

**A COMPARISON OF TOTAL COST ESTIMATES BETWEEN EXCLUSIVE  
BREASTFEEDING AND USE OF BREAST MILK SUBSTITUTES IN  
HUMANITARIAN CONTEXTS**

An examination of the total cost estimates of the practice of exclusive breastfeeding and the use of breast milk substitutes from birth to infants under the age of six months using data from selected middle-and-high income countries.

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## **Abstract**

When a humanitarian emergency occurs and a response is warranted by either local or international actors including humanitarian response organizations, government entities, and individuals themselves, there is often a myriad of health concerns that must be immediately addressed. Increasingly, among those health concerns is the question of best infant feeding practices and there are few, if any, standard operating procedures that humanitarian response organizations have to determine if and when breast milk substitutes should be distributed instead of encouraging exclusive breastfeeding for infants under the age of six months. Given the reality that humanitarian response options do not have unlimited funding, this paper proposes that in order to create those standard operating procedures, responding humanitarian actors should consider the total cost of exclusive breastfeeding versus breast milk substitute use among populations where both are viable options.

This paper attempts to lay out the total costs of each option using data from selected case studies of the Nineveh governorate in Iraq, Syrian refugees living in Jordan in the Za'atri refugee camp, the Azraq refugee camp or within host communities, and a natural disaster setting in Indonesia. Upon laying out these costs, the paper summarizes the high level of cost differences between the two options that emerge in each of the aforementioned settings while providing brief recommendations for how these findings should be considered by humanitarian response organizations moving forward.

## I. Introduction

Worldwide, the health benefits of exclusive breastfeeding (EBF) for infants under the age of six months are well documented including reduced incidence rates of diarrheal illness and respiratory infections including pneumonia (1, 2). Furthermore, it is known that in disaster settings that call for a humanitarian response, there can be an increased incidence of diarrheal diseases stemming from the use of unclean water as well as respiratory illnesses among the larger affected population including infants (3). All of these health concerns would necessitate a form of response by humanitarian actors and/ or the existing health system.

Due to these reasons and others, the World Health Organization (WHO) and United Nations Children's Fund (UNICEF) recommend that infants under the age of six months be exclusively breastfed to the extent possible in their *Global strategy for infant and young child feeding* (4). The Infant and Young Child Feeding in Emergencies Core Group (IFE Core Group) upheld these guidelines in their 2017 *Infant and Young Child Feeding in Emergencies: Operational Guidance* (5). Also, the IFE Core Group added that as part of a coordinated emergency response, humanitarian actors should seek to minimize the use of breast milk substitutes (BMS) to contexts in which there is a documented need (5). Furthermore, the IFE Core Group's recommendations state that BMS and the requisite supplies should not be included in a general or blanket distribution to mothers with infants under the age of six months (5). However, despite these recommendations, humanitarian organizations do not always have a clear set of internal policies regarding how they determine which individuals should be provided with BMS (6). As a result, there can be uncontrolled and unmonitored distribution of BMS for infants under the age of six months during humanitarian responses to emergencies.

Yet, it is important to note that the use of BMS comes with high costs, both singular and recurring, that extend across the entire feeding period in question. These costs must then be covered by either humanitarian actors or the larger health system (if it is functioning and accessible) as well as the families/ mothers of the infants themselves. Ultimately, the costs of any humanitarian response intervention must be considered in light of the ever-evolving reality that humanitarian response funding is lower than the stated need in an age of prolonged humanitarian response (7). It is only through a concrete understanding of the total cost of alternative feeding options that humanitarian actors can optimize finite resources.

This study aims to determine the total cost of alternative infant feeding strategies for the first six months of life: 1. EBF; and 2. BMS. Costs were estimated from historical and ongoing humanitarian responses in middle-and-high-income countries where rates of EBF are low and the usage rates of BMS high. Case studies included 1. the ongoing humanitarian response in the Republic of Iraq, 2. humanitarian response to a natural disaster setting in the Republic of Indonesia, and 3. the ongoing humanitarian response to Syrian refugees in the Hashemite Kingdom of Jordan. Each case study begins with a brief introduction of the scenario in question and then lays out the costs for both a single infant as well as a larger population of infants. It is hoped that the information gleaned from these distinct case studies will help to illuminate the widespread realities of the use of BMS during humanitarian response while helping to quantify the costs of such use across geographically and culturally diverse settings. Following these total cost estimates, this paper critically examines the results from the total cost estimation exercise to see what, if any, recommendations can be drawn regarding the cost of using BMS during humanitarian responses.

## **II. Data Collection Design and Methods**

### **a. Analytic Time Horizon and Study Perspective**

The timeframe for which each case study’s cost estimates are presented is for six months as this is the amount of time in which both the WHO and UNICEF recommend infants be exclusively breastfed. This study uses a societal perspective to capture all of the costs associated with either EBF or BMS usage during a humanitarian response regardless of whether the costs are borne by the existing government structures (hereafter referred to as government), the responding humanitarian organization or implementing partner (IP) or the families of the infant in question (hereafter referred to as family). Under each cost, the actor(s) who would be responsible for the cost is identified.

### **b. Study Population**

Each case study will present the total costs of care for a single infant who experiences either EBF or BMS. However, since it is extremely unlikely that responding humanitarian organizations would only encounter one such infant as part of a response, total costs are then presented for a larger population of 100 infants who are divided between being EBF or receiving BMS based on current feeding practice data. The larger population of 100 infants was decided upon through collaboration with practitioners who have encountered the issues of infant feeding in their previous work. This presentation is made in order to conceptualize the true cost differences that exist at baseline given current feeding practices in a specific location so that humanitarian organizations could look to see where there is the largest potential to achieve cost savings through helping mothers to move from one feeding method to another. These feeding practice rates are summarized in the table below.

