover, when care and treatment are delivered outside of public healthcare institutions by faith-based organizations, there is limited research that examines how trust in the leadership of these organizations influences subsequent adherence to treatment that is offered.

To engage with these questions, we retrospectively analyzed data collected by a Philippine faith-based non-governmental organization (International Care Ministries; ICM) that delivered a program to address MAM and SAM in children living in ultrapoor households (defined as less than $0·50 USD per person per day) in partnership with local religious leaders and institutions. The objective of this study was to examine how different dimensions of trust, in addition to other indicators of social capital, affected program adherence and physiological outcomes among participating children.

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Methods

Intervention & Study Design

ICM implemented three rounds of a treatment program targeted at acute child malnutrition from 2012 to 2013. The programs ran from June 2012 to September 2012, October 2012 to January 2013, and February 2013 to May 2013. A total of 1,219 children from 1,010 households representing 150 unique communities were treated and surveyed across the provinces of Negros Oriental, Negros Occidental, Bohol, Palawan, Sarangani, South Cotabato, Sultan Kudarat, and Zamboanga del Norte in the Philippines.

The treatment program, called Malnourished Child Outreach (MCO), was a 16-week site-based feeding program for moderately and severely wasted children between the ages of 6 to 60 months. Severe acute malnutrition (SAM) was defined as weight-for-height Z-score (WHZ) ≤ -3SD from median reference values, and moderate acute malnutrition (MAM) was defined as WHZ ≤ -2SD and > -3SD from reference values according to international standards [20]. ICM initiated programs when a volunteer pastor was able to identify 10 to 15 malnourished children within the vicinity of his or her church. Pastors consulted a list of malnourished children kept by local health centers, followed by house-to-house visits to complete enrollment. Once the enrollment target was met, ICM would provide the food, protocol, and staff to complement the pastor and church volunteers for program delivery. In a fixed location in or near the volunteer pastors' church, ICM staff would prepare a single meal which was fed to children, assisted by their caregivers, for five days per week over a 16-week period. The product used for the feeding program was a micronutrient fortified rice-based soy blend which required cooking. Other program components included deworming, a health assessment, weight monitoring, weekly health, nutrition, and health education for caregivers, and home-based vegetable gardening. Children who remained SAM at the end of the 16 weeks were referred to local government clinics for additional assessment and management.

To understand household characteristics, caregivers of enrolled children were interviewed at baseline by trained enumerators prior to the start of the treatment. Questions covered household demographics, economic well-being, general health, asset-based poverty measures, and hygiene. Indicators of social capital were also explored including group membership, trust in local religious leaders and institutions, and trust in local public healthcare facilities (Appendix 1). These survey data were linked with weekly monitoring and outcomes data. Monitoring data captured weekly weights, number of feeding sessions attended, and outcomes included treatment completion (did not drop out), and discharge weight and height measures (Appendix 2).

Limited Patient and Public Involvement

We did not include PPI in the design, conduct, or analysis in this study. The preliminary findings have been discussed with carers and providers, with plans to disseminate implications to the wider nutrition community in the Philippines.

Statistical Approach

There were two outcomes of interest: 1) dropout (categorical variable), defined as children who were withdrawn from the program by their caregiver or missed repeated feeding sessions and lost to follow up and 2) WHZ at the end of the program (continuous variable). Independent variables were at both the individual/household level and the community level (see Table 1). The geographical type of community was categorized into Urban Slum, Rural Plain/Rural Slum, Rural Mountain, or Coastal/Fishing by ICM staff. We adopted and revised the measure for *intensity* of poverty, or *A*, as defined in the Alkire-Foster Method for measuring multi-dimensional poverty[21]. *Intensity* of poverty is defined as the average proportion of indicators in which a household is deprived in, and a household is categorized as 'experiencing poverty' if they are deprived in at least one third of the weighted indicators. One important feature of *A* is the ability to quantitatively estimate poverty at the household level, and therefore include in model building (see Appendix 3 for more detail).

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Table 1. List of Model Outcomes & Variables

Level	Item	Variable	Description
Logistic Model			
Outcome	Dropout	π_{ij}	Binary result if child dropped out of the program
1 (household level)	Sex	X_{1ij}	Sex of the child
	Trust in Religious Leader or Church	X_{3ij}	How much do you trust your religious leaders or church? [5 point Likert scale]
	Trust in Barangay	X_{4ij}	How much do you trust your local barangay? [5 point Likert scale]
	Trust in Neighbours	X_{7ij}	How much do you trust your neighbours? [5 point Likert scale]
	Family Satisfaction	X_{8ij}	How satisfied are you with your Family Life? [5 point Likert scale]
	WHZ$_1$	X_{5ij}	Baseline weight-for-height z-score of the child
	A	X_{6ij}	Intensity of poverty
Linear Model			
Outcome	WHZ$_2$	Y_{ij}	Discharge weight-for-height z-score of the child
1 (household level)	Sex	X_{1ij}	Sex of the child
	Age	X_{2ij}	Age of the child at baseline
	Trust in Religious Leader or Church	X_{3ij}	How much do you trust your religious leaders or church? [5 point Likert scale]
	Trust in Barangay	X_{4ij}	How much do you trust your local barangay? [5 point Likert scale]
	WHZ$_1$	X_{5ij}	Baseline weight-for-height z-score of the child
	A	X_{6ij}	Intensity of poverty
2 (community level)	Geography	Z_j	Geographical type of the community

The hierarchical structure in which this intervention was set (households in communities) required the utilization of mixed-effects modeling to explore the potential causal relationship of varied dimensions of social capital at the household and the geographical context at the community level.

For both outcomes, the covariates producing the most parsimonious model by minimizing deviance was chosen. All analyses were conducted using R (Version 3.2.3). Detailed statistical methods are described in the Supplementary Materials (Appendix 3).

This study was reviewed and approved by the University of Toronto's Research Ethics Board (REB# 30943).

Results

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A total of 1,219 treated children were included in this study, however 27 cases had incomplete treatment records and an additional 176 cases had incomplete weight data. As a result, final logistic analyses included 1,192 children, while the linear analyses included 1,016 children. Significant differences were not detected between the logistic and linear cases at baseline (Tables 2 & 3). The average age of children was 33.13 months and 32.96 months in the logistic and linear models, respectively. The sex of the children was balanced, while measures of trust were found to be slightly higher for religious leaders or churches than for local government (barangay) and neighbours.

Table 2. Baseline Values of Continuous Independent Variables

Variable	Logistic Model (n=1192)		Linear Model (n=1016)	
	mean	sd	mean	sd
Age (months)	33.13	15.56	32.96	15.55
WHZ_1	-2.42	1.00	-2.42	1.01
A	0.36	0.22	0.37	0.21
Trust in Religious Leader or Church	4.20	0.83	4.21	0.83
Trust in Local Barangay	3.96	0.93	3.94	0.94
Trust in Neighbours	3.91	0.92	-	-
Family Satisfaction	3.77	1.02	-	-

Table 3. Baseline Values of Categorical Independent Variables

Variables	n	%
Logistic Model		
sex (male)	585	49%
sex (female)	607	51%
Linear Model		
sex (male)	504	50%
sex (female)	512	50%
Geographical Types		
Urban Slum	225	19%
Rural Plain/Rural Slum	305	26%
Rural Mountain	487	41%
Coastal/Fishing	175	15%

The final mixed-effects model on dropout included sex, three measures of social capital, intensity of poverty (*A*) and a series of random effects (Table 4). In the most parsimonious model, which includes predictors and interaction terms, trust in religious leaders or church was negatively associated with dropout (-0.87; [95CI: -1.43, -0.26]), suggesting that each increased level of satisfaction or trust was associated with a decreased proportion of dropouts from the treatment program. Trust in the local barangay was associated with dropout in the reverse direction (0.81; [95CI: 0.22, 1.40]), interpreted as those with higher levels of trust in local government dropping out more. These estimates reveal that trust in specific entities can be correlated with likelihood of dropout in opposing directions, depending on whom or where the trust is directed towards. Households reporting a higher intensity of poverty were also significantly linked with a lower rate of dropout (-4.21; [95CI: -7.76, -0.66]).

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Table 4. Logistic Mixed Effects Model on Dropout from HBF program

	Model 1 (intercept only)				Model 2 (with predictors)				Model 3 (with predictors & interaction)			
	coefficient	se[1]	95CI	sig[2]	coefficient	se[1]	95CI	sig[2]	coefficient	se[1]	95CI	sig[2]
Fixed items												
Intercept	-2.04	0.15	(-2.33, -1.75)	***	-0.65	1.01	(-2.63, 1.33)		-1.01	1.05	(-3.17, 1.05)	
Sex (male)					-0.28	0.22	(-0.71, 0.15)		-0.26	0.22	(-0.69, 0.17)	
A[3]					-1.34	0.88	(-3.06, 0.38)		-4.21	1.81	(-7.76, -0.66)	*
Family satisfaction					-0.35	0.22	(-0.78, 0.08)		-0.38	0.23	(-0.83, 0.07)	
Trust in Religious Leader or Church					-0.85	0.31	(-1.46, -0.24)	**	-0.87	0.31	(-1.48, -0.26)	**
Trust in Local Barangay					0.73	0.29	(0.16, 1.30)	*	0.81	0.30	(0.22, 1.40)	*
Geographical type												
Urban slum (reference)					-	-	-		-	-	-	
Rural Plain/Rural Slum					0.05	0.43	(-0.79, 0.89)		0.20	0.46	(-0.70, 1.10)	
Rural Mountain					0.12	0.48	(-0.82, 1.06)		0.41	0.51	(-0.59, 1.41)	
Coastal/Fishing					0.009	0.56	(-1.09, 1.11)		0.30	0.57	(-0.82, 1.42)	
Interactions												
A x Urban slum (reference)									-	-	-	
A x Rural Plain/Rural Slum									2.11	2.11	(-2.03, 6.25)	
A x Rural Mountain									4.05	2.25	(-0.36, 8.46)	
A x Coastal/Fishing									6.45	2.45	(1.65, 11.25)	**
Random items												
σ_0	1.12	1.06	(-0.96, 3.20)									
σ_{034578}					27.21	5.22	(16.98, 37.44)		28.86	5.37	(18.33, 39.39)	
σ_3					1.07	1.04	(-0.97, 3.11)		1.31	1.14	(-0.92, 3.54)	
σ_4					19.56	4.42	(10.90, 28.22)		12.88	3.59	(5.84, 19.92)	
σ_5					0.62	0.79	(-0.93, 2.17)		0.68	0.82	(-0.93, 2.29)	
σ_7					1.40	1.18	(-0.91, 3.17)		1.62	1.27	(-0.87, 4.11)	
σ_8					1.07	1.03	(-0.95, 3.09)		0.98	0.99	(-0.96, 2.92)	
Deviance	960.1				893.1				884.8			

1. Standard Error
2. Statistical significance: * when p<0.05, ** when p<0.01, ** when p<0.001
3. Intensity of Poverty

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The estimates in Table 5 describe the results of mixed-effects modeling on WHZ_2 as an outcome. The intercept of Model 1 (intercept only) estimated at -0.38 is the unadjusted decrease in average WHZ at discharge for children treated across all communities. The direction of this coefficient suggests that on average, children that adhered and completed the program experienced movement toward normal WHZ. The ICC calculated for the model was 0.27, representing that 27% of variance in WHZ_2 is attributed to the community level covariate of geographical type. Age was negatively correlated to WHZ_2, indicating that older children experienced diminished growth compared to younger children. WHZ_1 was positively correlated with WHZ_2, which can be interpreted as children who were closer to normal weight at the beginning of the program achieved a higher WHZ_2 by the end of the program. Intensity of poverty was also found to be significant. The coefficient of -0.47 in Model 3 is not directly interpretable, but the direction shows that greater intensity of household poverty was linked to lower WHZ_2. Neither measure of trust (in religious leaders and church, or local government) was found to be significantly correlated with WHZ_2. Additional modeling using centered coefficients to increase parsimony were conducted but are not reported as they were not found to improve the model.

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Table 5. Linear Mixed Effects Model on Weight-for-Height Z-score at Discharge

	Model 1 (intercept only)				Model 2 (with predictors)				Model 3 (with predictors & interaction)			
	coefficient	se[1]	95CI	sig[2]	coefficient	se[1]	95CI	sig[2]	coefficient	se[1]	95CI	sig[2]
Fixed items												
Intercept	-0.38	0.06	(-0.50, -0.26)	***	0.71	0.30	(0.12, 1.30)	**	1.02	0.45	(0.14, 1.90)	**
Sex (male)					0.03	0.06	(-0.09, 0.15)		0.01	0.06	(-0.11, 0.13)	
Age (months)					-0.48	0.08	(-0.64, -0.32)	***	-0.47	0.08	(-0.63, -0.31)	***
WHZ_1					0.45	0.05	(0.35, 0.55)	***	0.45	0.05	(0.35, 0.55)	***
A^3					-0.47	0.16	(-0.78, -0.16)	**	-0.48	0.16	(-0.79, -0.17)	**
Trust in Religious Leader or Church					0.09	0.06	(-0.03, 0.21)		0.02	0.09	(-0.16, 0.20)	
Trust in Local Barangay					-0.006	0.05	(-0.10, 0.09)		-0.007	0.05	(-0.11, 0.09)	
Geographical type												
Urban Slum (reference)					-	-			-	-		
Rural Plain/Rural Slum					0.32	0.14	(0.05, 0.59)	*	0.14	0.60	(-1.04, 1.32)	
Rural Mountain					0.21	0.16	(-0.10, 0.52)		-0.04	0.54	(-1.10, 1.02)	
Coastal/Fishing					0.82	0.20	(0.43, 1.21)	***	-1.21	0.71	(-2.60, 0.18)	
Interactions												
Trust in Religious Leader or Church x Urban Slum (reference)												
Trust in Religious Leader or Church x Rural Plain/Rural Slum									0.04	0.13	(-0.21, 0.29)	
Trust in Religious Leader or Church x Rural Mountain									0.05	0.12	(-0.19, 0.29)	
Trust in Religious Leader or Church x Coastal/Fishing									0.55	0.18	(0.20, 0.90)	**
Random items												
σ_e	1.05	1.02	(-0.95, 3.05)		0.71	0.84	(-0.94, 2.36)		0.71	0.84	(-0.94, 2.36)	
σ_{u0}	0.38	0.62	(-0.84, 1.60)									
σ_{u013}					0.89	0.94	(-0.95, 2.73)		0.83	0.91	(-0.95, 2.61)	
σ_{u1}					0.11	0.33	(-0.54, 0.76)		0.12	0.34	(-0.55, 0.79)	
σ_{u3}					0.09	0.31	(-0.52, 0.70)		0.10	0.31	(-0.51, 0.71)	
σ_{u06}					0.91	0.95	(-0.95, 2.77)		0.64	0.80	(-0.93, 2.21)	
σ_{u6}					0.02	0.13	(-0.23, 0.27)		0.009	0.10	(-0.19, 0.21)	
Deviance	3100.2				2808.8				2800.4			

1. Standard Error
2. Statistical significance: * when p<0.05, ** when p<0.01, ** when p<0.001
3. Intensity of Poverty

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Discussion

While social networks are critical for the poorest households to access and navigate health and social services, the multidimensional vulnerabilities and exclusion that these households often experience make them the least able to effectively leverage relationships for household benefit [22]. This reality is evident in the Philippines, with a previous study demonstrating that poor households in a slum area with few social ties had less access to key municipal services including water [23]. Our study suggests that for households experiencing extreme poverty that do not have an established trusting relationship with their local government, existing trust in local religious leaders and institutions offers an opportunity for high-quality care to be provided in partnership with local religious leaders and institutions. This may be especially true for the households with the greatest intensity of poverty, who were the least likely to dropout of the program offered by ICM in partnership with local religious leaders.

There is a lack of consensus regarding the effectiveness of existing models of public partnerships with private providers or FBOs to deliver primary healthcare across low-resource settings among populations experiencing extreme poverty [24-27]. Additionally, a recent effort to synthesize lessons of engagement within the health sector between states and FBOs similarly demonstrated a need for more information to understand if and under what conditions these types of partnerships improve health outcomes [4]. However, the trusting relationships that faith based organizations and institutions often hold in the communities in which they were embedded and operated were highlighted as an important feature and possible mechanism to ensure effective and meaningful service delivery. Our study confirmed that trust in religious leaders and institutions was a determinant of treatment adherence among participants attending a program administered by a faith-based organization in partnership with local religious leaders. Thus, this model of service delivery provides an opportunity for the public sector to support and partner with faith-based organizations to offer complementary care to address acute child malnutrition.

High levels of structural social capital (i.e., group membership and the presence of social support) among caregivers have been hypothesized to contribute to a good nutritional status in their children. Structural social capital is thought to lead to access to food resources, improved living conditions, access to knowledge networks, and access to health services, which in turn, may create conditions of increased food security, reduced childhood illness, and an increased ability to care for a child [28]. In our study, initial weight-for-height, age at baseline, and the intensity of household poverty were associated with physiological outcomes among acutely malnourished children following treatment. Additionally, children who completed the treatment program experienced movement toward a normal WHZ. However, various structural dimensions of social capital among caregivers were not directly associated with improved physiological outcomes in acutely malnourished children. This finding pushes us to more closely examine the relationship between treatment adherence and structural social capital as the mechanism through which structural social capital influences child nutrition outcomes.