*Table 1: Reported Feeding Practice Rates in Case Study Locations*

<b>Location of Case Study</b>	<b>EBF Rate among infants &lt;6 months</b>	<b>BMS usage rate among infant &lt;6 months</b>	<b>Source of Information</b>
Nineveh Governorate, Republic of Iraq	30.4 percent	69.6 percent	UNICEF Multiple Indicator Cluster Survey, 2018 (8)

Republic of Indonesia	52 percent	48 percent	Demographic and Health Survey (DHS), 2017 (9)
Za'atri Refugee Camp, Hashemite Kingdom of Jordan	53.7 percent	46.3 percent	UNHCR Interagency Nutrition Surveys amongst Syrian Refugees in Jordan, 2016 (10)
Azraq Refugee Camp, Hashemite Kingdom of Jordan	38.2 percent	61.8 percent	UNHCR Interagency Nutrition Surveys amongst Syrian Refugees in Jordan, 2016 (10)
Host Communities, Hashemite Kingdom of Jordan	19.1 percent	80.9 percent	UNHCR Interagency Nutrition Surveys amongst Syrian Refugees in Jordan, 2016 (10)

### c. Inputs Required

Each total cost estimate includes various inputs that are required for either EBF or BMS usage among infants under the age of six months. These inputs are named and described in the table below along with whether they are required for EBF, BMS use or both. In addition, the table gives the type of unit required and the number as well as assumptions that were made while calculating the number of required units, and the source(s) for the information.

*Table 2: Description of Inputs Required*

Name of Input	Description	Required for EBF and/or BMS use	Units Required	Assumptions	Source
Salary costs for CHW to provide lactation consultant sessions to the caregiver who plans to EBF.	Consultation sessions (30 minutes long) provided to nursing caregivers to facilitate EBF. These costs are presented as the number of hours spent by the CHW per caregiver.	EBF	For the Low Cost: 2 hours (four 30-minute sessions), for the Base Cost: 2.5 hours (five 30-minute sessions), and for the High Cost: 3 hours (six 30-minute sessions).	Consultation sessions could be provided via a CHW and would be done on an individual basis for all caregivers relying on EBF.	Personal communication with Mija Ververs (11)
Salary costs for CHW to provide a training session on how to correctly prepare and use BMS.	Consultation sessions (30 minutes long) provided to EBF users to ensure safe preparation of BMS. These costs are presented as the number of hours	BMS use	30 minutes of salary per individual.	This training session could be conducted by a CHW and would be given to all caregivers relying on BMS use on an individual basis.	Personal communication with Mija Ververs (11)



	spent by the CHW per caregiver.				
Additional water	Additional water would be required for either feeding method for either the lactating caregiver to consume or for the BMS user to use for preparation and cleaning purposes.	EBF and BMS use	For EBF, each caregiver should consume an additional 0.7 liters (L) per day, which equates to a total of 127.4L. For BMS use, each user requires an estimated additional 170L per week, which equates to 4420L.	The additional water would be provided to EBF caregivers.	For EBF: European Food Safety Authority, 2010 (12)  For BMS use: Gribble and Berry, 2011 (13)
500kcal of additional food	Additional daily food consumption (worth a total of 500kcal daily) is advised for lactating women.	EBF	Number of days that such additional food would need to be required given the size of the population in question.	Additional food would be provided and that the type of food can vary from an increased amount in the general food rations to Super Cereal.	<i>Food and Nutrition Needs in Emergencies</i> , 2004 (14)  Guidance note: Substitution of specialized nutritious foods in situations of temporary commodity shortfalls, January 2019. (15)
Basic Preparation Materials	This set would include the following items: cooking pot with lid for sterilizing the preparation equipment and boiling water to prepare BMS and stirring spoons	BMS use	One set of basic preparation materials per infant relying on BMS use.	One set of preparation materials would last the entire six-month period and no items would be lost or require replacement.	Gribble and Berry, 2011 (13)  Personal communication with Mija Ververs (11)  Personal communication with Kelly Hormez (16)  Personal communication with Dina Jardeneh (17)
Feeding Bottles	Reusable feeding bottles for BMS use.	BMS use	Two feeding bottles per infant using BMS. This amount was the minimum on in consultation with field practitioners	Feeding bottles would not be damaged and need replacement over the course of the six-month period.	Gribble and Berry, 2011 (13)  Personal communication with Mija Ververs (11)  Personal communication with Kelly Hormez (16)

					Personal communication with Dina Jardeneh (17)
Gas Stove	A gas stove which is used to prepare the BMS	BMS use	One gas stove per caretaker using BMS.	The gas stove would not be damaged and need replacement over the course of the six-month period.	Gribble and Berry, 2011 (13)  Personal communication with Mija Ververs (11)  Personal communication with Kelly Hormez (16)  Personal communication with Dina Jardeneh (17)
Formula Tin	Containers of powdered infant feeding formula that could be used to prepare BMS.	BMS use	One infant requires 1800 grams of formula a week or a total of 46,800 grams over the course of the six-month period. The units required are calculated based on the size of the package specified (either 400 or 900 grams).		Gribble and Berry, 2011 (13)
Liquid Petroleum Gas (LPG)	The gas that will be used to power the gas stove which is required for BMS preparation.	BMS use	One BMS user would require an estimated 17 kilograms of LPG per week which would equate to 442 KG per individual over the course of the six-month period.		Gribble and Berry, 2011 (13)

In addition to requiring various supply inputs as well as counseling/training for the specific feeding practice, the total average treatment costs for certain infections are included as the incidences of these named infections vary based on the feeding practice used. As provided in the table above, the table below names the type of infection while also providing the population which is directly

impacted by the infection, the incidence rate explained, the type of treatment planned for, any assumptions made and sources for this information.