Experiences of social exclusion (e.g. mistrust of public institutions) may influence health seeking behaviour and contribute to gaps in healthcare provision. When individuals feel socially excluded from public health services or institutions, a model of service delivery involving faith-based-public collaboration can provide a critical alternative. Given the high burden of child malnutrition in the Philippines, there is a need for improved models of care for MAM and SAM. Community-based care offered by faith-based organizations in partnership with local religious leaders and institutions presents an opportunity to engage with and support income poor households with weak social networks. Based on the promising findings from our study, complementary models of healthcare delivery between faith-based organizations of public health facilities that leverage public funding, in addition to bilateral and multi-lateral support should be further explored and evaluated.

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Footnotes

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Supplementary Materials

Appendix 1. ICM Survey Form v3.3

ICM Survey Form v3.3 was the survey instrument used to interview program participants before and after the intervention. The interviews were conducted by part-time enumerators hired by ICM's Research Department, trained on data collection practices and survey conduct. These enumerators are separate from the program delivery team, with minimal to no interaction.

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INTERNATIONAL CARE MINISTRIES FOUNDATION, INC.
Program Survey Form

ICM

[ ] Pastor [ ] Counselor [ ] Participant [ ] Jumpstart [ ] MCO   Date: _____ Time: _____

Name: (Last, First MI) _____   Mobile No.: _____

Recipient No.:

| Base # | Program # | Batch # | Community # | Participant # |

1:Bacolod, 2:Bohol, 3:Dumaguete, 4:GenSan, 5:Koronadal, 6:El Nido; 7:Dipolog

1:Transform, 2:Jumpstart 3:MCO

Hello. My name is _____, and I am working with International Care Ministry of the Philippines (ICMPI). We are conducting a survey about various health and livelihood issues. We would very much appreciate your participation in this survey. The survey usually takes between 30 and 45 minutes to complete. The purpose of this survey is for ICMPI to measure the impact of the program you have been selected to join. It is a two part survey: the „pre" and the „post". Which means the before program survey and the after program survey. Today it will be the Pre survey / Post survey (chose the correct one). ICMPI uses this information to inform sponsors and donors about the activities of ICM, but most importantly these survey"s help ICMPI to improve the programs that they offer and help teach ICMPI about how better to conduct their programs. The interview is completely confidential and your responses will only be analysed together with all the others. No one will find out how you answered and your answers will not have any impact on the benefits that you receive so please answer honestly.

At this time, do you want to ask me anything about the survey?

First we will collect information about your household. Can I start by asking about the people who are 16 years old & above in your household:

Line/ID Number	Q1: Starting with the participant, please give me the names of the adults (over 16) who usually live here and eat with you.	Q2: What is the highest grade he or she has completed?	Q3: What is the age of each person?	Q4: Is each person male or female?		Q5: What is each person"s marital status?						Q6: Does he or she have a birth certificate at home?		Q7: Does he or she have a marriage certificate at home?	
				1	2	1	2	3	4	5	6	1	2	1	2
Adult1				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A2				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A3				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A4				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A5				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A6				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A7				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A8				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
AVERAGE (AGE)/TOTAL:															

(For questions 5-7, please fill up only for adults aged 16 to 65)

Just to make sure that I have a complete listing, are there any other people who may not be members of your family, such as domestic help, lodgers, or friends who usually live here? [IF "YES", ADD TO FIRST TABLE]

Now, I'd like to ask about the children who are 15 years old and younger that live in the household:
NOTE: For Jumpstart recipient kindly fill up the first column to indicate that the child is a Jumpstart recipient.

Line/ID Number	Q8: Please give me the names of the children (15 years old and below) who usually live here and eat with you.	Q9: How old is each person(in years)?	Q10: what is the highest grade he or she completed	Q11: Is each person male or female?		Q12: Is each child currently enrolled in school?		Q13: Does each child receive a scholarship?		Q14: What type of school does each child attend?		
				1	2	1	2	1	2	1	2	3
Jumpstart				M	F	Yes	No	Yes	No	ICM	Government	Private
MCO				M	F	Yes	No	Yes	No	ICM	Government	Private
Child1				M	F	Yes	No	Yes	No	ICM	Government	Private
C2				M	F	Yes	No	Yes	No	ICM	Government	Private
C3				M	F	Yes	No	Yes	No	ICM	Government	Private
C4				M	F	Yes	No	Yes	No	ICM	Government	Private
C5				M	F	Yes	No	Yes	No	ICM	Government	Private
C6				M	F	Yes	No	Yes	No	ICM	Government	Private
C7				M	F	Yes	No	Yes	No	ICM	Government	Private
C8				M	F	Yes	No	Yes	No	ICM	Government	Private
C9				M	F	Yes	No	Yes	No	ICM	Government	Private
C10				M	F	Yes	No	Yes	No	ICM	Government	Private
6 to 15 AVERAGE (AGE)/TOTAL:												
0 to 5 AVERAGE (AGE)/TOTAL:												

Note: If the child is a Jumpstart recipients use the table labelled as "Jumpstart for his/her data & for an MCO recipient use the table labelled as "MCO" as well.

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		1	2	3	4	5
		0 to 5	6 to 15	16 to 65	65+	Total
Q15:	Household Count Summary: 〔Put in total number of people in each category〕					
Q16:	Show the recipient the sentence written on the last page of this survey form. Ask them to read it out for you. If they can read it then mark "Yes", if not mark "No".	Yes	No			

Now I would like to ask you about your relationships with other people. In particular I would like to ask you about your interactions with other people.

Q17:	How satisfied are you with your family life?	Not at all satisfied	Not very satisfied	Neutral	Somewhat satisfied	Very Satisfied
Q18:	How satisfied are you with your friendships?	Not at all satisfied	Not very satisfied	Neutral	Somewhat satisfied	Very Satisfied

For questions 19 – 22, please indicate how much you trust the following people:

Q19:	Your relatives	No trust	Tentatively trust	Neutral	Moderately trust	Very trusting
Q20:	Your neighbors	No trust	Tentatively trust	Neutral	Moderately trust	Very trusting
Q21:	Your religious leaders or church	No trust	Tentatively trust	Neutral	Moderately trust	Very trusting
Q22:	Your local barangay	No trust	Tentatively trust	Neutral	Moderately trust	Very trusting
Q23:	In the last 6 months how many times have you been in a serious dispute with another person?					
Q24:	In your family is there anyone currently experiencing physical abuse?	Yes	No			
Q25:	(If yes to Q24) Has this problem gotten better in the last 6 months?	Yes	No			
Q26:	Does anyone in your family currently have problems with substance abuse (alcohol/drugs)	Yes	No			
Q27:	(If yes to Q26) Has this problem gotten better in the last 6 months?	Yes	No			

Now I would like to ask you about your health and the health of other people in your household.

Q28:	Are you a member of Phil Health? (Select one)	Yes	No, because the benefits won't help my family.	No, because the benefits are too expensive.	No, because I don't have the appropriate paperwork to enroll. (no birth certificate,etc.)	I am not familiar with Phil Health.
Q29:	Is the female household head currently pregnant?	Yes	No			

(If Yes to Q29, continue with questions 30-31. If No, skip to Q32.)

Q30:	If pregnant, have they been given a maternal tetanus immunization?	Yes	No			
Q31:	If pregnant, whom are they attending pre-natal care? (Select all that apply)	Quack doctor	Hilot (Traditional)	Barangay health worker/ midwife/ birthing home	Doctor or Hospital	No pre-natal care
Q32:	At the last occasion, where did the female household head give birth?	Home	Birthing Home	Hospital	Other	
Q33:	At the last occasion the female household head gave birth was there anyone at the birth – choose only one:	Quack Doctor	Hilot (Traditional)	Barangay health worker/ midwife/ birthing home	Doctor or Hospital	No One
Q34:	At the last occasion the female household head gave birth did she received a home visit within 24 hours after delivery?	Yes	No			
Q35:	If yes to Q34, who visited?	Quack Doctor	Hilot (Traditional)	Barangay health worker/ midwife/ birthing home	Doctor	Other
Q36:	Has the female household head ever had a baby or child die?	No child has died.	Yes, miscarriage before birth.	Yes, death within one month to 5 years at time of death.	Yes, aged 6-15 at time of death.	Yes, aged 16 or older at time of death.
Q37:	(If yes to question 36) How many children have died?					
Q38:	Which of the following do you think is the best to feed baby under 6 months of age?	Breast milk only	Other milk only	Breast milk & other milk	Breast milk & other food	
Q39:	For how long did you breast feed your youngest child before introducing any other milk or food?	0-3 mos.	4-6 mos.	7-9 mos.	10-12 mos.	

Q40:	What type of family planning are you using, if any? (Select only one, the most commonly use) **[Let the recipient give the response without prompting the options.]**	Abstinence	Natural methods	IUD	Pill	Injection
		Condom	Ligation	Vasectomy	Other family planning method	No family planning method

	Q41: In the last month, does each person have an illness?											Q42: How does this person receive treatment (Select one common choice that apply)								Q43: Does each child have? *Note: Ask for children only.*		
Line/ID Number	Chronic sickness(3 mo. Or more requiring treatment)	Physical disability	Blind	Deaf	Nausea and / or vomiting in the past month	Unresolved cough for more than two weeks	Diarrhea	Goitre	Mental illness	Other significant illness	No Significant illness	Hospital admission within the past month	Local health centre	Doctor	Quack doctor	Hilot	Barangay health worker	Other health worker	No medical assistance	Birth certificate at home	White Card	Complete routine Immunization
	1	2	3	4	5	6	6	7	8	9	10	1	2	3	4	5	6	7	8	1	2	3
Adult1	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A3	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A4	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A5	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A6	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A7	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A8	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Jumpstart	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
MCO	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Child1	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C3	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C4	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C5	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C6	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C7	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C8	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C9	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C10	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
TOTAL																						
6 to 15 TOTAL																						
0 to 5 TOTAL																						

		1	2	3	4	5	6
Q44:	Where do you go to the toilet?	Public Toilet	Toilet in the compound	Toilet in the house	Outside(No toilet)	On paper or in a plastic bag	Not sure
Q45:	Is there a means for hand washing in the toilet/cubicle/location?	Yes	No				
Q46:	Where did the water for hand washing come from?	Hands not washed	Took the water to the toilet location	Container near the toilet location	Tap water from the house	Not sure	
Q47:	Do you use soap for hand washing?	Hands not washed	Soap not use – water only	Soap not use – ash or other abrasive matl's	Soap & water	Not sure	

Q48:	Reason for not using soap:	Cost	Unable to purchase in local store	Prefer to use ash or other material	Not sure that soap is required	
Q49:	Where do you wash your clothes?	Clothes not washed	In river/water source more than 500 meters	In river/water source closer than 500 meters	At well more than 500 meters	At well closer than 500 meters / At home
Q50:	Where do you hang your clothes to dry?	Do not hung clothes	In fence around the house	In a tree	Outside on a line	House windows / Inside the house
Q51:	How do you clean your teeth?	Do not clean teeth	Rinse with water	Use salt and water	Use herbal mouth wash	Tooth brush only / Tooth brush & tooth paste
Q52:	How do you dispose dog or animal excrement?	No disposal	In paper/plastic bag	Sweep it away/burn it	Bury it	No dogs/animals allowed inside or yard

Now I'd like to ask you some questions about your food and drink.

Q53:	How many meals do you usually eat in a normal day?	One meal	Two meals	Three meals	More than three meals	
Q54:	How many times a week do you serve a meal containing vegetable?	zero	1 – 5 times week	6 – 10 times a week	11 – 15 times a week	16 – 21 times a week
Q55:	How many times a week do you serve viand? (Or meal containing meat, chicken or fish)	zero	1 – 5 times a week	6 – 10 times a week	11 – 15 times a week	16 – 21 times a week
Q56:	Total pesos spent by family on junk food per day?	0 – 10 Pesos	11 – 20 pesos	21- 30 pesos	31 – 40 pesos	41 – 50 pesos
Q57:	How often do you feel hungry at the end of the day?	Everyday	Several days a week	Once a week	Once a month	Rarely
Q58:	Do you do anything to make your water safer to drink?	No action	Buy drinking water (bottled, ATM)	Use water filter (ex: bio-sand)	Solar disinfection	Boiling of water / Other method to make water safe to drink
Q59:	How do you store water for cooking or drinking?	No storage	Bucket or similar container – no lid	Bucket or similar container – with lid	Earthen wear or plastic jug w/lid	Container from water vendor / From the tap in the house
Q60:	How far is your main water supply from your home?	0 to 20 meters	21 to 50 meters	51 to 100 meters	101 to 500 meters	500+ meters

I'd like to ask you some questions about your Income & occupation.

Line/ID Number	Q61: What is the type of work of each person?									Q62: How much did each person earn from **regular work/petty jobs/occasional work** in the past month?	Q63: What was the approximate **value of any product produced** by each person during the past month? (Example: veg., detergent, snack, etc.)	Q64: How much did each person receive in **assistance from friends or relatives** in the past month? (include overseas remittances and gifts from nearby friends, but exclude gifts from mother to son within the family group below)	Q65: How much cash or value did each person receive **from any other source** in the past month?	
	Fisherman	Tricycle /trisikad driver	Farmer	Laundry	Buy & sell	Construction	Household helper	Others	No work					
	1	2	3	4	5	6	7	8	9					
Adult1	O	O	O	O	O	O	O	O	O					
A2	O	O	O	O	O	O	O	O	O					Recipient Income
A3	O	O	O	O	O	O	O	O	O					
A4	O	O	O	O	O	O	O	O	O					
A5	O	O	O	O	O	O	O	O	O					
A6	O	O	O	O	O	O	O	O	O					
A7	O	O	O	O	O	O	O	O	O					
A8	O	O	O	O	O	O	O	O	O					Total HH income
Column Total														

		1	2	3	4	5
Q66:	**Compared to the rest of the year,** do you feel that your household income over the past month was:	Above average	Average	Below average		
Q67:	Has anyone in the household made a family budget before?	Yes	No			
Q68:	Does anyone in the household owe anyone money? If yes, how much?: _____	Yes	No			
Q69:	Does anyone in the household have any savings? If yes, how much?: _____	Yes	No			
Q70:	Do you have a vegetable garden?	Yes	No			
Q71:	If yes to Q70, how many vegetable plants are there in your garden?	1-10	11-20	21-50	51-100	101 +
Q72:	Does anyone in the household operate a small business?	Yes	No			
Q73:	If yes to Q72, check all that apply.	Vegetables or Seedlings	Vermi or Vermicast	Food & Snacks	Cleaning Products	Others
Q74:	Is the housing structure extremely poor and in need of emergency renovations?	Yes	No			
Q75:	If yes to Q74, select the box that best describes the poor condition of the house.	Habitable (needs few fix)	Dilapidated (some parts are falling)	Totally damage (could collapse at any time)		

(Fill in the following table based on your observations. Do not ask the recipient.)

Indicator	Description and Corresponding Score	Score
Q76: Building Size	Big: >25 sqm. (4) | Medium: 10-15 sqm. (2) | Small: <15 sqm. (0)	
Q77: Foundation Structure	Concrete/Firm (4) | Bamboo/Moderate (2) | Dirt/Weak (0)	
Q78: Roof Materials	New GI Sheet (2) | Old GI Sheet/New Nipa (1) | Scrap/Old Nipa (0)	
Q79: Wall Materials	Concrete (4) | Wood (3) | Lawnanit/Plywood (2) | Bamboo (1) | Scrap (0)	
Q80: Land (Ask)	Own/Inherited (4) | Mortgage (2) | Renting (1) | Tenant/Squatting (0)	
Q81: House Materials (Ask)	Own/Inherited (4) | Mortgage (2) | Renting (1) | Tenant/Squatting (0)	
Q82: Duration of Residence (Ask)	5 years & above (5) | 1 years to 4 years (3) | below 1 year (1)	
Q83: Water Supply (Ask)	Faucet (gripo) at home or own deep well (2) | Shared deep well or faucet within 50 meters (1) | None within 50 meters (0)	
Q84: Electricity (Ask)	Own meter (2) | Shared meter (1) | None (0)	
Q85: Fuel (Ask)	LPG/Electricity for cooking (3) | Kerosene (2) | Charcoal/Wood (0)	
Q86: Toilet (Ask)	Flush in home (3) | Manual in home (2) | Pit/Shared/Communal (1) | None (0)	
Q87: Furniture	Wood/Steel/Plastic [New] (2) | Old/Used Furniture (1) | None (0)	
Q88: Appliances	1 point per working appliance: *(Example: TV, Stereo, Radio, Stove)*	
Q89: Car/Vehicle (Ask)	Jeep/Car (6) | Motorcycle/Tricycle (4) | Trisikad (3) | Bicycle (2) | None (0)	
	Total Poverty Score:	

Appendix 2. MCO M&E data collection template

This is the monitoring and evaluation (M&E) template (two pages) used to collect regular metrics during the implementation of MCO. The ICM team responsible for implementing each MCO program would fill these templates in, under the supervision of ICM's national office.

		MALNOURISHED CHILDRENS OUTREACH PROGRAM DATA																
		PROGRAM DETAILS							PRE-PROGRAM DATA						MID-PROGRAM DATA			
ID	Base	Name of Child	Sex (M/F)	Date of birth	Age (months)	Feeding site	Referral source (B or C)	Date	Weight (kg)	Height (cm)	Weight-for-height Z score	WHZ	HAZ	FEB	MARCH	APRIL	MAY
1	Dumaguete																
2	Dumaguete																
3	Dumaguete																
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5	Dumaguete																
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25	Dumaguete																

ID	END PROGRAM DATA								RISK MANAGEMENT					ATTENDANCE		FOLLOW UP PROGRAM DATA (6 months post MCO			
	Date	Weight (cm)	Height (cm)	Weight-for-height score	WHZ	HAZ	Weight gain (kg)	% weight gain	Dewormed as per protocol? (I or L or N)	Vit A as per protocol? (I or L or N)	Edema (y/n)	Health record warning (y/n)	Referred to RM (y/n)	No. days child attended feeding	No. days guardian attended feeding	No. mths post feeding	Height (cm)	Weight (kg)	Weight-for-height Z score
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Appendix 3. Supplementary Statistical Methods

In this study, we adopted and revised the measure for *intensity* of poverty, or *A*, as defined in the Alkire-Foster Method for measuring multi-dimensional poverty.[1] *Intensity* of poverty is defined as the average proportion of indicators in which a household is deprived in, and a household is categorized as 'experiencing poverty' if they are deprived in at least one third of the weighted indicators. One important feature of *A* is the ability to quantitatively estimate poverty at the household level, and therefore include in model building. In this study, *A* was developed from 13 weighted indicators available from the ICM household survey. The indicators used were the household's building size, foundation material, roof material, wall material, water supply, electricity, type of toilet, ownership of appliances, furniture, cars/vehicles, household head's literacy, and household food security. To develop weights for each indicator, Principal Component Analysis (PCA) was first utilized to develop the factor structure, after which Confirmatory Factor Analysis (CFA) was applied to the structure for model building. All model indices for *A* were found to be acceptable, CFI and NNFI were greater than 0.9 and RMSEA was below 0.05 as per the Alkire-Foster Method. Weights were finalized by taking the mean of bootstrapped communalities for each indicator. Further analysis showed that *A* weighed according to the CFA was more informative to the finalized models when compared to an equally weighted *A*.

For the linear outcome, model building started with an intercept-only model:

$$Y_{ij} = \gamma_{00} + u_{0j} + e_{ij}$$

and intraclass correlation (ICC) was calculated by:

$$ICC = \frac{\sigma_{u0}^2}{\sigma_{u0}^2 + \sigma_e^2}$$

where σ_{u0}^2 is the variance of the community-level residuals u_{0j}, and σ_e^2 is the variance of the individual-level residuals e_{ij}. Models were fitted with lower-level independent variables, excluding variables not significant according to t-tests. A community-level variable, Z_j was tested and included only if the deviance difference test was significant. Following this step, community-level residuals of the slope were systematically tested to determine the model with lowest deviance. Finally, interaction terms between lower and higher level variables were tested and included according to significance and model convergence.

The model building for the logistic outcome was similar, except for a few key steps. First, ICC was calculated by:

$$ICC = \frac{\sigma_{u0}^2}{\sigma_{u0}^2 + 3.29}$$

where 3.29 is the variance of a logistic distribution with scale factor 1 (with $\pi \approx 3.14$). Second, the variables included in the final model were shown to only lower deviance in combination, but not individually. Random slopes of independent variables which were not significant in the model, but significant as slopes were included in the final model if found to contribute towards parsimony.

After following the specified steps, the two final mixed-effects models were:

Linear (WHZ₂)
$$Y_{ij} = \gamma_{00} + \gamma_{10}X_{1ij} + \gamma_{20}X_{2ij} + \gamma_{30}X_{3ij} + \gamma_{40}X_{4ij} + \gamma_{50}X_{5ij} + \gamma_{60}X_{6ij} + \gamma_{01}Z_j$$
$$+\gamma_{31}X_{3ij}Z_j + u_{2j}X_{2ij} + u_{5j}X_{5ij} + u_{4j}X_{4ij} + u_{0j} + e_{ij}$$

Logistic (dropout)
$$\pi_{ij} = logistic(\eta_{ij})$$
$$\eta_{ij} = \gamma_{00} + \gamma_{10}X_{1ij} + \gamma_{30}X_{3ij} + \gamma_{40}X_{4ij} + \gamma_{80}X_{8ij}$$
$$+u_{1j}X_{1ij} + u_{3j}X_{3ij} + u_{4j}X_{4ij} + u_{7j}X_{7ij} + u_{8j}X_{8ij} + u_{0j}$$

All statistical analyses were performed in R (Version 3.2.3).[2] Full Maximum Likelihood (FML) was used to compare linear mixed-effects models. The default Laplace Approximation build in the package 'lme4'[3] was used to compare logistic mixed-effects models in conjunction with the optimizer 'mimqa'[4] set at 10,000 iterations.

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Exploring trust in religious leaders and institutions as a mechanism for improving retention in child malnutrition interventions in the Philippines: A retrospective cohort study

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Exploring trust in religious leaders and institutions as a mechanism for improving retention in child malnutrition interventions in the Philippines: A retrospective cohort study

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Abstract

Objectives: In the context of persistent child malnutrition in the Philippines, the objective of this study was to understand the role of one faith-based organization (FBO) in addressing moderate and severe acute malnutrition among children from households experiencing extreme poverty.

Setting: We retrospectively analyzed survey data collected by International Care Ministries (ICM) in 2012-2013 across 150 communities in eight provinces (Negros Oriental, Negros Occidental, Bohol, Palawan, Sarangani, South Cotabato, Sultan Kudarat, and Zamboanga del Norte) of the Philippines.

Participants: 1,219 children experiencing moderate acute malnutrition and severe acute malnutrition between the ages of 6 to 60 months

Intervention: A 16-week child malnutrition treatment program called Malnourished Child Outreach (MCO) offered by ICM in partnership with local religious leaders and institutions

Primary and secondary outcome measures: Program dropout and weight-for-height z-score (WHZ) at the end of the program for enrolled children were the two outcomes of interest. A logistic mixed-effects model was built to assess factors associated with program dropout, and a linear mixed-effects model for factors associated with WHZ at the end of the program.

Results: Trust in religious leaders or institutions (-0·87; [95CI: -1·43, -0·26]) was negatively associated with program dropout, suggesting that with increasing levels of trust, decreasing proportions of children dropped out of treatment. Retention in the program led to improved WHZ among participating children. Various measures of social capital, including trust in religious and public institutions, were not associated with WHZ at the end of the program.

Conclusions: Leveraging pre-existing trust in religious leaders and institutions among households experiencing extreme poverty is one way that ICM, and potentially other FBOs, can promote retention in child nutrition interventions among vulnerable populations.

Trial registration: None

Key Words

nutrition, children, faith-based organizations, social capital, Philippines

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Strengths and Limitations

- The study was conducted in a unique setting for examining the underlying mechanisms associated with the retention of participants in malnutrition interventions delivered by a faith-based organization to children in households experiencing extreme poverty
- The study clarifies the pathways through which structural social capital shapes nutrition outcomes in malnourished children who concurrently experience extreme poverty in the Philippines
- The retrospective cohort design of this study is a novel approach for exploring the role of religious leaders in health interventions
- Multi-level modelling allows analyses to account for the hierarchal structure of variables that are present in the communities where the child malnutrition intervention described in this study took place
- While multiple factors were considered to examine participant retention in child malnutrition interventions, the study could not account for all potential confounders within the complex social settings where the study was conducted

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Introduction

Faith-based organization (FBOs) play a critical role in delivering healthcare in low resource settings. Compared to public health facilities and providers, programs and interventions offered by FBOs in some settings may have increased geographic and socioeconomic coverage, greater social and physical capital, and more flexible governance and funding structures [1-3]. Additionally, many FBOs focus exclusively on serving poor and vulnerable people, addressing limited reach of public health systems [4 ,5]. As a result, partnerships between public health institutions and FBOs are increasingly being viewed as an important strategy for improving healthcare access and health outcomes in low-and-middle-income countries [3 ,6].

Despite the critical role that FBOs play in delivering healthcare in low resource settings, the capabilities and assets of some FBOs have been underused and underexplored [1 ,7]. This underutilization may be influenced by concerns that the religious underpinnings of FBOs contradict human rights and associated health outcomes, such as in the case of sexual and reproductive health or vaccination campaigns [1 ,8]. Challenges also exist with the alignment of health priorities between FBOs and national health systems, inconsistent funding and governance of local FBOs, and their limited capacity to adapt to changing health systems [2 ,7]. Additionally, there are gaps in evidence with regard to the quantity and distribution of FBOs, the quality of care provided by these organizations, and the factors that contribute to the success of programs and interventions led by FBOs [1 ,5 ,7].

Collaboration with local religious leaders and their institutions is one factor contributing to the success of health interventions implemented by FBOs. Many communities view religious leaders and institutions as a trustworthy and credible source of health advice and information, with research finding that religious leaders' opinions can strongly influence social and behavioural norms [9-12]. As embedded members of their communities, local religious leaders frequently have intimate knowledge of existing histories, networks, and sociocultural dynamics influencing individual and community health and wellbeing, which positions them as important resources for health interventions [13]. As such, local religious leaders have been identified as change agents key to promoting health awareness, disseminating health education, developing and implementing health interventions, and influencing health seeking behaviour [9-12 ,14 ,15].

Turning to the Philippines, recent impressive national economic growth has not translated into a meaningful reduction in chronic and acute child malnutrition. According to the 2015 National Nutrition Survey, between 2013 and 2015, the national prevalence of under-five underweight increased from 20% to 21·5% and under-five stunting increased from 30·3% to 33·4% [16 ,17]. Prevalence of under-five wasting decreased slightly from 8.0% to 7.1% over this time period [18]. Concurrently, an estimated 8.1% of the total population lived in extreme poverty in 2015 [19], which represents a high national-level prevalence of poverty when compared to neighbouring Asia-Pacific countries [20].

Achieving universal healthcare with an emphasis on health equity is a core mandate for the Department of Health in the Philippines. However, gaps remain in service provision for households that simultaneously experience extreme poverty and child malnutrition, which is especially problematic in cases of moderate acute malnutrition (MAM) and severe acute malnutrition (SAM). Where such service gaps exist, civil society organizations including FBOs, in addition to multi-lateral institutions, such as the World Food Programme and United Nations International Children's Emergency Fund (UNICEF), may step in to provide complementary care. Notably, there is increasing attention and interest in the longstanding role of FBOs in delivering healthcare to complement existing public healthcare infrastructure [1 ,4 ,21].

Trust, social relationships, cooperation, and reciprocity, or *social capital*, play a critical role in the well-being of income poor households [22 ,23]. Social capital is theorized to have both an internal (via bonding relationships between members of a group) [24] and an external (via bridging connections to external supports beyond a group) function [25]. In terms of external functionality, trust in healthcare providers and institutions is an important mechanism underlying healthcare decisions and treatment adherence [26]. Additionally, trust in healthcare personnel, a facility, or the healthcare system more broadly is often cited as a determinant of health seeking behaviour and connected with positive health outcomes [27-29]. What is less clear is how trust in religious leaders and institutions in partnership with FBOs delivering health interventions interacts with other structural and socioeconomic barriers to influence healthcare access and use for households that experience extreme poverty. Moreover, there is limited research examining how trust in the religious leaders and institutions associated with these organizations influences subsequent retention of participants within program interventions aimed at addressing childhood malnutrition.

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To engage with these questions, we retrospectively analyzed data collected by a Philippine FBO (International Care Ministries; ICM) that delivered a program to address MAM and SAM in children living in ultrapoor households (defined as less than $0.50 USD per person per day) in partnership with local religious leaders and institutions. The objective of this study was to examine how different dimensions of trust, in addition to other indicators of social capital, affected program retention and physiological outcomes among participating children.

Methods

Intervention & Study Design

ICM implemented three rounds of a treatment program targeted at acute child malnutrition from 2012 to 2013. The programs ran from June 2012 to September 2012, October 2012 to January 2013, and February 2013 to May 2013. A total of 1,219 children from 1,010 households representing 150 unique communities were treated and surveyed across the provinces of Negros Oriental, Negros Occidental, Bohol, Palawan, Sarangani, South Cotabato, Sultan Kudarat, and Zamboanga del Norte in the Philippines.

The treatment program, called Malnourished Child Outreach (MCO), was a 16-week site-based feeding program for moderately and severely wasted children between the ages of 6 to 60 months. Severe acute malnutrition (SAM) was defined as weight-for-height Z-score (WHZ) $\leq$ -3SD from median reference values, and moderate acute malnutrition (MAM) was defined as WHZ $\leq$ -2SD and $>$ -3SD from reference values according to international standards [30]. ICM initiated programs when a local volunteer pastor was able to identify 10 to 15 malnourished children within the vicinity of his or her church. Pastors, who were associated with various Protestant denominations, consulted a list of malnourished children kept by local health centers. These pastors then conducted house-to-house visits to complete enrollment. All malnourished children were eligible for enrollment, regardless of religious affiliation. Once the enrollment target was met, ICM would provide the food, protocol, and staff to complement the pastor and church volunteers for program delivery. In a fixed location in or near the volunteer pastors' church, ICM staff would prepare a single meal which was fed to children, assisted by their caregivers, for five days per week over a 16-week period. The product used for the feeding program was a micronutrient fortified rice-based soy blend which required cooking. Other program components included deworming, a health assessment, weight monitoring, weekly health, nutrition, and health education for caregivers, and home-based vegetable gardening. Children who remained SAM at the end of the 16 weeks were referred to local government clinics for additional assessment and management.

To understand household characteristics, caregivers of enrolled children were interviewed at baseline by trained enumerators prior to the start of the treatment. Written informed consent was obtained at two points in time: first from the guardian when children were enrolled into the program, and again at the start of the baseline survey. Questions covered household demographics, economic well-being, general health, asset-based poverty measures, and hygiene. Indicators of social capital were also explored including group membership, trust in local religious leaders and institutions, and trust in local public healthcare facilities (Appendix 1). These survey data were linked with weekly monitoring and outcomes data. Monitoring data captured weekly weights, number of feeding sessions attended, and outcomes included treatment completion (did not drop out), and discharge weight and height measures (Appendix 2).

Limited Patient and Public Involvement

We did not include patient and public involvement (PPI) in the design, conduct, or analysis in this study. The preliminary findings have been discussed with carers and providers, with plans to disseminate implications to the wider nutrition community in the Philippines.

Statistical Approach

There were two outcomes of interest: 1) dropout (categorical variable), defined as children who were withdrawn from the program by their caregiver or missed repeated feeding sessions and lost to follow up and 2) WHZ at the end of the program (continuous variable). Independent variables were at both the individual/household level and the community level (see Table 1). The geographical type of community was categorized into Urban Slum, Rural Plain/Rural Slum, Rural Mountain, or Coastal/Fishing by ICM staff. We adopted and revised the measure for *intensity* of poverty, or *A*, as defined in the Alkire-Foster Method for measuring multi-dimensional poverty

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[31]. *Intensity* of poverty is defined as the average proportion of indicators in which a household is deprived in, and a household is categorized as 'experiencing poverty' if they are deprived in at least one third of the weighted indicators. One important feature of *A* is the ability to quantitatively estimate poverty at the household level, and therefore include in model building (see Appendix 3 for more detail).

Table 1. List of Model Outcomes & Variables

Level	Item	Variable	Description
Logistic Model			
Outcome	Dropout	π_{ij}	Binary result if child dropped out of the program
1 (household level)	Sex	X_{1ij}	Sex of the child
	Trust in Religious Leader or Church	X_{3ij}	How much do you trust your religious leaders or church? [5 point Likert scale]
	Trust in Barangay	X_{4ij}	How much do you trust your local barangay? [5 point Likert scale]
	Trust in Neighbours	X_{7ij}	How much do you trust your neighbours? [5 point Likert scale]
	Family Satisfaction	X_{8ij}	How satisfied are you with your Family Life? [5 point Likert scale]
	WHZ$_1$	X_{5ij}	Baseline weight-for-height z-score of the child
	A	X_{6ij}	Intensity of poverty
Linear Model			
Outcome	WHZ$_2$	Y_{ij}	Discharge weight-for-height z-score of the child
1 (household level)	Sex	X_{1ij}	Sex of the child
	Age	X_{2ij}	Age of the child at baseline
	Trust in Religious Leader or Church	X_{3ij}	How much do you trust your religious leaders or church? [5 point Likert scale]
	Trust in Barangay	X_{4ij}	How much do you trust your local barangay? [5 point Likert scale]
	WHZ$_1$	X_{5ij}	Baseline weight-for-height z-score of the child
	A	X_{6ij}	Intensity of poverty
2 (community level)	Geography	Z_j	Geographical type of the community

The hierarchical structure in which this intervention was set (households in communities) required the utilization of mixed-effects modeling to explore the potential causal relationship of varied dimensions of social capital at the household and the geographical context at the community level.

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For both outcomes, a series of covariates such as sex of caregiver, age of caregiver, household size, etc. were explored. The most parsimonious models that minimize deviance were chosen. All analyses were conducted using R (Version 3.2.3). Detailed statistical methods are described in the Supplementary Materials (Appendix 3).