*Table 3: Description of Infections*

<b>Type of Infection</b>	<b>Population Impacted</b>	<b>Incidence (explain)</b>	<b>Treatment</b>	<b>Assumptions</b>	<b>Source</b>
Mastitis	Nursing caregivers	The number of average total instances of mastitis that a total population could expect to have given WHO data.  Since this number is not established in each location, incidence rates are as follows: Base Cost: 0.2 cases per individual High Cost: 0.3 cases per individual Low Cost: 0.1 cases per individual	For this study, the treatment cost estimations were budgeted as a 30-minute consultation with a CHW to receive advice on massaging and applying warm compresses to the afflicted area.	Treatment would solely take the form of massaging and applying hot compresses to the afflicted area after receiving advice from a CHW.  The range of incidences will vary	Incidence Source: World Health Organization (18)  Treatment Source: Personal communication with Mija Ververs (11)
Diarrheal Illness (DI)	Infants under the age of six months	The number of average total instances of diarrheal illness that a total population could expect to have given IHME data and whether or not the infants were EBF in the case study location.	Treatment ranges from at-home treatment costs to treatment via an out-patient consultation to in-patient hospital stays. The costs given represent the average of those options.	Incidence rates are experienced at an equal rate across the first year of life in order to calculate the total expected amount of cases that would be seen within the first six months.	Incidence Source: Institute for Health Metrics and Evaluation (19)  Treatment Source: Cost of Not Breastfeeding tool (2)
Acute Respiratory Infections (ARI) including pneumonia	Infants under the age of six months	The number of average total instances of diarrheal illness that a total population could expect to have given IHME data and whether or not the infants were EBF in the case study location	Treatment ranges from at-home treatment costs to treatment via an out-patient consultation to in-patient hospital stays. The costs given represent the average of those options.	Incidence rates are experienced at an equal rate across the first year of life in order to calculate the total expected amount of cases that would be seen within the first six months.	Incidence Source: Institute for Health Metrics and Evaluation (19)  Treatment: Costs of Not Breastfeeding tool (2)

#### **d. Costing Data**

Each total cost estimate includes both capital and recurring costs. The capital costs include those associated with the basic preparation materials for BMS usage and the costs for associated necessary personnel who would teach BMS using caregivers how to correctly prepare the BMS. The recurring costs begin with the costs for lactation consulting for EBF and are followed by the

estimated costs for additional water consumption and use (for EBF caregivers and BMS users respectively) and food consumption for nursing caregivers. The next included cost is that of LPG. The final costs are the treatment costs for common health concerns whose incidence rates vary based on the feeding method used: mastitis treatment, DI and ARI, including pneumonia, among infants.

To the extent possible, all costs have been given as base costs, high costs and low costs, since the prices of many commodities in a capitalistic market are not set. All of the costs that are provided below are based on cost figures given in other reputable literature, search engines from different time points, or from estimates given by humanitarian professionals in the field and are not the result of firsthand data collection.

#### **e. Cost Analysis**

There is a specified percentage attributed to each cost (10, 37, 68 or 100) based on how much of cost for the identified item or service can justifiably be assigned to either EBF or BMS usage. The ten percent is used for the purchase of gas stove using justifications discussed immediately below. The 37 and 68 percent values apply respectively to the costs for diarrheal illness treatment and ARI including pneumonia treatment among EBF infants and are based on the protective health benefits of EBF for these specific diseases (1). All other costs have a percent attribution of 100 percent as they can be fully attributed to either EBF or BMS use. Additionally, all costs were standardized into 2019 United States Dollars (USD) to facilitate the comparison of results across the case study locations and time periods of individual price collection. The cost standardizations were done by first converting any local currency costs into USD using fixed Oanda exchange rate calculators and by then applying year-appropriate inflation calculations as necessary. Finally, no annualization rates have been calculated for any of the given prices.

#### **f. Assumptions**

Several assumptions were made as part of these total cost estimations. First, it was assumed that there would be no bulk rate discount for any of the materials purchased in any of the settings although there is the potential for such discounted prices depending on the location where the goods are purchased, which actors are bearing the costs, and the overall amount purchased. Additionally, it is assumed that the pieces supplied by the purchase of the general UNHCR Kitchen Set (20) could be substituted to ensure the supply of the necessary preparation utensils required for BMS usage. Thirdly, it is assumed that the gas stove that would be required for BMS usage would not solely be used for BMS preparation. Therefore, the total cost estimates only attribute 10% of the gas stove's cost to BMS usage. Finally, for any costs that could not be found for the specific geographic context, other similar geographic locations were used with the assumption that these costs would be more similar than using prices found in American markets. When this is done within the estimates of the total costs, the specific costs will be identified.

#### **g. Limitations**

There are two major limitations to these total cost estimations that are important to keep in mind. Firstly, the total cost estimations do not include opportunity cost estimations for the time it would take a caregiver to either exclusively breastfeed or prepare BMS substitutes. This omission was made due to the understanding that in many humanitarian response situations, individuals may not be able to find paid employment opportunities regardless of whether they were caring for an infant. Additionally, field practitioners indicated that regardless of whether such opportunities existed, there would be the question of whether or not it would be considered culturally appropriate for a caregiver of an infant under six months to pursue paid employment even if such opportunities were available. Therefore, these costs were left out of the estimations. Secondly, transportation

costs associated with the transport of any of the required inputs were not calculated in as it can not be fully predicted where the materials in these humanitarian responses would be shipped from or whether they could be fully procured locally.

#### **h. Disclaimer**

Before proceeding with the total cost estimations, it is important to note the following disclaimer that for this total cost estimation study, it is assumed that the caregivers of the infants in question are both physically present and able to breastfeed if provided with the proper guidance, food supplementation, and space.

### **III. Cost Estimations from Case Studies**

#### **a. Republic of Iraq**

The Republic of Iraq (hereafter referred to as Iraq) is currently in the midst of a complex humanitarian emergency with high levels of humanitarian needs. The current crisis has its roots in more than 15 years of government transition from a dictatorship to a fledgling democracy with various periods of conflict with first, the United States, then between Shi'a and Sunni religious factions, and most recently, against the Islamic State of Iraq and Syria (ISIS) (21). Additionally, Iraq is prone to experiencing natural disasters including earthquakes and flooding, which have historically led to increased humanitarian needs among civilians (21).

Currently, the United Nations Office for the Coordination of Humanitarian Affairs estimates that there are approximately 4.1 million individuals with some level of humanitarian needs (21). Of these individuals, an estimated 1.77 million are predicted to have acute humanitarian needs as they are experiencing a partial-to-complete collapse of both their living standards and their access to basic goods and services including health services (21). The majority

of these individuals require assistance due to the recent conflict with ISIS and are located within the western side of the country, with the highest number of individuals in need located within the Nineveh governorate (an estimated 1.35 million individuals) (21). The UNICEF Multiple Indicator Cluster Survey (MICS) from 2018 found that within this region, only 30.4 percent of infants experienced EBF for the first six months of their lives (8). Given these statistics, the total cost estimates for the larger population of 100 infants were divided between 30 infants experiencing EBF and 70 infants experiencing exclusive BMS usage.

Below are the total cost estimates of care for a single infant who experiences EBF in the Nineveh governorate from birth until six months followed by the total cost estimated for a single infant who receives BMS in the Nineveh governorate from birth until six months. These estimates are followed by the estimates for the larger population.

Table 4: Total Costs of EBF for One Infant &lt;6 months in the Nineveh Governorate, Iraq

Recurring Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Low Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Case	Total High Case	Total Low Case	Actor Bearing Costs
Salary costs for CHW to provide lactation consultant sessions to the caregiver	hours	Base Cost: 2.5 High Cost: 3 Low Cost: 2	\$ 2.67 (9, 22)	\$ 13.21	\$ 15.85 (9, 22)	\$ 10.57 (9, 22)	100%	\$ 13.21	\$ 15.85	\$ 10.57	IP or Government
Additional water for lactating woman	liter	127.4	\$ 0.65 (23)	\$ 0.64	\$ 1.47 (23)	\$ 0.59 (23)	100%	\$ 81.54	\$ 187.28	\$ 75.17	IP or Family
500 kcal of additional food for lactating woman	days	182	\$ 0.07 (24)	\$ 0.07	\$ 0.11 (15)	\$ 0.06 (15)	100%	\$ 12.74	\$ 20.02	\$ 10.01	IP or Family
Mastitis Treatment	incidence	Base Cost: 0.2 High Cost: 0.3 Low Cost: 0.1 (11, 18)	\$ 2.67 (9, 22)	\$ 2.64	\$ 2.64	\$ 2.64	100%	\$ 0.53	\$ 0.79	\$ 0.26	Shared between all three
DI Treatment	incidence	1.085 (19)	\$ 1.40 (2)	\$ 1.46	\$ 1.46 (2)	\$ 1.46 (2)	37% (1)	\$ 0.59	\$ 0.59	\$ 0.59	Shared between all three
ARI/ Pneumonia Treatment	incidence	0.9 (19)	\$ 24.37 (2)	\$ 25.42	\$ 25.42 (2)	\$ 25.42 (2)	68% (1)	\$ 15.55	\$ 15.55	\$ 15.55	Shared between all three
<b>Total Costs</b>								<b>\$ 124.16</b>	<b>\$ 240.08</b>	<b>\$ 112.15</b>	
<b>Average Monthly Costs</b>								<b>\$ 20.69</b>	<b>\$ 40.01</b>	<b>\$ 18.69</b>	



*Table 5: Total Costs of Exclusive Use of BMS for One Infant <6 months in the Nineveh Governorate, Iraq*