This study was reviewed and approved by the University of Toronto's Research Ethics Board (REB# 30943).

Results

A total of 1,219 treated children were included in this study, however 27 cases had incomplete treatment records and an additional 176 cases had incomplete weight data. As a result, final logistic analyses included 1,192 children, while the linear analyses included 1,016 children. Significant differences were not detected between the logistic and linear cases at baseline (Tables 2 & 3). The average age of children was 33.13 months and 32.96 months in the logistic and linear models, respectively. The sex of the children was balanced, while measures of trust were found to be slightly higher for religious leaders or churches than for local government (barangay) and neighbours.

Table 2. Baseline Values of Continuous Independent Variables

Variable	Logistic Model (n=1192)		Linear Model (n=1016)	
	mean	sd	mean	sd
Age (months)	33.13	15.56	32.96	15.55
WHZ_1	-2.42	1.00	-2.42	1.01
A	0.36	0.22	0.37	0.21
Trust in Religious Leader or Church	4.20	0.83	4.21	0.83
Trust in Local Barangay	3.96	0.93	3.94	0.94
Trust in Neighbours	3.91	0.92	-	-
Family Satisfaction	3.77	1.02	-	-

Table 3. Baseline Values of Categorical Independent Variables

Variables	n	%
Logistic Model		
sex (male)	585	49%
sex (female)	607	51%
Linear Model		
sex (male)	504	50%
sex (female)	512	50%
Geographical Types		
Urban Slum	225	19%
Rural Plain/Rural Slum	305	26%
Rural Mountain	487	41%
Coastal/Fishing	175	15%

The final mixed-effects model on dropout included sex, three measures of social capital, intensity of poverty (*A*) and a series of random effects (Table 4). In the most parsimonious model, which includes predictors and interaction terms, trust in religious leaders or church was negatively associated with dropout (-0.87; [95CI: -1.43,

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-0.26]), suggesting that each increased level of satisfaction or trust was associated with a decreased proportion of dropouts from the treatment program. Trust in the local barangay was associated with dropout in the reverse direction (0.81; [95CI: 0.22, 1.40]), interpreted as those with higher levels of trust in local government dropping out more. These estimates reveal that trust in specific entities can be correlated with likelihood of dropout in opposing directions, depending on whom or where the trust is directed towards. Households reporting a higher intensity of poverty were also significantly linked with a lower rate of dropout (-4.21; [95CI: -7.76, -0.66]).

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Table 4. Logistic Mixed Effects Model on Dropout from HBF program

	Model 1 (intercept only)				Model 2 (with predictors)				Model 3 (with predictors & interaction)			
	coefficient	se[1]	95CI	sig[2]	coefficient	se[1]	95CI	sig[2]	coefficient	se[1]	95CI	sig[2]
Fixed items												
Intercept	-2.04	0.15	(-2.33, -1.75)	***	-0.65	1.01	(-2.63, 1.33)		-1.01	1.05	(-3.17, 1.05)	
Sex (male)					-0.28	0.22	(-0.71, 0.15)		-0.26	0.22	(-0.69, 0.17)	
A^3					-1.34	0.88	(-3.06, 0.38)		-4.21	1.81	(-7.76, -0.66)	*
Family satisfaction					-0.35	0.22	(-0.78, 0.08)		-0.38	0.23	(-0.83, 0.07)	
Trust in Religious Leader or Church					-0.85	0.31	(-1.46, -0.24)	**	-0.87	0.31	(-1.48, -0.26)	**
Trust in Local Barangay					0.73	0.29	(0.16, 1.30)	*	0.81	0.30	(0.22, 1.40)	*
Geographical type												
Urban slum (reference)					-	-	-		-	-	-	
Rural Plain/Rural Slum					0.05	0.43	(-0.79, 0.89)		0.20	0.46	(-0.70, 1.10)	
Rural Mountain					0.12	0.48	(-0.82, 1.06)		0.41	0.51	(-0.59, 1.41)	
Coastal/Fishing					0.009	0.56	(-1.09, 1.11)		0.30	0.57	(-0.82, 1.42)	
Interactions												
A x Urban slum (reference)									-	-	-	
A x Rural Plain/Rural Slum									2.11	2.11	(-2.03, 6.25)	
A x Rural Mountain									4.05	2.25	(-0.36, 8.46)	
A x Coastal/Fishing									6.45	2.45	(1.65, 11.25)	**
Random items												
σ_0	1.12	1.06	(-0.96, 3.20)									
σ_{034578}					27.21	5.22	(16.98, 37.44)		28.86	5.37	(18.33, 39.39)	
σ_3					1.07	1.04	(-0.97, 3.11)		1.31	1.14	(-0.92, 3.54)	
σ_4					19.56	4.42	(10.90, 28.22)		12.88	3.59	(5.84, 19.92)	
σ_5					0.62	0.79	(-0.93, 2.17)		0.68	0.82	(-0.93, 2.29)	
σ_7					1.40	1.18	(-0.91, 3.17)		1.62	1.27	(-0.87, 4.11)	
σ_8					1.07	1.03	(-0.95, 3.09)		0.98	0.99	(-0.96, 2.92)	
Deviance	960.1				893.1				884.8			

1. Standard Error
2. Statistical significance: * when p<0.05, ** when p<0.01, ** when p<0.001
3. Intensity of Poverty

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The estimates in Table 5 describe the results of mixed-effects modeling on WHZ_2 as an outcome. The intercept of Model 1 (intercept only) estimated at -0.38 is the unadjusted decrease in average WHZ at discharge for children treated across all communities. The direction of this coefficient suggests that on average, children that adhered and completed the program experienced movement toward normal WHZ. The intraclass correlation coefficient (ICC) calculated for the model was 0.27, representing that 27% of variance in WHZ_2 is attributed to the community level covariate of geographical type. Age was negatively correlated to WHZ_2, indicating that older children experienced diminished growth compared to younger children. WHZ_1 was positively correlated with WHZ_2, which can be interpreted as children who were closer to normal weight at the beginning of the program achieved a higher WHZ_2 by the end of the program. Intensity of poverty was also found to be significant. The coefficient of -0.47 in Model 3 is not directly interpretable, but the direction shows that greater intensity of household poverty was linked to lower WHZ_2. Neither measure of trust (in religious leaders and church, or local government) was found to be significantly correlated with WHZ_2. Additional modeling using centered coefficients to increase parsimony were conducted but are not reported as they were not found to improve the model.

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Table 5. Linear Mixed Effects Model on Weight-for-Height Z-score at Discharge

	Model 1 (intercept only)				Model 2 (with predictors)				Model 3 (with predictors & interaction)			
	coefficient	se[1]	95CI	sig[2]	coefficient	se[1]	95CI	sig[2]	coefficient	se[1]	95CI	sig[2]
Fixed items												
Intercept	-0.38	0.06	(-0.50, -0.26)	***	0.71	0.30	(0.12, 1.30)	**	1.02	0.45	(0.14, 1.90)	**
Sex (male)					0.03	0.06	(-0.09, 0.15)		0.01	0.06	(-0.11, 0.13)	
Age (months)					-0.48	0.08	(-0.64, -0.32)	***	-0.47	0.08	(-0.63, -0.31)	***
WHZ_1					0.45	0.05	(0.35, 0.55)	***	0.45	0.05	(0.35, 0.55)	***
A^3					-0.47	0.16	(-0.78, -0.16)	**	-0.48	0.16	(-0.79, -0.17)	**
Trust in Religious Leader or Church					0.09	0.06	(-0.03, 0.21)		0.02	0.09	(-0.16, 0.20)	
Trust in Local Barangay					-0.006	0.05	(-0.10, 0.09)		-0.007	0.05	(-0.11, 0.09)	
Geographical type												
Urban Slum (reference)					-	-			-	-		
Rural Plain/Rural Slum					0.32	0.14	(0.05, 0.59)	*	0.14	0.60	(-1.04, 1.32)	
Rural Mountain					0.21	0.16	(-0.10, 0.52)		-0.04	0.54	(-1.10, 1.02)	
Coastal/Fishing					0.82	0.20	(0.43, 1.21)	***	-1.21	0.71	(-2.60, 0.18)	
Interactions												
Trust in Religious Leader or Church x Urban Slum (reference)												
Trust in Religious Leader or Church x Rural Plain/Rural Slum									0.04	0.13	(-0.21, 0.29)	
Trust in Religious Leader or Church x Rural Mountain									0.05	0.12	(-0.19, 0.29)	
Trust in Religious Leader or Church x Coastal/Fishing									0.55	0.18	(0.20, 0.90)	**
Random items												
σ_e	1.05	1.02	(-0.95, 3.05)		0.71	0.84	(-0.94, 2.36)		0.71	0.84	(-0.94, 2.36)	
σ_{u0}	0.38	0.62	(-0.84, 1.60)									
σ_{u013}					0.89	0.94	(-0.95, 2.73)		0.83	0.91	(-0.95, 2.61)	
σ_{u1}					0.11	0.33	(-0.54, 0.76)		0.12	0.34	(-0.55, 0.79)	
σ_{u3}					0.09	0.31	(-0.52, 0.70)		0.10	0.31	(-0.51, 0.71)	
σ_{u06}					0.91	0.95	(-0.95, 2.77)		0.64	0.80	(-0.93, 2.21)	
σ_{u6}					0.02	0.13	(-0.23, 0.27)		0.009	0.10	(-0.19, 0.21)	
Deviance	3100.2				2808.8				2800.4			

1. Standard Error
2. Statistical significance: * when p<0.05, ** when p<0.01, ** when p<0.001
3. Intensity of Poverty

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Discussion

While social networks are critical for the poorest households to access and navigate health and social services, the multidimensional vulnerabilities and exclusion that these households often experience make them the least able to effectively leverage relationships for household benefit [32 ,33]. This reality is evident in the Philippines, with a previous study demonstrating that poor households in a slum area with few social ties had less access to key municipal services, such as water [34]. We suggest that when households experiencing extreme poverty trust local religious leaders and institutions (i.e., local pastors and churches) an opportunity exists for these actors to provide them with needed healthcare services. This may be especially true for households with the greatest intensity of poverty, who were the least likely to drop out of the program offered by ICM in partnership with local religious leaders.

There is a lack of consensus regarding the effectiveness of FBOs to deliver primary healthcare across low-resource settings among populations experiencing extreme poverty [35-38]. Similarly there is a need for more information to understand if and under what conditions these organizations contribute to positive health outcomes [5]. However, the trusting relationships that FBOs as well as religious leaders and institutions often hold in the communities in which they are embedded in and operate have been highlighted as an important feature and possible mechanism to ensure effective and meaningful service delivery [9 ,13 ,15]. Using quantitative analysis of survey data, our study confirmed that trust in religious leaders and institutions was a determinant of retention among participants attending the Malnourished Child Outreach program administered by ICM in partnership with local religious leaders. This model of service delivery provides an example of a potential strategy FBOs in the Philippines, and elsewhere, can use to contribute to addressing acute child malnutrition – namely, leveraging pre-existing trust in religious leaders and institutions among households experiencing extreme poverty to promote health program retention among vulnerable populations.

High levels of structural social capital (i.e., group membership and the presence of social support) among caregivers have been hypothesized to contribute positively to the nutritional status of their children. Structural social capital is thought to lead to access to food resources, improved living conditions, access to knowledge networks, and access to health services, which in turn, may create conditions of increased food security, reduced childhood illness, and an increased ability to care for children [39]. In our study, initial weight-for-height, age at baseline, and the intensity of household poverty were associated with physiological outcomes among acutely malnourished children following treatment. Additionally, children who completed the treatment program experienced movement toward a normal WHZ. However, various structural dimensions of social capital among caregivers were not directly associated with improved physiological outcomes in acutely malnourished children. This finding pushes us to more closely examine the relationship between participant retention in malnutrition interventions and structural social capital as the mechanism through which structural social capital influences child nutrition outcomes.

This study faced several limitations. The findings represent the outcomes of one program implemented by a specific Christian FBO in the Philippines and its partnership with Protestant religious leaders and churches, which might not be readily generalizable to other settings. The data collected were limited to enumerators directly asking caregivers of children in income poor communities to respond to questions about their trust in individuals and groups connected to the organization providing them with services or resources. Additionally, the models presented were restricted to exploring the covariates included in the baseline survey. It is also important to disclose that two of the authors received funding from ICM, which informs our view on the importance of partnerships with religious leaders and institutions in delivering health programs in income poor settings. . Finally, the sustainability of these results over time could be questioned as the data were collected up to and including May 2013.To address this limitation, future replication studies are planned.

Experiences of social exclusion (e.g. limited trust in public institutions) have been found to influence health seeking behaviour and contribute to gaps in healthcare provision [40]. We suggest that when individuals feel socially excluded from public health services or institutions, providing health services through collaborations between FBOs and trusted religious leaders and institutions can act as a critical alternative. Given the high burden of child malnutrition in the Philippines, there is a need for effective strategies to deliver care for MAM and SAM. Community-based care offered by FBOs in partnership with local religious leaders and institutions presents an opportunity to engage with and support income poor households with weak social networks. Based on this finding, we suggest that the delivery of healthcare through FBOs that build on pre-established trusting relationships with local religious leaders and institutions, should be further explored and evaluated.

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Footnotes

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Supplementary Materials

Appendix 1. ICM Survey Form v3.3

ICM Survey Form v3.3 was the survey instrument used to interview program participants before and after the intervention. The interviews were conducted by part-time enumerators hired by ICM's Research Department, trained on data collection practices and survey conduct. These enumerators are separate from the program delivery team, with minimal to no interaction.

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INTERNATIONAL CARE MINISTRIES FOUNDATION, INC.
Program Survey Form

ICM

[ ] Pastor [ ] Counselor [ ] Participant [ ] Jumpstart [ ] MCO   Date: _____ Time: _____

Name: (Last, First MI) _____   Mobile No.: _____

Recipient No.:

Base #	Program #	Batch #	Community #	Participant #

1:Bacolod, 2:Bohol, 3:Dumaguete, 4:GenSan, 5:Koronadal, 6:El Nido; 7:Dipolog

1:Transform,
2:Jumpstart
3:MCO

Hello. My name is _____, and I am working with International Care Ministry of the Philippines (ICMPI). We are conducting a survey about various health and livelihood issues. We would very much appreciate your participation in this survey. The survey usually takes between 30 and 45 minutes to complete. The purpose of this survey is for ICMPI to measure the impact of the program you have been selected to join. It is a two part survey: the „pre" and the „post". Which means the before program survey and the after program survey. Today it will be the Pre survey / Post survey (chose the correct one). ICMPI uses this information to inform sponsors and donors about the activities of ICM, but most importantly these survey"s help ICMPI to improve the programs that they offer and help teach ICMPI about how better to conduct their programs. The interview is completely confidential and your responses will only be analysed together with all the others. No one will find out how you answered and your answers will not have any impact on the benefits that you receive so please answer honestly.

At this time, do you want to ask me anything about the survey?

First we will collect information about your household. Can I start by asking about the people who are 16 years old & above in your household:

Line/ID Number	Q1: Starting with the participant, please give me the names of the adults (over 16) who usually live here and eat with you.	Q2: What is the highest grade he or she has completed?	Q3: What is the age of each person?	Q4: Is each person male or female?		Q5: What is each person"s marital status? *(For questions 5-7, please fill up only for adults aged 16 to 65)*						Q6: Does he or she have a birth certificate at home?		Q7: Does he or she have a marriage certificate at home?	
				1	2	1	2	3	4	5	6	1	2	1	2
				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
Adult1				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A2				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A3				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A4				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A5				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A6				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A7				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A8				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
AVERAGE (AGE)/TOTAL:															

Just to make sure that I have a complete listing, are there any other people who may not be members of your family, such as domestic help, lodgers, or friends who usually live here? [IF "YES", ADD TO FIRST TABLE]

Now, I'd like to ask about the children who are 15 years old and younger that live in the household:
NOTE: For Jumpstart recipient kindly fill up the first column to indicate that the child is a Jumpstart recipient.

Line/ID Number	Q8: Please give me the names of the children (15 years old and below) who usually live here and eat with you.	Q9: How old is each person(in years)?	Q10: what is the highest grade he or she completed	Q11: Is each person male or female?		Q12: Is each child currently enrolled in school?		Q13: Does each child receive a scholarship?		Q14: What type of school does each child attend?		
				1	2	1	2	1	2	1	2	3
				M	F	Yes	No	Yes	No	ICM	Government	Private
Jumpstart				M	F	Yes	No	Yes	No	ICM	Government	Private
MCO				M	F	Yes	No	Yes	No	ICM	Government	Private
Child1				M	F	Yes	No	Yes	No	ICM	Government	Private
C2				M	F	Yes	No	Yes	No	ICM	Government	Private
C3				M	F	Yes	No	Yes	No	ICM	Government	Private
C4				M	F	Yes	No	Yes	No	ICM	Government	Private
C5				M	F	Yes	No	Yes	No	ICM	Government	Private
C6				M	F	Yes	No	Yes	No	ICM	Government	Private
C7				M	F	Yes	No	Yes	No	ICM	Government	Private
C8				M	F	Yes	No	Yes	No	ICM	Government	Private
C9				M	F	Yes	No	Yes	No	ICM	Government	Private
C10				M	F	Yes	No	Yes	No	ICM	Government	Private
6 to 15 AVERAGE (AGE)/TOTAL:												
0 to 5 AVERAGE (AGE)/TOTAL:												

Note: If the child is a Jumpstart recipients use the table labelled as "Jumpstart for his/her data & for an MCO recipient use the table labelled as "MCO" as well.