Capital Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Low Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Case	Total High Case	Total Low Case	Actor Bearing Costs
Basic Preparation Materials	unit	1	\$ 20.00 (20)	\$ 19.80	\$ 19.80 (20)	\$ 19.80 (20)	100%	\$ 19.80	\$ 19.80	\$ 19.80	IP or Family
Feeding Bottles	unit	2	\$ 9.02 (25)	\$ 8.93	\$ 12.61 (25)	\$ 8.41 (25)	100%	\$ 17.86	\$ 25.22	\$ 16.81	IP or Family
Gas Stove	unit	1	\$ 30.00 (26)	\$ 31.96	\$ 59.81 <sup>1</sup> (27)	\$ 53.26 (26)	10%	\$ 3.20	\$ 5.98	\$ 5.33	IP or Family
Salary costs for CHW to provide a training session on how to correctly prepare and use BMS to the caregiver	hours	0.5	\$ 2.67 (9, 22)	\$ 2.64	\$ 2.64 (9, 22)	\$ 2.64 (9, 22)	100%	\$ 2.64	\$ 2.64	\$ 2.64	IP or Government
Recurring Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Low Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Case	Total High Case	Total Low Case	Actor Bearing Costs
Formula Tin (400g)	container	117	\$ 6.23 (16)	\$ 6.71	\$ 8.95 (16)	\$ 4.48 (16)	100%	\$ 785.57	\$ 1,047.43	\$ 523.71	IP or Family
Water	liter	4420	\$ 0.65 (23)	\$ 0.64	\$ 1.47 (23)	\$ 0.59 (23)	100%	\$ 2,842.81	\$ 6,482.97	\$ 2,593.19	IP or Family
LPG	kilogram	442	\$ 0.60 (28) <sup>2</sup>	\$ 0.60	\$ 2.65 (28)	\$ 0.20 (28)	100%	\$ 265.20	\$ 1,172.78	\$ 88.40	IP or Family
DI Treatment	incidence	1.085 (19)	\$ 1.40 (2)	\$ 1.40	\$ 1.40 (2)	\$ 1.40 (2)	100% (1)	\$ 1.52	\$ 1.52	\$ 1.52	Shared between all three
ARI/ Pneumonia Treatment	incidence	0.9 (19)	\$ 24.37 (2)	\$ 25.42	\$ 25.42 (2)	\$ 25.42 (2)	100% (1)	\$ 22.87	\$ 22.87	\$ 22.87	Shared between all three
<b>Total Costs</b>								<b>\$ 3,961.47</b>	<b>\$ 8,780.55</b>	<b>\$ 3,274.93</b>	
<b>Average Monthly Costs</b>								<b>\$ 660.25</b>	<b>\$ 1,463.43</b>	<b>\$ 543.82</b>	

<sup>1</sup> This price could not be found for Iraq and instead uses a price found for the neighboring country of Saudi Arabia.

<sup>2</sup> These prices could not be found for Iraq and instead uses prices found for the worldwide average.

Table 6: Total Costs of EBF for 30 Infants &lt;6 months in the Nineveh Governorate, Iraq

Recurring Costs											
	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Low Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Case	Total High Case	Total Low Case	Actor Bearing Costs
Salary costs for CHW to provide lactation consultant sessions to the caregiver	hours	Base Cost: 75 High Cost: 90 Low Cost: 60	\$ 2.67 (9, 22)	\$ 13.21	\$ 15.85 (9, 22)	\$ 10.57 (9, 22)	100%	\$ 396.33	\$ 475.59	\$ 317.06	IP or Government
Additional water for lactating woman	liter	3,822	\$ 0.65 (23)	\$ 0.64	\$ 1.47 (23)	\$ 0.59 (23)	100%	\$2,446.08	\$5,618.34	\$2,254.98	IP or Family
500 kcal of additional food for lactating woman	days	5,460	\$ 0.07 (24)	\$ 0.07	\$ 0.11 (15)	\$ 0.06 (15)	100%	\$ 382.20	\$ 600.60	\$ 300.30	IP or Family
Mastitis Treatment	incidence	Base Cost: 6 High Cost: 9 Low Cost: 3 (11, 18)	\$ 2.67 (9, 18)	\$ 2.64	\$ 2.64	\$ 2.64	100%	\$ 15.85	\$ 23.78	\$ 7.93	Shared between all three
DI Treatment	incidence	12.0435 (19)	\$ 1.40 (2)	\$ 1.46	\$ 1.46 (2)	\$ 1.46 (2)	37% (1)	\$ 6.50	\$ 6.50	\$ 6.50	Shared between all three
ARI/Pneumonia Treatment	incidence	18.36 (19)	\$ 24.37 (2)	\$ 25.42	\$ 25.42 (2)	\$ 25.42 (2)	68% (1)	\$ 317.32	\$ 317.32	\$ 317.32	Shared between all three
<b>Total Costs</b>								<b>\$ 3,564.28</b>	<b>\$ 7,042.13</b>	<b>\$ 3,204.09</b>	

*Table 7: Total Costs of Exclusive Use of BMS for 70 infants <6 months in the Nineveh Governorate, Iraq*

Capital Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Low Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Case	Total High Case	Total Low Case	Actor Bearing Costs
Basic Preparation Materials	set	70	\$ 20.00 (20)	\$ 19.80	\$ 19.80 (20)	\$ 19.80 (20)	100%	\$ 1,386.00	\$ 1,386.00	\$ 1,386.00	IP or Family
Feeding Bottles	unit	140	\$ 9.02 (25)	\$ 8.93	\$ 12.61 (25)	\$ 8.41 (25)	100%	\$ 1,250.29	\$ 1,765.12	\$ 1,176.75	IP or Family
Gas Stove	unit	70	\$ 30.00 (26)	\$ 31.96	\$ 59.81 <sup>3</sup> (27)	\$ 53.26 (26)	10%	\$ 223.69	\$ 372.82	\$ 152.39	IP or Family
Salary costs for CHW to provide training session on how to correctly prepare and use BMS to caregiver.	hours	35	\$ 2.67 (9, 22)	\$ 2.64	\$ 2.64 (9, 22)	\$ 2.64 (9, 22)	100%	\$ 184.95	\$ 184.95	\$ 184.95	IP or Government
Recurring Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Low Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Case	Total High Case	Total Low Case	Actor Bearing Costs
Formula tin (400g)	container	8190	\$ 6.23 (16)	\$ 6.71	\$ 8.95 (16)	\$ 4.48 (16)	100%	\$ 54,989.99	\$ 73,319.99	\$ 36,660.00	IP or Family
Water	liter	309,400	\$ 0.65 (23)	\$ 0.64	\$ 1.47 (23)	\$ 0.59 (23)	100%	\$ 198,996.56	\$ 453,807.65	\$ 181,523.06	IP or Family
LPG	kilogram	30940	\$ 0.60 (28) <sup>4</sup>	\$ 0.60	\$ 2.65 (28)	\$ 0.20 (28)	100%	\$ 18,564.00	\$ 82,094.83	\$ 6,188.00	IP or Family
DI Treatment	incidence	75.95 (19)	\$ 1.40 (2)	\$ 1.40	\$ 1.40 (2)	\$ 1.40 (2)	100% (1)	\$ 110.78	\$ 110.78	\$ 110.78	Shared between all three
ARI/ Pneumonia Treatment	incidence	63 (19)	\$ 24.37 (2)	\$ 25.42	\$ 25.42 (2)	\$ 25.42 (2)	100% (1))	\$ 1,601.23	\$ 1,601.23	\$ 1,601.23	Shared between all three
<b>Total Costs</b>								<b>\$ 277,307.51</b>	<b>\$ 614,643.39</b>	<b>\$ 229,983.16</b>	

<sup>3</sup> This price could not be found for Iraq and instead uses a price found for the neighboring country of Saudi Arabia.

<sup>4</sup> These prices could not be found for Iraq and instead uses prices found for the worldwide average.

**b. Republic of Indonesia**

The Republic of Indonesia (hereafter referred to as Indonesia) is extremely prone to natural disasters which often then necessitate some form of humanitarian response on either the national or international level. According to the Global Facility for Disaster Reduction and Recovery, Indonesia has on average 289 natural disasters annually as the country is at a high level of risk for flooding, earthquakes, landslides, tsunamis, and cyclones (29). Examples of recent natural disasters that have necessitated a large-scale humanitarian response include the Indian Ocean Tsunami of 2004, the May 2006 earthquake in Yogyakarta and Central Java, and the September 2018 earthquake and tsunami in the Sulawesi region which struck the city of Palu (30).

Following the humanitarian response to the May 2006 earthquake, a published study in the Public Health Nutrition journal critically examined the distribution and use practices of BMS among infants and found an increased association to the incidence of diarrheal disease among BMS-fed infants, and consequently argued for the need for stricter distribution and use criteria of BMS within humanitarian response (6). However, the use of BMS is still high as the 2017 Demographic and Health Survey (DHS) found that approximately 52 percent of infants are EBF through the age of six months (9). Therefore, given all of this information, Indonesia is being used as a mock location for this cost-estimation exercise. Given the DHS data, the total cost estimates for the larger population of 100 infants were divided between 52 infants experiencing EBF and 48 infants experiencing exclusive BMS usage.

Below are the total cost estimates of care for a single infant who experiences EBF from birth until six months followed by the total cost estimated for a single infant who receives BMS usage from birth until six months. These estimates are followed by the estimates for the larger population.

Table 8: Total Costs of EBF for One Infant &lt;6 months in Indonesia

Recurring Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Low Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Salary costs for CHW to provide lactation consultant sessions to caregiver	hours	Base Cost: 2.5 High Cost: 3 Low Cost: 2	\$ 2.55 (9, 31)	\$ 12.64	\$ 15.16 (9, 31)	\$ 10.11 (9, 31)	100%	\$ 12.64	\$ 15.16	\$ 10.11	IP or Government
Additional water for lactating woman	liter	127.4	\$ 0.27 (32)	\$ 0.27	\$ 0.69 (32)	\$ 0.14 (32)	100%	\$ 34.05	\$ 88.29	\$ 17.66	IP or Family
500 kcal of additional food for lactating woman	days	182	\$ 0.07 (24)	\$ 0.07	\$ 0.11 (15)	\$ 0.06 (15)	100%	\$ 12.74	\$ 20.02	\$ 10.92	IP or Family
Mastitis Treatment	incidence	Base Cost: 0.2 High Cost: 0.3 Low Cost: 0.1 (11, 18)	\$ 2.55 (9, 31)	\$ 2.64	\$ 2.64	\$ 2.64	100%	\$ 0.51	\$ 0.76	\$ 0.21	Shared between all three
DI Treatment	incidence	1.545 (19)	\$ 8.39 (2)	\$ 8.75	\$ 8.75 (2)	\$ 8.75 (2)	37% (1)	\$ 5.00	\$ 5.00	\$ 5.00	Shared between all three
ARI/ Pneumonia Treatment	incidence	1.115 (19)	\$ 17.10 (2)	\$ 17.84	\$ 17.84 (2)	\$ 17.84 (2)	68% (1)	\$13.52	\$13.52	\$13.52	Shared between all three
<b>Total Costs</b>								<b>\$ 78.46</b>	<b>\$ 142.76</b>	<b>\$ 57.47</b>	
<b>Average Monthly Costs</b>								<b>\$ 13.08</b>	<b>\$ 23.79</b>	<b>\$ 9.57</b>	

Table 9: Total Costs of Exclusive Use of BMS for One Infant &lt;6 months in Indonesia