		1	2	3	4	5
		0 to 5	6 to 15	16 to 65	65+	Total
Q15:	Household Count Summary: [Put in total number of people in each category]					
Q16:	Show the recipient the sentence written on the last page of this survey form. Ask them to read it out for you. If they can read it then mark "Yes", if not mark "No".	Yes	No			

Now I would like to ask you about your relationships with other people. In particular I would like to ask you about your interactions with other people.

Q17:	How satisfied are you with your family life?	Not at all satisfied	Not very satisfied	Neutral	Somewhat satisfied	Very Satisfied
Q18:	How satisfied are you with your friendships?	Not at all satisfied	Not very satisfied	Neutral	Somewhat satisfied	Very Satisfied

For questions 19 – 22, please indicate how much you trust the following people:

Q19:	Your relatives	No trust	Tentatively trust	Neutral	Moderately trust	Very trusting
Q20:	Your neighbors	No trust	Tentatively trust	Neutral	Moderately trust	Very trusting
Q21:	Your religious leaders or church	No trust	Tentatively trust	Neutral	Moderately trust	Very trusting
Q22:	Your local barangay	No trust	Tentatively trust	Neutral	Moderately trust	Very trusting
Q23:	In the last 6 months how many times have you been in a serious dispute with another person?					
Q24:	In your family is there anyone currently experiencing physical abuse?	Yes	No			
Q25:	(If yes to Q24) Has this problem gotten better in the last 6 months?	Yes	No			
Q26:	Does anyone in your family currently have problems with substance abuse (alcohol/drugs)	Yes	No			
Q27:	(If yes to Q26) Has this problem gotten better in the last 6 months?	Yes	No			

Now I would like to ask you about your health and the health of other people in your household.

Q28:	Are you a member of Phil Health? (Select one)	Yes	No, because the benefits won't help my family.	No, because the benefits are too expensive.	No, because I don't have the appropriate paperwork to enroll. (no birth certificate,etc.)	I am not familiar with Phil Health.
Q29:	Is the female household head currently pregnant?	Yes	No			

(If Yes to Q29, continue with questions 30-31. If No, skip to Q32.)

Q30:	If pregnant, have they been given a maternal tetanus immunization?	Yes	No			
Q31:	If pregnant, whom are they attending pre-natal care? (Select all that apply)	Quack doctor	Hilot (Traditional)	Barangay health worker/ midwife/ birthing home	Doctor or Hospital	No pre-natal care
Q32:	At the last occasion, where did the female household head give birth?	Home	Birthing Home	Hospital	Other	
Q33:	At the last occasion the female household head gave birth was there anyone at the birth – choose only one:	Quack Doctor	Hilot (Traditional)	Barangay health worker/ midwife/ birthing home	Doctor or Hospital	No One
Q34:	At the last occasion the female household head gave birth did she received a home visit within 24 hours after delivery?	Yes	No			
Q35:	If yes to Q34, who visited?	Quack Doctor	Hilot (Traditional)	Barangay health worker/ midwife/ birthing home	Doctor	Other
Q36:	Has the female household head ever had a baby or child die?	No child has died.	Yes, miscarriage before birth.	Yes, death within one month to 5 years at time of death.	Yes, aged 6-15 at time of death.	Yes, aged 16 or older at time of death.
Q37:	(If yes to question 36) How many children have died?					
Q38:	Which of the following do you think is the best to feed baby under 6 months of age?	Breast milk only	Other milk only	Breast milk & other milk	Breast milk & other food	
Q39:	For how long did you breast feed your youngest child before introducing any other milk or food?	0-3 mos.	4-6 mos.	7-9 mos.	10-12 mos.	

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Q40:	What type of family planning are you using, if any? (Select only one, the most commonly use) [Let the recipient give the response without prompting the options.]	Abstinence	Natural methods	IUD	Pill	Injection
		Condom	Ligation	Vasectomy	Other family planning method	No family planning method

	Q41: In the last month, does each person have an illness?											Q42: How does this person receive treatment (Select one common choice that apply)								Q43: Does each child have? Note: Ask for children only.		
Line/ID Number	Chronic sickness(3 mo. Or more requiring treatment)	Physical disability	Blind	Deaf	Nausea and / or vomiting in the past month	Unresolved cough for more than two weeks	Diarrhea	Goitre	Mental illness	Other significant illness	No Significant illness	Hospital admission within the past month	Local health centre	Doctor	Quack doctor	Hilot	Barangay health worker	Other health worker	No medical assistance	Birth certificate at home	White Card	Complete routine Immunization
	1	2	3	4	5	6	6	7	8	9	10	1	2	3	4	5	6	7	8	1	2	3
Adult1	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A3	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A4	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A5	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A6	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A7	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A8	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Jumpstart	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
MCO	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Child1	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C3	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C4	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C5	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C6	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C7	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C8	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C9	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C10	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
TOTAL																						
6 to 15 TOTAL																						
0 to 5 TOTAL																						

		1	2	3	4	5	6
Q44:	Where do you go to the toilet?	Public Toilet	Toilet in the compound	Toilet in the house	Outside(No toilet)	On paper or in a plastic bag	Not sure
Q45:	Is there a means for hand washing in the toilet/cubicle/location?	Yes	No				
Q46:	Where did the water for hand washing come from?	Hands not washed	Took the water to the toilet location	Container near the toilet location	Tap water from the house	Not sure	
Q47:	Do you use soap for hand washing?	Hands not washed	Soap not use – water only	Soap not use – ash or other abrasive matl's	Soap & water	Not sure	

Q48:	Reason for not using soap:	Cost	Unable to purchase in local store	Prefer to use ash or other material	Not sure that soap is required	
Q49:	Where do you wash your clothes?	Clothes not washed	In river/water source more than 500 meters	In river/water source closer than 500 meters	At well more than 500 meters	At well closer than 500 meters · At home
Q50:	Where do you hang your clothes to dry?	Do not hung clothes	In fence around the house	In a tree	Outside on a line	House windows · Inside the house
Q51:	How do you clean your teeth?	Do not clean teeth	Rinse with water	Use salt and water	Use herbal mouth wash	Tooth brush only · Tooth brush & tooth paste
Q52:	How do you dispose dog or animal excrement?	No disposal	In paper/plastic bag	Sweep it away/burn it	Bury it	No dogs/animals allowed inside or yard

Now I'd like to ask you some questions about your food and drink.

Q53:	How many meals do you usually eat in a normal day?	One meal	Two meals	Three meals	More than three meals	
Q54:	How many times a week do you serve a meal containing vegetable?	zero	1 – 5 times week	6 – 10 times a week	11 – 15 times a week	16 – 21 times a week
Q55:	How many times a week do you serve viand? (Or meal containing meat, chicken or fish)	zero	1 – 5 times a week	6 – 10 times a week	11 – 15 times a week	16 – 21 times a week
Q56:	Total pesos spent by family on junk food per day?	0 – 10 Pesos	11 – 20 pesos	21- 30 pesos	31 – 40 pesos	41 – 50 pesos
Q57:	How often do you feel hungry at the end of the day?	Everyday	Several days a week	Once a week	Once a month	Rarely
Q58:	Do you do anything to make your water safer to drink?	No action	Buy drinking water (bottled, ATM)	Use water filter (ex: bio-sand)	Solar disinfection	Boiling of water · Other method to make water safe to drink
Q59:	How do you store water for cooking or drinking?	No storage	Bucket or similar container – no lid	Bucket or similar container – with lid	Earthen wear or plastic jug w/lid	Container from water vendor · From the tap in the house
Q60:	How far is your main water supply from your home?	0 to 20 meters	21 to 50 meters	51 to 100 meters	101 to 500 meters	500+ meters

I'd like to ask you some questions about your Income & occupation.

Line/ID Number	Q61: What is the type of work of each person? Fisherman (1)	Tricycle /trisikad driver (2)	Farmer (3)	Laundry (4)	Buy & sell (5)	Construction (6)	Household helper (7)	Others (8)	No work (9)	Q62: How much did each person earn from **regular work/petty jobs/occasional work** in the past month?	Q63: What was the approximate **value of any product produced** by each person during the past month? (Example: veg., detergent, snack, etc.)	Q64: How much did each person receive in **assistance from friends or relatives** in the past month? (include overseas remittances and gifts from nearby friends, but exclude gifts from mother to son within the family group below)	Q65: How much cash or value did each person receive **from any other source** in the past month?	
Adult1	O	O	O	O	O	O	O	O	O					
A2	O	O	O	O	O	O	O	O	O					Recipient Income
A3	O	O	O	O	O	O	O	O	O					
A4	O	O	O	O	O	O	O	O	O					
A5	O	O	O	O	O	O	O	O	O					
A6	O	O	O	O	O	O	O	O	O					
A7	O	O	O	O	O	O	O	O	O					
A8	O	O	O	O	O	O	O	O	O					Total HH income
Column Total														

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Q66:	**Compared to the rest of the year,** do you feel that your household income over the past month was:	Above average	Average	Below average		
Q67:	Has anyone in the household made a family budget before?	Yes	No			
Q68:	Does anyone in the household owe anyone money? If yes, how much?: _____	Yes	No			
Q69:	Does anyone in the household have any savings? If yes, how much?: _____	Yes	No			
Q70:	Do you have a vegetable garden?	Yes	No			
Q71:	If yes to Q70, how many vegetable plants are there in your garden?	1-10	11-20	21-50	51-100	101 +
Q72:	Does anyone in the household operate a small business?	Yes	No			
Q73:	If yes to Q72, check all that apply.	Vegetables or Seedlings	Vermi or Vermicast	Food & Snacks	Cleaning Products	Others
Q74:	Is the housing structure extremely poor and in need of emergency renovations?	Yes	No			
Q75:	If yes to Q74, select the box that best describes the poor condition of the house.	Habitable (needs few fix)	Dilapidated (some parts are falling)	Totally damage (could collapse at any time)		

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(Fill in the following table based on your observations. Do not ask the recipient.)

Indicator	Description and Corresponding Score	Score
Q76: Building Size	Big: >25 sqm. (4) | Medium: 10-15 sqm. (2) | Small: <15 sqm. (0)	
Q77: Foundation Structure	Concrete/Firm (4) | Bamboo/Moderate (2) | Dirt/Weak (0)	
Q78: Roof Materials	New GI Sheet (2) | Old GI Sheet/New Nipa (1) | Scrap/Old Nipa (0)	
Q79: Wall Materials	Concrete (4) | Wood (3) | Lawnanit/Plywood (2) | Bamboo (1) | Scrap (0)	
Q80: Land (Ask)	Own/Inherited (4) | Mortgage (2) | Renting (1) | Tenant/Squatting (0)	
Q81: House Materials (Ask)	Own/Inherited (4) | Mortgage (2) | Renting (1) | Tenant/Squatting (0)	
Q82: Duration of Residence (Ask)	5 years & above (5) | 1 years to 4 years (3) | below 1 year (1)	
Q83: Water Supply (Ask)	Faucet (gripo) at home or own deep well (2) | Shared deep well or faucet within 50 meters (1) | None within 50 meters (0)	
Q84: Electricity (Ask)	Own meter (2) | Shared meter (1) | None (0)	
Q85: Fuel (Ask)	LPG/Electricity for cooking (3) | Kerosene (2) | Charcoal/Wood (0)	
Q86: Toilet (Ask)	Flush in home (3) | Manual in home (2) | Pit/Shared/Communal (1) | None (0)	
Q87: Furniture	Wood/Steel/Plastic [New] (2) | Old/Used Furniture (1) | None (0)	
Q88: Appliances	1 point per working appliance: *(Example: TV, Stereo, Radio, Stove)*	
Q89: Car/Vehicle (Ask)	Jeep/Car (6) | Motorcycle/Tricycle (4) | Trisikad (3) | Bicycle (2) | None (0)	
	Total Poverty Score:	

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Appendix 2. MCO M&E data collection template

This is the monitoring and evaluation (M&E) template (two pages) used to collect regular metrics during the implementation of MCO. The ICM team responsible for implementing each MCO program would fill these templates in, under the supervision of ICM's national office.

		MALNOURISHED CHILDRENS OUTREACH PROGRAM DATA															
		PROGRAM DETAILS						PRE-PROGRAM DATA						MID-PROGRAM DATA			
ID	Base	Name of Child	Sex (M/F)	Date of birth	Age (months)	Feeding site	Referral source (B or C)	Date	Weight (kg)	Height (cm)	Weight-for-height Z score	WHZ	HAZ	FEB	MARCH	APRIL	MAY
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ID	END PROGRAM DATA								RISK MANAGEMENT					ATTENDANCE		FOLLOW UP PROGRAM DATA (6 months post MCO			
	Date	Weight (cm)	Height (cm)	Weight-for-height score	WHZ	HAZ	Weight gain (kg)	% weight gain	Dewormed as per protocol? (I or L or N)	Vit A as per protocol? (I or L or N)	Edema (y/n)	Health record warning (y/n)	Referred to RM (y/n)	No. days child attended feeding	No. days guardian attended feeding	No. mths post feeding	Height (cm)	Weight (kg)	Weight-for-height Z score
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Appendix 3. Supplementary Statistical Methods

In this study, we adopted and revised the measure for *intensity* of poverty, or *A*, as defined in the Alkire-Foster Method for measuring multi-dimensional poverty.[1] *Intensity* of poverty is defined as the average proportion of indicators in which a household is deprived in, and a household is categorized as 'experiencing poverty' if they are deprived in at least one third of the weighted indicators. One important feature of *A* is the ability to quantitatively estimate poverty at the household level, and therefore include in model building. In this study, *A* was developed from 13 weighted indicators available from the ICM household survey. The indicators used were the household's building size, foundation material, roof material, wall material, water supply, electricity, type of toilet, ownership of appliances, furniture, cars/vehicles, household head's literacy, and household food security. To develop weights for each indicator, Principal Component Analysis (PCA) was first utilized to develop the factor structure, after which Confirmatory Factor Analysis (CFA) was applied to the structure for model building. All model indices for *A* were found to be acceptable, CFI and NNFI were greater than 0.9 and RMSEA was below 0.05 as per the Alkire-Foster Method. Weights were finalized by taking the mean of bootstrapped communalities for each indicator. Further analysis showed that *A* weighed according to the CFA was more informative to the finalized models when compared to an equally weighted *A*.

For the linear outcome, model building started with an intercept-only model:

$$Y_{ij} = \gamma_{00} + u_{0j} + e_{ij}$$

and intraclass correlation (ICC) was calculated by:

$$ICC = \frac{\sigma_{u0}^2}{\sigma_{u0}^2 + \sigma_e^2}$$

where σ_{u0}^2 is the variance of the community-level residuals u_{0j}, and σ_e^2 is the variance of the individual-level residuals e_{ij}. Models were fitted with lower-level independent variables, excluding variables not significant according to t-tests. A community-level variable, Z_j was tested and included only if the deviance difference test was significant. Following this step, community-level residuals of the slope were systematically tested to determine the model with lowest deviance. Finally, interaction terms between lower and higher level variables were tested and included according to significance and model convergence.

The model building for the logistic outcome was similar, except for a few key steps. First, ICC was calculated by:

$$ICC = \frac{\sigma_{u0}^2}{\sigma_{u0}^2 + 3.29}$$

where 3.29 is the variance of a logistic distribution with scale factor 1 (with $\pi \approx 3.14$). Second, the variables included in the final model were shown to only lower deviance in combination, but not individually. Random slopes of independent variables which were not significant in the model, but significant as slopes were included in the final model if found to contribute towards parsimony.

After following the specified steps, the two final mixed-effects models were:

Linear (WHZ₂)
$$Y_{ij} = \gamma_{00} + \gamma_{10}X_{1ij} + \gamma_{20}X_{2ij} + \gamma_{30}X_{3ij} + \gamma_{40}X_{4ij} + \gamma_{50}X_{5ij} + \gamma_{60}X_{6ij} + \gamma_{01}Z_j$$
$$+ \gamma_{31}X_{3ij}Z_j + u_{2j}X_{2ij} + u_{5j}X_{5ij} + u_{4j}X_{4ij} + u_{0j} + e_{ij}$$

Logistic (dropout)
$$\pi_{ij} = logistic(\eta_{ij})$$
$$\eta_{ij} = \gamma_{00} + \gamma_{10}X_{1ij} + \gamma_{30}X_{3ij} + \gamma_{40}X_{4ij} + \gamma_{80}X_{8ij}$$
$$+ u_{1j}X_{1ij} + u_{3j}X_{3ij} + u_{4j}X_{4ij} + u_{7j}X_{7ij} + u_{8j}X_{8ij} + u_{0j}$$

All statistical analyses were performed in R (Version 3.2.3).[2] Full Maximum Likelihood (FML) was used to compare linear mixed-effects models. The default Laplace Approximation build in the package 'lme4'[3] was used to compare logistic mixed-effects models in conjunction with the optimizer 'mimqa'[4] set at 10,000 iterations.

References

1. Alkire S, Roche JM, Ballon P, et al. Multidimensional poverty measurement and analysis. Oxford, UK: Oxford University Press 2015.
2. R Core Team. R: A language and environment for statistical computing. R package version 3.2.3 Vienna, Austria: R Foundation for Statistical Computing; 2013 [Available from: http://www.R-project.org/.
3. Bates D, Maechler M, Bolker B, et al. Fitting Linear Mixed Effects Models Using lme4. *Journal of Statistical Software* 2015;67(1):1-48.
4. Bates D, Mullen KM, Nash JC, et al. Derivative-free optimization algorithms by quadratic approximation [program]: CRAN, 2015.

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No.	Recommendation	Page No.	Relevant text from manuscript
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1	Exploring trust in religious leaders and institutions as a mechanism for improving retention in child malnutrition interventions in the Philippines: A retrospective cohort study
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2	
Introduction				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5	
Objectives	3	State specific objectives, including any prespecified hypotheses	5	The objective of this study was to examine how different dimensions of trust, in addition to other indicators of social capital, affected program retention and physiological outcomes among participating children
Methods				
Study design	4	Present key elements of study design early in the paper	5	
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5	
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	5	
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case		

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Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6; Appendix 1 and Appendix 2
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	5

Continued on next page

Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6-7
		(*b*) Describe any methods used to examine subgroups and interactions	6
		(*c*) Explain how missing data were addressed	6
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	6
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	7
		© Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	7
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	7
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	7
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9-11
		(*b*) Report category boundaries when continuous variables were categorized	9-11
		© If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A

Continued on next page

Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	9-11

Discussion

Key results	18	Summarise key results with reference to study objectives	12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12
Generalisability	21	Discuss the generalisability (external validity) of the study results	12-13

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

BMJ Open

Exploring trust in religious leaders and institutions as a mechanism for improving retention in child malnutrition interventions in the Philippines: A retrospective cohort study

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Exploring trust in religious leaders and institutions as a mechanism for improving retention in child malnutrition interventions in the Philippines: A retrospective cohort study

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Abstract

Objectives: In the context of persistent child malnutrition in the Philippines, the objective of this study was to understand the mechanisms at play when a faith-based organization (FBO) addressed moderate and severe acute malnutrition among children from households experiencing extreme poverty.

Setting: We retrospectively analyzed survey data collected by International Care Ministries (ICM) in 2012-2013 across 150 communities in eight provinces (Negros Oriental, Negros Occidental, Bohol, Palawan, Sarangani, South Cotabato, Sultan Kudarat, and Zamboanga del Norte) of the Philippines.

Study Participants: Caregivers of 1,192 children experiencing moderate acute malnutrition and severe acute malnutrition between the ages of 6 to 60 months

Intervention: A 16-week child malnutrition treatment program called Malnourished Child Outreach (MCO) offered by ICM in partnership with local religious leaders and institutions

Primary and secondary outcome measures: Program dropout and weight-for-height z-score (WHZ) at the end of the program for enrolled children were the two outcomes of interest. A logistic mixed-effects model was built to assess factors associated with program dropout, and a linear mixed-effects model for factors associated with WHZ at the end of the program.

Results: Trust in religious leaders or institutions (-0·87; [95CI: -1·43, -0·26]) was negatively associated with program dropout, suggesting that with increasing levels of trust, decreasing proportions of children dropped out of treatment. Retention in the program led to improved WHZ among participating children (-0.38; [95CI: -1.43, -0.26]). Various measures of social capital, including trust in religious and public institutions, were not associated with WHZ at the end of the program.

Conclusions: Leveraging pre-existing trust in religious leaders and institutions among households experiencing extreme poverty is one way that ICM, and potentially other FBOs, can promote retention in child nutrition interventions among vulnerable populations.

Trial registration: None

Key Words

nutrition, children, faith-based organizations, social capital, Philippines

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Strengths and Limitations

- The study was conducted in a unique setting for examining the underlying mechanisms associated with the retention of children enrolled in malnutrition interventions delivered by a faith-based organization to children in households experiencing extreme poverty
- The retrospective cohort design of this study is an opportunistic and practical approach for exploring the role of religious leaders in health interventions
- Linear and logistic modelling is used to explore the pathways through which social capital shapes nutrition outcomes in malnourished children who concurrently experience extreme poverty in the Philippines
- Multi-level modelling allows analyses to account for the hierarchal structure of variables that are present in the communities where the child malnutrition intervention described in this study took place
- While multiple factors were considered to examine treatment outcomes in child malnutrition interventions, the study could not account for all potential confounders within the complex social settings where the study was conducted

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Introduction

Faith-based organization (FBOs) play a critical role in delivering healthcare in low resource settings. Compared to public health facilities and providers, programs and interventions offered by FBOs in some settings may have increased geographic and socioeconomic coverage, greater social and physical capital, and more flexible governance and funding structures [1-3]. Additionally, many FBOs focus exclusively on serving poor and vulnerable people, addressing limited reach of public health systems [4 ,5]. As a result, partnerships between public health institutions and FBOs are increasingly being viewed as an important strategy for improving healthcare access and health outcomes in low-and-middle-income countries [3 ,6].

Despite the critical role that FBOs play in delivering healthcare in low resource settings, the capabilities and assets of some FBOs have been underused and underexplored [1 ,7]. This underutilization may be influenced by concerns that the religious underpinnings of FBOs contradict human rights and associated health outcomes, such as in the case of sexual and reproductive health or vaccination campaigns [1 ,8]. Challenges also exist with the alignment of health priorities between FBOs and national health systems, inconsistent funding and governance of local FBOs, and their limited capacity to adapt to changing health systems [2 ,7]. Additionally, there are gaps in evidence with regard to the quantity and distribution of FBOs, the quality of care provided by these organizations, and the factors that contribute to the success of programs and interventions led by FBOs [1 ,5 ,7].

Collaboration with local religious leaders and their institutions is one factor contributing to the success of health interventions implemented by FBOs. Many communities view religious leaders and institutions as a trustworthy and credible source of health advice and information, with research finding that religious leaders' opinions can strongly influence social and behavioural norms [9-12]. As embedded members of their communities, local religious leaders frequently have intimate knowledge of existing histories, networks, and sociocultural dynamics influencing individual and community health and wellbeing, which positions them as important resources for health interventions [13]. As such, local religious leaders have been identified as change agents key to promoting health awareness, disseminating health education, developing and implementing health interventions, and influencing health seeking behaviour [9-12 ,14 ,15].

Turning to the Philippines, recent impressive national economic growth has not translated into a meaningful reduction in chronic and acute child malnutrition. According to the 2015 National Nutrition Survey, between 2013 and 2015, the national prevalence of under-five underweight increased from 20% to 21.5% and under-five stunting increased from 30.3% to 33.4% [16 ,17]. Prevalence of under-five wasting decreased slightly from 8.0% to 7.1% over this time period [18]. Concurrently, an estimated 8.1% of the total population lived in extreme poverty in 2015 [19], which represents a high national-level prevalence of poverty when compared to neighbouring Asia-Pacific countries [20].

Achieving universal healthcare with an emphasis on health equity is a core mandate for the Department of Health in the Philippines. However, gaps remain in service provision for households that simultaneously experience extreme poverty and child malnutrition, which is especially problematic in cases of moderate acute malnutrition (MAM) and severe acute malnutrition (SAM). Where such service gaps exist, civil society organizations including FBOs, in addition to multi-lateral institutions, such as the World Food Programme and United Nations International Children's Emergency Fund (UNICEF), may step in to provide complementary care. Notably, there is increasing attention and interest in the longstanding role of FBOs in delivering healthcare to complement existing public healthcare infrastructure [1 ,4 ,21].

Trust, social relationships, cooperation, and reciprocity, or *social capital*, play a critical role in the well-being of income poor households [22 ,23]. Social capital is theorized to have both an internal (via bonding relationships between members of a group) [24] and an external (via bridging connections to external supports beyond a group) function [25]. In terms of external functionality, trust in healthcare providers and institutions is an important mechanism underlying healthcare decisions and treatment adherence [26]. Additionally, trust in healthcare personnel, a facility, or the healthcare system more broadly is often cited as a determinant of health seeking behaviour and connected with positive health outcomes [27-29]. What is less clear is how trust in religious leaders and institutions in partnership with FBOs delivering health interventions interacts with other structural and socioeconomic barriers to influence healthcare access and use for households that experience extreme poverty. Moreover, there is limited research examining how trust in the religious leaders and institutions associated with these organizations influences subsequent retention of participants within program interventions aimed at addressing childhood malnutrition.

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To engage with these questions, we retrospectively analyzed data collected by a Philippine FBO (International Care Ministries; ICM) that delivered a program to address MAM and SAM in children living in ultrapoor households (defined as less than $0.50 USD per person per day) in partnership with local religious leaders and institutions. The objective of this study was to examine how different dimensions of trust, in addition to other indicators of social capital, affected program retention and physiological outcomes among participating children.

Methods

Intervention

ICM implemented three rounds of a treatment program targeted at acute child malnutrition from 2012 to 2013. The programs ran from June 2012 to September 2012, October 2012 to January 2013, and February 2013 to May 2013. A total of 1,219 children from 1,010 households representing 150 unique communities were treated and surveyed across the provinces of Negros Oriental, Negros Occidental, Bohol, Palawan, Sarangani, South Cotabato, Sultan Kudarat, and Zamboanga del Norte in the Philippines.

The treatment program, called Malnourished Child Outreach (MCO), was a 16-week site-based feeding program for moderately and severely wasted children between the ages of 6 to 60 months. Severe acute malnutrition (SAM) was defined as weight-for-height Z-score (WHZ) $\leq$ -3SD from median reference values, and moderate acute malnutrition (MAM) was defined as WHZ $\leq$ -2SD and > -3SD from reference values according to international standards [30]. ICM initiated programs when a local volunteer pastor was able to identify 10 to 15 malnourished children within the vicinity of his or her church. Pastors, who were associated with various Protestant denominations, consulted a list of malnourished children kept by local health centers. These pastors then conducted house-to-house visits to complete enrollment. All malnourished children were eligible for enrollment, regardless of religious affiliation. Once the enrollment target was met, ICM would provide the food, protocol, and staff to complement the pastor and church volunteers for program delivery. In a fixed location in or near the volunteer pastors' church, ICM staff would prepare a single meal which was fed to children, assisted by their caregivers, for five days per week over a 16-week period. The product used for the feeding program was a micronutrient fortified rice-based soy blend which required cooking. Other program components included deworming, a health assessment, weight monitoring, weekly health, nutrition, and health education for caregivers, and home-based vegetable gardening. Children who remained SAM at the end of the 16 weeks were referred to local government clinics for additional assessment and management.

Study Design

This was an opportunistic study, retrospectively designed to utilize household surveys that ICM administered to the caregivers of the children enrolled in the MCO program. As a result, all households with complete treatment outcome data were included as study participants within the retrospective cohort. To understand household characteristics, caregivers of enrolled children were interviewed at baseline by trained enumerators prior to the start of the treatment. Written informed consent was obtained at two points in time: first from the guardian when children were enrolled into the program, and again at the start of the baseline survey. Questions covered household demographics, economic well-being, general health, asset-based poverty measures, and hygiene. Indicators of pre-existing social capital were also explored including group membership, trust in local religious leaders and institutions, and trust in local public healthcare facilities (Appendix 1). These survey data were linked with weekly monitoring and outcomes data. Monitoring data captured weekly weights, number of feeding sessions attended, and outcomes included treatment completion (did not drop out), and discharge weight and height measures (Appendix 2).

Limited Patient and Public Involvement

We did not include patient and public involvement (PPI) in the design, conduct, or analysis in this study. The preliminary findings have been discussed with carers and providers, with plans to disseminate implications to the wider nutrition community in the Philippines.

Statistical Approach

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There were two outcomes of interest: 1) dropout (categorical variable), defined as children who were withdrawn from the program by their caregiver or missed repeated feeding sessions and lost to follow up and 2) WHZ at the end of the program (continuous variable). Independent variables were at both the individual/household level and the community level (see Table 1). The geographical type of community was categorized into Urban Slum, Rural Plain/Rural Slum, Rural Mountain, or Coastal/Fishing by ICM staff. We adopted and revised the measure for *intensity* of poverty, or *A*, as defined in the Alkire-Foster Method for measuring multi-dimensional poverty [31]. *Intensity* of poverty is defined as the average proportion of indicators in which a household is deprived in, and a household is categorized as 'experiencing poverty' if they are deprived in at least one third of the weighted indicators. One important feature of *A* is the ability to quantitatively estimate poverty at the household level, and therefore include in model building (see Appendix 3 for more detail).

Table 1. List of Model Outcomes & Variables

Level	Item	Variable	Description
Logistic Model			
Outcome	Dropout	π_{ij}	Binary result if child dropped out of the program
1 (household level)	Sex	X_{1ij}	Sex of the child
	Trust in Religious Leader or Church	X_{3ij}	How much do you trust your religious leaders or church? [5 point Likert scale]
	Trust in Barangay[1]	X_{4ij}	How much do you trust your local barangay? [5 point Likert scale]
	Trust in Neighbours	X_{7ij}	How much do you trust your neighbours? [5 point Likert scale]
	Family Satisfaction	X_{8ij}	How satisfied are you with your Family Life? [5 point Likert scale]
	WHZ_1	X_{5ij}	Baseline weight-for-height z-score of the child
	A	X_{6ij}	Intensity of poverty
Linear Model			
Outcome	WHZ_2	Y_{ij}	Discharge weight-for-height z-score of the child
1 (household level)	Sex	X_{1ij}	Sex of the child
	Age	X_{2ij}	Age of the child at baseline
	Trust in Religious Leader or Church	X_{3ij}	How much do you trust your religious leaders or church? [5 point Likert scale]
	Trust in Barangay	X_{4ij}	How much do you trust your local barangay? [5 point Likert scale]
	WHZ_1	X_{5ij}	Baseline weight-for-height z-score of the child
	A	X_{6ij}	Intensity of poverty
2 (community level)	Geography	Z_j	Geographical type of the community

1. A 'barangay' is the smallest administrative division in the Philippines, and represents the local government

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The hierarchical structure in which this intervention was set (households in communities) required the utilization of mixed-effects modeling to explore the potential causal relationship of varied dimensions of social capital at the household and the geographical context at the community level.

For both outcomes, a series of covariates such as sex of caregiver, age of caregiver, household size, etc. were explored. The most parsimonious models that minimize deviance were chosen. All analyses were conducted using R (Version 3.2.3). Detailed statistical methods are described in the Supplementary Materials (Appendix 3).

This study was reviewed and approved by the University of Toronto's Research Ethics Board (REB# 30943).

Results

A total of 1,219 treated children were included in this study, however 27 cases had incomplete treatment records and an additional 176 cases had incomplete weight data. As a result, final logistic analyses included 1,192 children, while the linear analyses included 1,016 children. Significant differences were not detected between the logistic and linear cases at baseline (Tables 2 & 3). The average age of children was 33.13 months and 32.96 months in the logistic and linear models, respectively. The sex of the children was balanced, while measures of trust were found to be slightly higher for religious leaders or churches than for local government (barangay) and neighbours.

Table 2. Baseline Values of Continuous Independent Variables

Variable	Logistic Model (n=1192)		Linear Model (n=1016)	
	mean	sd	mean	sd
Age (months)	33.13	15.56	32.96	15.55
WHZ_1	-2.42	1.00	-2.42	1.01
A	0.36	0.22	0.37	0.21
Trust in Religious Leader or Church	4.20	0.83	4.21	0.83
Trust in Local Barangay	3.96	0.93	3.94	0.94
Trust in Neighbours	3.91	0.92	-	-
Family Satisfaction	3.77	1.02	-	-

Table 3. Baseline Values of Categorical Independent Variables

Variables	n	%
Logistic Model		
sex (male)	585	49%
sex (female)	607	51%
Linear Model		
sex (male)	504	50%
sex (female)	512	50%
Geographical Types		
Urban Slum	225	19%
Rural Plain/Rural Slum	305	26%
Rural Mountain	487	41%
Coastal/Fishing	175	15%

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The final mixed-effects model on dropout included sex, three measures of social capital, intensity of poverty (*A*) and a series of random effects (Table 4). In the most parsimonious model, which includes predictors and interaction terms, the caregiver's trust in religious leaders or church was negatively associated with dropout (-0.87; [95CI: -1.43, -0.26]), suggesting that each increased level of satisfaction or trust was associated with a decreased proportion of dropouts from the treatment program. The caregiver's trust in the local barangay was associated with dropout in the reverse direction (0.81; [95CI: 0.22, 1.40]), interpreted as those with higher levels of trust in local government dropping out more. These estimates reveal that trust in specific entities can be correlated with likelihood of dropout in opposing directions, depending on whom or where the trust is directed towards. Households reporting a higher intensity of poverty were also significantly linked with a lower rate of dropout (-4.21; [95CI: -7.76, -0.66]).