<b>Capital Costs</b>											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Low Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Basic Preparation Materials	Unit	1	\$ 20.00 (20)	\$ 19.80	\$ 19.80 (20)	\$ 19.80 (20)	100%	\$ 19.80	\$ 19.80	\$ 19.80	IP or Family
Feeding Bottles	unit	2	\$ 2.52 (33)	\$ 2.49	\$ 6.99 (33)	\$ 1.87 (33)	100%	\$ 4.99	\$ 13.98	\$ 3.74	IP or Family
Gas Stove	unit	1	\$ 42.41 (34)	\$ 41.98	\$ 53.26 (26)	\$ 31.96 (26)	10%	\$ 4.20	\$ 5.33	\$ 3.20	IP or Family
Salary costs for CHW to provide training session on how to correctly prepare and use BMS to caregiver.	hours	0.5	\$ 2.55 (9, 31)	\$ 2.53	\$ 2.53 (9, 31)	\$ 2.53 (9, 31)	100%	\$ 2.53	\$ 2.53	\$ 2.53	IP or Government
<b>Recurring Costs</b>											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Formula tin (900g)	tin	52	\$ 8.66 (2)	\$ 8.66	\$ 22.04 (35)	\$ 4.99 (36)	100%	\$ 450.32	\$ 1,145.94	\$ 259.46	IP or Family
Water	liter	4420	\$ 0.27 (32)	\$ 0.27	\$ 0.69 (32)	\$ 0.14 (32)	100%	\$ 1,172.78	\$ 3,063.06	\$ 612.61	IP or Family
LPG	kilogram	442	\$ 0.30 (37)	\$ 0.30	\$ 0.30 (37)	\$ 0.30 (37)	100%	\$ 131.50	\$ 131.50	\$ 131.50	IP or Family
DI Treatment	incidence	1.545 (19)	\$ 8.39 (2)	\$ 8.75	\$ 8.75 (2)	\$ 8.75 (2)	100% (1)	\$ 13.52	\$ 13.52	\$ 13.52	Shared between all three
ARI/ Pneumonia Treatment	incidence	1.115 (19))	\$ 17.10 (2)	\$ 17.84	\$ 17.84 (2)	\$ 17.84 (2)	100% (1)	\$ 19.89	\$ 19.89	\$ 19.89	Shared between all three
<b>Total Costs</b>								<b>\$ 1,819.51</b>	<b>\$ 4,415.55</b>	<b>\$ 1,066.24</b>	
<b>Average Monthly Costs</b>								<b>\$ 303.25</b>	<b>\$ 735.92</b>	<b>\$ 177.71</b>	

Table 10: Total Costs of EBF for 52 Infants &lt;6 months in Indonesia

Recurring Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Salary costs for CHW to provide lactation consultant sessions to caregiver	hours	Base Cost: 130 High Cost: 156 Low Cost: 104	\$ 2.55 (9, 31)	\$ 12.64	\$ 15.16 (9, 31)	\$ 10.11 (9, 31)	100%	\$ 657.13	\$ 788.56	\$ 525.71	IP or Government
Additional water for lactating woman	liter	6624.8	\$ 0.27 (32)	\$ 0.27	\$ 0.69 (32)	\$ 0.14 (32)	100%	\$ 1,770.81	\$ 4,590.99	\$ 918.20	IP or Family
500 kcal of additional food for lactating woman	days	9464	\$ 0.07 (24)	\$ 0.07	\$ 0.11 (15)	\$ 0.06 (15)	100%	\$ 662.48	\$ 1,041.04	\$ 567.84	IP or Family
Mastitis Treatment	incidence	Base Cost: 10.4 High Cost: 15.6 Low Cost 5.2 (11, 18)	\$ 2.55	\$ 2.53	\$ 2.53	\$ 2.53	100%	\$ 26.29	\$ 39.43	\$ 13.14	Shared between all three
DI Treatment	incidence	80.34 (19)	\$ 8.39 (2)	\$ 8.75	\$ 8.75 (2)	\$ 8.75 (2)	37% (1)	\$ 260.09	\$ 260.09	\$ 260.09	Shared between all three
ARI/ Pneumonia Treatment	incidence	57.98 (19)	\$ 17.10 (2)	\$ 17.84	\$ 17.84 (2)	\$ 17.84 (2)	68% (1)	\$ 703.29	\$ 703.29	\$ 703.29	Shared between all three
<b>Total Costs</b>								<b>\$ 4,089.09</b>	<b>\$ 7,423.39</b>	<b>\$ 2,988.27</b>	

Table 11: Total Costs of Exclusive Use of BMS for 48 Infants &lt;6 months in Indonesia