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Table 4. Logistic Mixed Effects Model on Dropout from HBF program

	Model 1 (intercept only)				Model 2 (with predictors)				Model 3 (with predictors & interaction)			
	coefficient	se[1]	95CI	sig[2]	coefficient	se[1]	95CI	sig[2]	coefficient	se[1]	95CI	sig[2]
Fixed items												
Intercept	-2.04	0.15	(-2.33, -1.75)	***	-0.65	1.01	(-2.63, 1.33)		-1.01	1.05	(-3.17, 1.05)	
Sex (male)					-0.28	0.22	(-0.71, 0.15)		-0.26	0.22	(-0.69, 0.17)	
A^3					-1.34	0.88	(-3.06, 0.38)		-4.21	1.81	(-7.76, -0.66)	*
Family satisfaction					-0.35	0.22	(-0.78, 0.08)		-0.38	0.23	(-0.83, 0.07)	
Trust in Religious Leader or Church					-0.85	0.31	(-1.46, -0.24)	**	-0.87	0.31	(-1.48, -0.26)	**
Trust in Local Barangay					0.73	0.29	(0.16, 1.30)	*	0.81	0.30	(0.22, 1.40)	*
Geographical type												
Urban slum (reference)					-	-	-		-	-	-	
Rural Plain/Rural Slum					0.05	0.43	(-0.79, 0.89)		0.20	0.46	(-0.70, 1.10)	
Rural Mountain					0.12	0.48	(-0.82, 1.06)		0.41	0.51	(-0.59, 1.41)	
Coastal/Fishing					0.009	0.56	(-1.09, 1.11)		0.30	0.57	(-0.82, 1.42)	
Interactions												
A x Urban slum (reference)									-	-	-	
A x Rural Plain/Rural Slum									2.11	2.11	(-2.03, 6.25)	
A x Rural Mountain									4.05	2.25	(-0.36, 8.46)	
A x Coastal/Fishing									6.45	2.45	(1.65, 11.25)	**
Random items												
σ_0	1.12	1.06	(-0.96, 3.20)									
σ_{034578}					27.21	5.22	(16.98, 37.44)		28.86	5.37	(18.33, 39.39)	
σ_3					1.07	1.04	(-0.97, 3.11)		1.31	1.14	(-0.92, 3.54)	
σ_4					19.56	4.42	(10.90, 28.22)		12.88	3.59	(5.84, 19.92)	
σ_5					0.62	0.79	(-0.93, 2.17)		0.68	0.82	(-0.93, 2.29)	
σ_7					1.40	1.18	(-0.91, 3.17)		1.62	1.27	(-0.87, 4.11)	
σ_8					1.07	1.03	(-0.95, 3.09)		0.98	0.99	(-0.96, 2.92)	
Deviance	960.1				893.1				884.8			

1. Standard Error
2. Statistical significance: * when p<0.05, ** when p<0.01, ** when p<0.001
3. Intensity of Poverty

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The estimates in Table 5 describe the results of mixed-effects modeling on WHZ_2 as an outcome. The intercept of Model 1 (intercept only) estimated at -0.38 is the unadjusted decrease in average WHZ at discharge for children treated across all communities. The direction of this coefficient suggests that on average, children that adhered and completed the program experienced movement toward normal WHZ. The intraclass correlation coefficient (ICC) calculated for the model was 0.27, representing that 27% of variance in WHZ_2 is attributed to the community level covariate of geographical type. Age was negatively correlated to WHZ_2, indicating that older children experienced diminished growth compared to younger children. WHZ_1 was positively correlated with WHZ_2, which can be interpreted as children who were closer to normal weight at the beginning of the program achieved a higher WHZ_2 by the end of the program. Intensity of poverty was also found to be significant. The coefficient of -0.47 in Model 3 is not directly interpretable, but the direction shows that greater intensity of household poverty was linked to lower WHZ_2. Neither measure of caregiver trust (in religious leaders and church, or local government) was found to be significantly correlated with WHZ_2. Additional modeling using centered coefficients to increase parsimony were conducted but are not reported as they were not found to improve the model.

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Table 5. Linear Mixed Effects Model on Weight-for-Height Z-score at Discharge

	Model 1 (intercept only)				Model 2 (with predictors)				Model 3 (with predictors & interaction)			
	coefficient	se[1]	95CI	sig[2]	coefficient	se[1]	95CI	sig[2]	coefficient	se[1]	95CI	sig[2]
Fixed items												
Intercept	-0.38	0.06	(-0.50, -0.26)	***	0.71	0.30	(0.12, 1.30)	**	1.02	0.45	(0.14, 1.90)	**
Sex (male)					0.03	0.06	(-0.09, 0.15)		0.01	0.06	(-0.11, 0.13)	
Age (months)					-0.48	0.08	(-0.64, -0.32)	***	-0.47	0.08	(-0.63, -0.31)	***
WHZ_1					0.45	0.05	(0.35, 0.55)	***	0.45	0.05	(0.35, 0.55)	***
A^3					-0.47	0.16	(-0.78, -0.16)	**	-0.48	0.16	(-0.79, -0.17)	**
Trust in Religious Leader or Church					0.09	0.06	(-0.03, 0.21)		0.02	0.09	(-0.16, 0.20)	
Trust in Local Barangay					-0.006	0.05	(-0.10, 0.09)		-0.007	0.05	(-0.11, 0.09)	
Geographical type												
Urban Slum (reference)					-	-			-	-		
Rural Plain/Rural Slum					0.32	0.14	(0.05, 0.59)	*	0.14	0.60	(-1.04, 1.32)	
Rural Mountain					0.21	0.16	(-0.10, 0.52)		-0.04	0.54	(-1.10, 1.02)	
Coastal/Fishing					0.82	0.20	(0.43, 1.21)	***	-1.21	0.71	(-2.60, 0.18)	
Interactions												
Trust in Religious Leader or Church x Urban Slum (reference)												
Trust in Religious Leader or Church x Rural Plain/Rural Slum									0.04	0.13	(-0.21, 0.29)	
Trust in Religious Leader or Church x Rural Mountain									0.05	0.12	(-0.19, 0.29)	
Trust in Religious Leader or Church x Coastal/Fishing									0.55	0.18	(0.20, 0.90)	**
Random items												
σ_e	1.05	1.02	(-0.95, 3.05)		0.71	0.84	(-0.94, 2.36)		0.71	0.84	(-0.94, 2.36)	
σ_{u0}	0.38	0.62	(-0.84, 1.60)									
σ_{u013}					0.89	0.94	(-0.95, 2.73)		0.83	0.91	(-0.95, 2.61)	
σ_{u1}					0.11	0.33	(-0.54, 0.76)		0.12	0.34	(-0.55, 0.79)	
σ_{u3}					0.09	0.31	(-0.52, 0.70)		0.10	0.31	(-0.51, 0.71)	
σ_{u06}					0.91	0.95	(-0.95, 2.77)		0.64	0.80	(-0.93, 2.21)	
σ_{u6}					0.02	0.13	(-0.23, 0.27)		0.009	0.10	(-0.19, 0.21)	
Deviance	3100.2				2808.8				2800.4			

1. Standard Error
2. Statistical significance: * when p<0.05, ** when p<0.01, ** when p<0.001
3. Intensity of Poverty

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Discussion

While social networks are critical for the poorest households to access and navigate health and social services, the multidimensional vulnerabilities and exclusion that these households often experience make them the least able to effectively leverage relationships for household benefit [32 ,33]. This reality is evident in the Philippines, with a previous study demonstrating that poor households in a slum area with few social ties had less access to key municipal services, such as water [34]. We suggest that when households experiencing extreme poverty trust local religious leaders and institutions (i.e., local pastors and churches), they are more likely remain enrolled in services provided through these networks, and an opportunity exists for these actors to improve the delivery of health and social services. In addition to trust, we recognize that need also drives program retention as households with the greatest intensity of poverty were the least likely to drop out of the program offered by ICM.

There is a lack of consensus regarding the effectiveness of FBOs to deliver primary healthcare across low-resource settings among populations experiencing extreme poverty [35-38]. Similarly there is a need for more information to understand if and under what conditions these organizations contribute to positive health outcomes [5]. However, the trusting relationships that FBOs as well as religious leaders and institutions often hold in the communities in which they are embedded in and operate have been highlighted as an important feature and possible mechanism to ensure effective and meaningful service delivery [9 ,13 ,15]. The logistic mixed effects model showed a significant negative association (-0.87; [95CI: -1.43, -0.26]) between dropout a caregiver's trust in religious leaders and institutions, confirming that this type of trust was a determinant of retention among participants attending the MCO program administered by ICM in partnership with local religious leaders. This model of service delivery provides an example of a potential strategy FBOs in the Philippines, and elsewhere, can use to contribute to addressing acute child malnutrition – namely, leveraging trust in religious leaders and institutions prior to the intervention among households experiencing extreme poverty to promote health program retention among vulnerable populations.

High levels of structural social capital (i.e., group membership and the presence of social support) among caregivers have been hypothesized to contribute positively to the nutritional status of their children. Structural social capital is thought to lead to access to food resources, improved living conditions, access to knowledge networks, and access to health services, which in turn, may create conditions of increased food security, reduced childhood illness, and an increased ability to care for children [39]. In our study, initial weight-for-height, age at baseline, and the intensity of household poverty were associated with physiological outcomes among acutely malnourished children following treatment. Additionally, children who completed the treatment program experienced movement toward a normal WHZ. However, various structural dimensions of social capital among caregivers were not directly associated with improved physiological outcomes in acutely malnourished children. This finding pushes us to more closely examine the relationship between participant retention in malnutrition interventions and structural social capital as the mechanism through which structural social capital influences child nutrition outcomes.

This study faced several limitations. First, the findings represent the outcomes of one program implemented by a specific Christian FBO in the Philippines and its partnership with Protestant religious leaders and churches, which might not be readily generalizable to other settings. Second, the data collected were limited to enumerators directly asking caregivers of children in income poor communities to respond to questions about their trust in individuals and groups connected to the organization providing them with services or resources. Third, the models presented were restricted to exploring the covariates included in the baseline survey. Fourth, there was the lack of distinction between interpersonal trust in religious leaders and trust in religious institutions in the survey. As a result, we were unable to distinguish between these types of trust within this study. Finally, the sustainability of these results over time could be questioned as the data were collected up to and including May 2013. To address this limitation, future replication studies are planned.

Given the high burden of child malnutrition in the Philippines, there is a need for effective strategies to deliver care for MAM and SAM. Experiences of social exclusion (e.g. limited trust in public institutions) have been found to influence health seeking behaviour and contribute to gaps in healthcare provision [40]. We suggest that when individuals feel socially excluded from public health services or institutions, providing health services through collaborations between FBOs and trusted religious leaders and institutions can act as a critical alternative. Community-based care offered by FBOs in partnership with local religious leaders and institutions presents an opportunity to engage with and support income poor households with weak social networks. Based on this finding, we suggest that the delivery of healthcare through FBOs that build on pre-existing trusting relationships with local religious leaders and institutions, should be further explored and evaluated.

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Footnotes

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Supplementary Materials

Appendix 1. ICM Survey Form v3.3

ICM Survey Form v3.3 was the survey instrument used to interview program participants before and after the intervention. The interviews were conducted by part-time enumerators hired by ICM's Research Department, trained on data collection practices and survey conduct. These enumerators are separate from the program delivery team, with minimal to no interaction.

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INTERNATIONAL CARE MINISTRIES FOUNDATION, INC.
Program Survey Form

[ ] Pastor [ ] Counselor [ ] Participant [ ] Jumpstart [ ] MCO   Date: _____ Time: _____

Name: (Last, First MI) _____   Mobile No.: _____

Recipient No.:

Base #	Program #	Batch #	Community #	Participant #

1:Bacolod, 2:Bohol, 3:Dumaguete, 4:GenSan, 5:Koronadal, 6:El Nido; 7:Dipolog

1:Transform, 2:Jumpstart 3:MCO

Hello. My name is _____, and I am working with International Care Ministry of the Philippines (ICMPI). We are conducting a survey about various health and livelihood issues. We would very much appreciate your participation in this survey. The survey usually takes between 30 and 45 minutes to complete. The purpose of this survey is for ICMPI to measure the impact of the program you have been selected to join. It is a two part survey: the „pre" and the „post". Which means the before program survey and the after program survey. Today it will be the Pre survey / Post survey (chose the correct one). ICMPI uses this information to inform sponsors and donors about the activities of ICM, but most importantly these survey"s help ICMPI to improve the programs that they offer and help teach ICMPI about how better to conduct their programs. The interview is completely confidential and your responses will only be analysed together with all the others. No one will find out how you answered and your answers will not have any impact on the benefits that you receive so please answer honestly.

At this time, do you want to ask me anything about the survey?

First we will collect information about your household. Can I start by asking about the people who are 16 years old & above in your household:

Line/ID Number	Q1: Starting with the participant, please give me the names of the adults (over 16) who usually live here and eat with you.	Q2: What is the highest grade he or she has completed?	Q3: What is the age of each person?	Q4: Is each person male or female?		Q5: What is each person"s marital status? *(For questions 5-7, please fill up only for adults aged 16 to 65)*						Q6: Does he or she have a birth certificate at home?		Q7: Does he or she have a marriage certificate at home?	
				1	2	1	2	3	4	5	6	1	2	1	2
				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
Adult1				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A2				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A3				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A4				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A5				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A6				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A7				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
A8				M	F	Married	Live-in	Separated	Widowed	Single	Other	Yes	No	Yes	No
AVERAGE (AGE)/TOTAL:															

Just to make sure that I have a complete listing, are there any other people who may not be members of your family, such as domestic help, lodgers, or friends who usually live here? [IF "YES", ADD TO FIRST TABLE]

Now, I'd like to ask about the children who are 15 years old and younger that live in the household:
NOTE: For Jumpstart recipient kindly fill up the first column to indicate that the child is a Jumpstart recipient.

Line/ID Number	Q8: Please give me the names of the children (15 years old and below) who usually live here and eat with you.	Q9: How old is each person(in years)?	Q10: what is the highest grade he or she completed	Q11: Is each person male or female?		Q12: Is each child currently enrolled in school?		Q13: Does each child receive a scholarship?		Q14: What type of school does each child attend?		
				1	2	1	2	1	2	1	2	3
				M	F	Yes	No	Yes	No	ICM	Government	Private
Jumpstart				M	F	Yes	No	Yes	No	ICM	Government	Private
MCO				M	F	Yes	No	Yes	No	ICM	Government	Private
Child1				M	F	Yes	No	Yes	No	ICM	Government	Private
C2				M	F	Yes	No	Yes	No	ICM	Government	Private
C3				M	F	Yes	No	Yes	No	ICM	Government	Private
C4				M	F	Yes	No	Yes	No	ICM	Government	Private
C5				M	F	Yes	No	Yes	No	ICM	Government	Private
C6				M	F	Yes	No	Yes	No	ICM	Government	Private
C7				M	F	Yes	No	Yes	No	ICM	Government	Private
C8				M	F	Yes	No	Yes	No	ICM	Government	Private
C9				M	F	Yes	No	Yes	No	ICM	Government	Private
C10				M	F	Yes	No	Yes	No	ICM	Government	Private
6 to 15 AVERAGE (AGE)/TOTAL:												
0 to 5 AVERAGE (AGE)/TOTAL:												

Note: If the child is a Jumpstart recipients use the table labelled as "Jumpstart for his/her data & for an MCO recipient use the table labelled as "MCO" as well.

		1	2	3	4	5
		0 to 5	6 to 15	16 to 65	65+	Total
Q15:	Household Count Summary: 〔Put in total number of people in each category〕					
Q16:	Show the recipient the sentence written on the last page of this survey form. Ask them to read it out for you. If they can read it then mark "Yes", if not mark "No".	Yes	No			

Now I would like to ask you about your relationships with other people. In particular I would like to ask you about your interactions with other people.

Q17:	How satisfied are you with your family life?	Not at all satisfied	Not very satisfied	Neutral	Somewhat satisfied	Very Satisfied
Q18:	How satisfied are you with your friendships?	Not at all satisfied	Not very satisfied	Neutral	Somewhat satisfied	Very Satisfied

For questions 19 – 22, please indicate how much you trust the following people:

Q19:	Your relatives	No trust	Tentatively trust	Neutral	Moderately trust	Very trusting
Q20:	Your neighbors	No trust	Tentatively trust	Neutral	Moderately trust	Very trusting
Q21:	Your religious leaders or church	No trust	Tentatively trust	Neutral	Moderately trust	Very trusting
Q22:	Your local barangay	No trust	Tentatively trust	Neutral	Moderately trust	Very trusting
Q23:	In the last 6 months how many times have you been in a serious dispute with another person?					
Q24:	In your family is there anyone currently experiencing physical abuse?	Yes	No			
Q25:	(If yes to Q24) Has this problem gotten better in the last 6 months?	Yes	No			
Q26:	Does anyone in your family currently have problems with substance abuse (alcohol/drugs)	Yes	No			
Q27:	(If yes to Q26) Has this problem gotten better in the last 6 months?	Yes	No			

Now I would like to ask you about your health and the health of other people in your household.

Q28:	Are you a member of Phil Health? (Select one)	Yes	No, because the benefits won't help my family.	No, because the benefits are too expensive.	No, because I don't have the appropriate paperwork to enroll. (no birth certificate,etc.)	I am not familiar with Phil Health.
Q29:	Is the female household head currently pregnant?	Yes	No			

(If Yes to Q29, continue with questions 30-31. If No, skip to Q32.)

Q30:	If pregnant, have they been given a maternal tetanus immunization?	Yes	No			
Q31:	If pregnant, whom are they attending pre-natal care? (Select all that apply)	Quack doctor	Hilot (Traditional)	Barangay health worker/ midwife/ birthing home	Doctor or Hospital	No pre-natal care
Q32:	At the last occasion, where did the female household head give birth?	Home	Birthing Home	Hospital	Other	
Q33:	At the last occasion the female household head gave birth was there anyone at the birth – choose only one:	Quack Doctor	Hilot (Traditional)	Barangay health worker/ midwife/ birthing home	Doctor or Hospital	No One
Q34:	At the last occasion the female household head gave birth did she received a home visit within 24 hours after delivery?	Yes	No			
Q35:	If yes to Q34, who visited?	Quack Doctor	Hilot (Traditional)	Barangay health worker/ midwife/ birthing home	Doctor	Other
Q36:	Has the female household head ever had a baby or child die?	No child has died.	Yes, miscarriage before birth.	Yes, death within one month to 5 years at time of death.	Yes, aged 6-15 at time of death.	Yes, aged 16 or older at time of death.
Q37:	(If yes to question 36) How many children have died?					
Q38:	Which of the following do you think is the best to feed baby under 6 months of age?	Breast milk only	Other milk only	Breast milk & other milk	Breast milk & other food	
Q39:	For how long did you breast feed your youngest child before introducing any other milk or food?	0-3 mos.	4-6 mos.	7-9 mos.	10-12 mos.	

Q40:	What type of family planning are you using, if any? (Select only one, the most commonly use) [**Let the recipient give the response without prompting the options.**]	Abstinence	Natural methods	IUD	Pill	Injection
		Condom	Ligation	Vasectomy	Other family planning method	No family planning method

	Q41: In the last month, does each person have an illness?											Q42: How does this person receive treatment (Select one common choice that apply)								Q43: Does each child have? *Note: Ask for children only.*		
Line/ID Number	Chronic sickness(3 mo. Or more requiring treatment)	Physical disability	Blind	Deaf	Nausea and / or vomiting in the past month	Unresolved cough for more than two weeks	Diarrhea	Goitre	Mental illness	Other significant illness	No Significant illness	Hospital admission within the past month	Local health centre	Doctor	Quack doctor	Hilot	Barangay health worker	Other health worker	No medical assistance	Birth certificate at home	White Card	Complete routine Immunization
	1	2	3	4	5	6	6	7	8	9	10	1	2	3	4	5	6	7	8	1	2	3
Adult1	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A3	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A4	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A5	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A6	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A7	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
A8	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Jumpstart	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
MCO	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Child1	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C2	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C3	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C4	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C5	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C6	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C7	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C8	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C9	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
C10	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
TOTAL																						
6 to 15 TOTAL																						
0 to 5 TOTAL																						

		1	2	3	4	5	6
Q44:	Where do you go to the toilet?	Public Toilet	Toilet in the compound	Toilet in the house	Outside(No toilet)	On paper or in a plastic bag	Not sure
Q45:	Is there a means for hand washing in the toilet/cubicle/location?	Yes	No				
Q46:	Where did the water for hand washing come from?	Hands not washed	Took the water to the toilet location	Container near the toilet location	Tap water from the house	Not sure	
Q47:	Do you use soap for hand washing?	Hands not washed	Soap not use – water only	Soap not use – ash or other abrasive matl's	Soap & water	Not sure	

Q48:	Reason for not using soap:	Cost	Unable to purchase in local store	Prefer to use ash or other material	Not sure that soap is required		
Q49:	Where do you wash your clothes?	Clothes not washed	In river/water source more than 500 meters	In river/water source closer than 500 meters	At well more than 500 meters	At well closer than 500 meters	At home
Q50:	Where do you hang your clothes to dry?	Do not hung clothes	In fence around the house	In a tree	Outside on a line	House windows	Inside the house
Q51:	How do you clean your teeth?	Do not clean teeth	Rinse with water	Use salt and water	Use herbal mouth wash	Tooth brush only	Tooth brush & tooth paste
Q52:	How do you dispose dog or animal excrement?	No disposal	In paper/plastic bag	Sweep it away/burn it	Bury it	No dogs/animals allowed inside or yard	

Now I'd like to ask you some questions about your food and drink.

Q53:	How many meals do you usually eat in a normal day?	One meal	Two meals	Three meals	More than three meals	
Q54:	How many times a week do you serve a meal containing vegetable?	zero	1 – 5 times week	6 – 10 times a week	11 – 15 times a week	16 – 21 times a week
Q55:	How many times a week do you serve viand? (Or meal containing meat, chicken or fish)	zero	1 – 5 times a week	6 – 10 times a week	11 – 15 times a week	16 – 21 times a week
Q56:	Total pesos spent by family on junk food per day?	0 – 10 Pesos	11 – 20 pesos	21- 30 pesos	31 – 40 pesos	41 – 50 pesos
Q57:	How often do you feel hungry at the end of the day?	Everyday	Several days a week	Once a week	Once a month	Rarely
Q58:	Do you do anything to make your water safer to drink?	No action	Buy drinking water (bottled, ATM)	Use water filter (ex: bio-sand)	Solar disinfection	Boiling of water	Other method to make water safe to drink
Q59:	How do you store water for cooking or drinking?	No storage	Bucket or similar container – no lid	Bucket or similar container – with lid	Earthen wear or plastic jug w/lid	Container from water vendor	From the tap in the house
Q60:	How far is your main water supply from your home?	0 to 20 meters	21 to 50 meters	51 to 100 meters	101 to 500 meters	500+ meters	

I'd like to ask you some questions about your Income & occupation.

Line/ID Number	Q61: What is the type of work of each person?									Q62: How much did each person earn from **regular work/petty jobs/occasional work** in the past month?	Q63: What was the approximate **value of any product produced** by each person during the past month? (Example: veg., detergent, snack, etc.)	Q64: How much did each person receive in **assistance from friends or relatives** in the past month? (include overseas remittances and gifts from nearby friends, but exclude gifts from mother to son within the family group below)	Q65: How much cash or value did each person receive **from any other source** in the past month?	
	Fisherman	Tricycle /trisikad driver	Farmer	Laundry	Buy & sell	Construction	Household helper	Others	No work					
	1	2	3	4	5	6	7	8	9					
Adult1	O	O	O	O	O	O	O	O	O					
A2	O	O	O	O	O	O	O	O	O					Recipient Income
A3	O	O	O	O	O	O	O	O	O					
A4	O	O	O	O	O	O	O	O	O					
A5	O	O	O	O	O	O	O	O	O					
A6	O	O	O	O	O	O	O	O	O					
A7	O	O	O	O	O	O	O	O	O					
A8	O	O	O	O	O	O	O	O	O					Total HH income
Column Total														

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		1	2	3	4	5
Q66:	**Compared to the rest of the year,** do you feel that your household income over the past month was:	Above average	Average	Below average		
Q67:	Has anyone in the household made a family budget before?	Yes	No			
Q68:	Does anyone in the household owe anyone money? If yes, how much?: _____	Yes	No			
Q69:	Does anyone in the household have any savings? If yes, how much?: _____	Yes	No			
Q70:	Do you have a vegetable garden?	Yes	No			
Q71:	If yes to Q70, how many vegetable plants are there in your garden?	1-10	11-20	21-50	51-100	101 +
Q72:	Does anyone in the household operate a small business?	Yes	No			
Q73:	If yes to Q72, check all that apply.	Vegetables or Seedlings	Vermi or Vermicast	Food & Snacks	Cleaning Products	Others
Q74:	Is the housing structure extremely poor and in need of emergency renovations?	Yes	No			
Q75:	If yes to Q74, select the box that best describes the poor condition of the house.	Habitable (needs few fix)	Dilapidated (some parts are falling)	Totally damage (could collapse at any time)		

(Fill in the following table based on your observations. Do not ask the recipient.)

Indicator	Description and Corresponding Score	Score
Q76: Building Size	Big: >25 sqm. (4) | Medium: 10-15 sqm. (2) | Small: <15 sqm. (0)	
Q77: Foundation Structure	Concrete/Firm (4) | Bamboo/Moderate (2) | Dirt/Weak (0)	
Q78: Roof Materials	New GI Sheet (2) | Old GI Sheet/New Nipa (1) | Scrap/Old Nipa (0)	
Q79: Wall Materials	Concrete (4) | Wood (3) | Lawnanit/Plywood (2) | Bamboo (1) | Scrap (0)	
Q80: Land (Ask)	Own/Inherited (4) | Mortgage (2) | Renting (1) | Tenant/Squatting (0)	
Q81: House Materials (Ask)	Own/Inherited (4) | Mortgage (2) | Renting (1) | Tenant/Squatting (0)	
Q82: Duration of Residence (Ask)	5 years & above (5) | 1 years to 4 years (3) | below 1 year (1)	
Q83: Water Supply (Ask)	Faucet (gripo) at home or own deep well (2) | Shared deep well or faucet within 50 meters (1) | None within 50 meters (0)	
Q84: Electricity (Ask)	Own meter (2) | Shared meter (1) | None (0)	
Q85: Fuel (Ask)	LPG/Electricity for cooking (3) | Kerosene (2) | Charcoal/Wood (0)	
Q86: Toilet (Ask)	Flush in home (3) | Manual in home (2) | Pit/Shared/Communal (1) | None (0)	
Q87: Furniture	Wood/Steel/Plastic [New] (2) | Old/Used Furniture (1) | None (0)	
Q88: Appliances	1 point per working appliance: *(Example: TV, Stereo, Radio, Stove)*	
Q89: Car/Vehicle (Ask)	Jeep/Car (6) | Motorcycle/Tricycle (4) | Trisikad (3) | Bicycle (2) | None (0)	
	Total Poverty Score:	

Appendix 2. MCO M&E data collection template

This is the monitoring and evaluation (M&E) template (two pages) used to collect regular metrics during the implementation of MCO. The ICM team responsible for implementing each MCO program would fill these templates in, under the supervision of ICM's national office.

		MALNOURISHED CHILDRENS OUTREACH PROGRAM DATA															
		PROGRAM DETAILS						PRE-PROGRAM DATA						MID-PROGRAM DATA			
ID	Base	Name of Child	Sex (M/F)	Date of birth	Age (months)	Feeding site	Referral source (B or C)	Date	Weight (kg)	Height (cm)	Weight-for-height Z score	WHZ	HAZ	FEB	MARCH	APRIL	MAY
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ID	END PROGRAM DATA								RISK MANAGEMENT					ATTENDANCE		FOLLOW UP PROGRAM DATA (6 months post MCO		
	Date	Weight (cm)	Height (cm)	Weight-for-height score	WHZ	HAZ	Weight gain (kg)	% weight gain	Dewormed as per protocol? (I or L or N)	Vit A as per protocol? (I or L or N)	Edema (y/n)	Health record warning (y/n)	Referred to RM (y/n)	No. days child attended feeding	No. days guardian attended feeding	No. mths post feeding	Height (cm)	Weight (kg)	Weight-for-height Z score
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Appendix 3. Supplementary Statistical Methods

In this study, we adopted and revised the measure for *intensity* of poverty, or *A*, as defined in the Alkire-Foster Method for measuring multi-dimensional poverty.[1] *Intensity* of poverty is defined as the average proportion of indicators in which a household is deprived in, and a household is categorized as 'experiencing poverty' if they are deprived in at least one third of the weighted indicators. One important feature of *A* is the ability to quantitatively estimate poverty at the household level, and therefore include in model building. In this study, *A* was developed from 13 weighted indicators available from the ICM household survey. The indicators used were the household's building size, foundation material, roof material, wall material, water supply, electricity, type of toilet, ownership of appliances, furniture, cars/vehicles, household head's literacy, and household food security. To develop weights for each indicator, Principal Component Analysis (PCA) was first utilized to develop the factor structure, after which Confirmatory Factor Analysis (CFA) was applied to the structure for model building. All model indices for *A* were found to be acceptable, CFI and NNFI were greater than 0.9 and RMSEA was below 0.05 as per the Alkire-Foster Method. Weights were finalized by taking the mean of bootstrapped communalities for each indicator. Further analysis showed that *A* weighed according to the CFA was more informative to the finalized models when compared to an equally weighted *A*.

For the linear outcome, model building started with an intercept-only model:

$$Y_{ij} = \gamma_{00} + u_{0j} + e_{ij}$$

and intraclass correlation (ICC) was calculated by:

$$ICC = \frac{\sigma_{u0}^2}{\sigma_{u0}^2 + \sigma_e^2}$$

where σ_{u0}^2 is the variance of the community-level residuals u_{0j}, and σ_e^2 is the variance of the individual-level residuals e_{ij}. Models were fitted with lower-level independent variables, excluding variables not significant according to t-tests. A community-level variable, Z_j was tested and included only if the deviance difference test was significant. Following this step, community-level residuals of the slope were systematically tested to determine the model with lowest deviance. Finally, interaction terms between lower and higher level variables were tested and included according to significance and model convergence.

The model building for the logistic outcome was similar, except for a few key steps. First, ICC was calculated by:

$$ICC = \frac{\sigma_{u0}^2}{\sigma_{u0}^2 + 3.29}$$

where 3.29 is the variance of a logistic distribution with scale factor 1 (with $\pi \approx 3.14$). Second, the variables included in the final model were shown to only lower deviance in combination, but not individually. Random slopes of independent variables which were not significant in the model, but significant as slopes were included in the final model if found to contribute towards parsimony.

After following the specified steps, the two final mixed-effects models were:

Linear (WHZ$_2$)
$$Y_{ij} = \gamma_{00} + \gamma_{10}X_{1ij} + \gamma_{20}X_{2ij} + \gamma_{30}X_{3ij} + \gamma_{40}X_{4ij} + \gamma_{50}X_{5ij} + \gamma_{60}X_{6ij} + \gamma_{01}Z_j$$
$$+ \gamma_{31}X_{3ij}Z_j + u_{2j}X_{2ij} + u_{5j}X_{5ij} + u_{4j}X_{4ij} + u_{0j} + e_{ij}$$

Logistic (dropout)
$$\pi_{ij} = logistic(\eta_{ij})$$
$$\eta_{ij} = \gamma_{00} + \gamma_{10}X_{1ij} + \gamma_{30}X_{3ij} + \gamma_{40}X_{4ij} + \gamma_{80}X_{8ij}$$
$$+ u_{1j}X_{1ij} + u_{3j}X_{3ij} + u_{4j}X_{4ij} + u_{7j}X_{7ij} + u_{8j}X_{8ij} + u_{0j}$$

All statistical analyses were performed in R (Version 3.2.3).[2] Full Maximum Likelihood (FML) was used to compare linear mixed-effects models. The default Laplace Approximation build in the package 'lme4'[3] was used to compare logistic mixed-effects models in conjunction with the optimizer 'mimqa'[4] set at 10,000 iterations.

References

1. Alkire S, Roche JM, Ballon P, et al. Multidimensional poverty measurement and analysis. Oxford, UK: Oxford University Press 2015.
2. R Core Team. R: A language and environment for statistical computing. R package version 3.2.3 Vienna, Austria: R Foundation for Statistical Computing; 2013 [Available from: http://www.R-project.org/.
3. Bates D, Maechler M, Bolker B, et al. Fitting Linear Mixed Effects Models Using lme4. *Journal of Statistical Software* 2015;67(1):1-48.
4. Bates D, Mullen KM, Nash JC, et al. Derivative-free optimization algorithms by quadratic approximation [program]: CRAN, 2015.

STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No.	Recommendation	Page No.	Relevant text from manuscript
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	1	Exploring trust in religious leaders and institutions as a mechanism for improving retention in child malnutrition interventions in the Philippines: A retrospective cohort study
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	2	
Introduction				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	4-5	
Objectives	3	State specific objectives, including any prespecified hypotheses	5	The objective of this study was to examine how different dimensions of trust, in addition to other indicators of social capital, affected program retention and physiological outcomes among participating children
Methods				
Study design	4	Present key elements of study design early in the paper	5	
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	5	
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants	5	
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case		

Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	5-6; Appendix 1 and Appendix 2
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group	6
Bias	9	Describe any efforts to address potential sources of bias	5
Study size	10	Explain how the study size was arrived at	5

Continued on next page

Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	6
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	6-7
		(*b*) Describe any methods used to examine subgroups and interactions	6
		(*c*) Explain how missing data were addressed	6
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy	6
		(*e*) Describe any sensitivity analyses	6
Results			
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	7
		(b) Give reasons for non-participation at each stage	7
		© Consider use of a flow diagram	N/A
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	7
		(b) Indicate number of participants with missing data for each variable of interest	7
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)	7
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time	7
		Case-control study—Report numbers in each exposure category, or summary measures of exposure	
		Cross-sectional study—Report numbers of outcome events or summary measures	
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included	9-11
		(*b*) Report category boundaries when continuous variables were categorized	9-11
		© If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	N/A

Continued on next page

Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	9-11

Discussion

Key results	18	Summarise key results with reference to study objectives	12
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias	12
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	12
Generalisability	21	Discuss the generalisability (external validity) of the study results	12-13

Other information

Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	14

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.