Capital Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Basic Preparation Materials	unit	48	\$ 20.00 (20)	\$ 19.80	\$ 19.80 (20)	\$ 19.80 (20)	100%	\$ 950.40	\$ 950.40	\$ 950.40	IP or Family
Feeding Bottles	unit	96	\$ 2.52 (33)	\$ 2.49	\$ 6.99 (33)	\$ 1.87 (33)	100%	\$ 239.50	\$ 671.27	\$ 179.63	IP or Family
Gas Stove	unit	48	\$ 42.41 (34)	\$ 41.98	\$ 53.26 (26)	\$ 31.96 (26)	10%	\$ 201.52	\$ 255.65	\$ 153.39	IP or Family
Salary costs for CHW to provide training session on how to correctly prepare and use BMS to caregiver.	hours	24	\$ 2.55 (9, 31)	\$ 2.53	\$ 2.53 (9, 31)	\$ 2.53 (9, 31)	100%	\$ 121.32	\$ 121.32	\$ 121.32	IP or Family
Recurring Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Formula tin (900g)	tin	2496	\$ 8.66 (2)	\$ 8.66	\$ 22.04 (35)	\$ 4.99 (36)	100%	\$ 21,615.36	\$ 55,005.35	\$ 12,454.04	IP or Family
Water	liter	212,160	\$ 0.27 (32)	\$ 0.27	\$ 0.69 (32)	\$ 0.14 (32)	100%	\$ 56,293.21	\$ 147,026.88	\$ 29,405.38	IP or Family
LPG	kilogram	21,216	\$ 0.30 (37)	\$ 0.30	\$ 0.30 (37)	\$ 0.30 (37)	100%	\$ 6,311.76	\$ 6,311.76	\$ 6,311.76	IP or Family
DI Treatment	incidence	74.16 (19)	\$ 8.39 (2)	\$ 8.75	\$ 8.75 (2)	\$ 8.75 (2)	100% (1)	\$ 648.87	\$ 648.87	\$ 648.87	Shared between all three
ARI/ Pneumonia Treatment	incidence	53.52 (19)	\$ 17.10 (2)	\$ 17.84	\$ 17.84 (2)	\$ 17.84 (2)	100% (1)	\$ 954.69	\$ 954.69	\$ 954.69	Shared between all three
<b>Total Costs</b>								<b>\$ 87,336.63</b>	<b>\$ 211,946.19</b>	<b>\$ 51,179.47</b>	



### **c. Syrian Refugees in the Hashemite Kingdom of Jordan**

Since the Syrian civil war began in March 2011 as a violent consequence of the wider 2011 Arab Spring protests that swept across various countries within the Middle East North Africa region, over an estimated 5.6 million Syrians have fled the country as refugees (38).<sup>5</sup> Overwhelmingly, the majority of these refugees are being hosted by the neighboring countries of Turkey, Lebanon, Jordan, and Iraq (38). While some of these estimated 5.6 refugees have been able to begin new lives in their respective host countries and do not require any form of humanitarian assistance, this is not the case for the vast majority of these individuals whose needs can cover the range of food assistance, health assistance, shelter provision or rent assistance, and education opportunities, among others.

Specifically, within the Hashemite Kingdom of Jordan (hereafter referred to as Jordan), more than 650,000 Syrian refugees have registered with the UNHCR, a number that accounts for more than ten percent of Jordan's total population (39). These refugees are not contained within a specific area of the country, as an estimated 81 percent reside within host communities. Of those living in the established camp settings, the majority are either within the Za'atri refugee camp or the Azraq refugee camp. Since all of these settings have different rates of EBF and BMS use according to a study published by the UNHCR in 2016 (10), this paper has conducted the cost estimation exercise for a larger mock population living in the Za'atri refugee camp, the Azraq refugee camp, or within host communities as well as the standard cost for a single infant as seen below. More detailed brief descriptions of each setting are also included.

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<sup>5</sup> This estimated 5.6 million does not include the estimated 13.1 million Syrians, including 6.6 million internally displaced persons, who remain in the Syrian Arab Republic who are also in need of humanitarian assistance (17).

### **i. Refugees in the Za'atri Refugee Camp**

The Za'atri refugee camp is both the largest camp for Syrian refugees within Jordan as well as the second-largest refugee camp in the world within an approximate population of 80,000 refugees (39). Given its size, the Za'atri refugee camp is referred to as Jordan's fourth-largest city (39). The UNHCR reports that there are an estimated 80 births per week among the refugee population (40) and that the EBF rate for infants under the age of six months is approximately 53.7 percent (10). Humanitarian assistance is provided to the camp's residents through Jordanian government entities including the Ministry of Health, and the over forty humanitarian organizations including UNICEF, the World Food Programme, Medecins Sans Frontieres, and the International Medical Corps (40). Given the size of the camp and the ongoing birth of infants among the camp's residents, the lower rates of EBF and the presence of multiple actors assisting the camp's residents, the Za'atri refugee camp made for a logical choice to conduct the mock cost estimation exercise. Based on the reported EBF versus BMS usage rates, the total cost estimates for the larger population of 100 infants were divided between 54 infants experiencing EBF and 46 infants experiencing exclusive BMS usage.

As was done earlier, below are the total cost estimates of care for a single infant who experiences EBF in the Za'atri refugee camp from birth until six months followed by the total cost estimated for a single infant who experiences BMS usage in Za'atri refugee camp from birth until six months. These estimates are followed by the estimates for the larger population.

Table 12: Total Costs of EBF for One Infant &lt;6 months in Za'atri Refugee Camp, Jordan

Recurring Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Salary costs for CHW to provide lactation consultant sessions to the caregiver	hours	Base Cost: 2.5 High Cost: 3 Low Cost: 2	\$ 1.06 (9, 17)	\$ 5.89	\$ 6.28 (9, 17)	\$ 4.19 (9, 17)	100%	\$ 5.89	\$ 6.28	\$ 4.19	IP or Government
Additional water for lactating woman	liter	127.4	\$ 1.10 (41)	\$ 1.09	\$ 1.47 (41)	\$ 0.84 (41)	100%	\$ 138.74	\$ 187.28	\$ 107.02	IP or Family
500 kcal of additional food for lactating woman	days	182	\$ 0.07 (24)	\$ 0.07	\$ 0.11 (15)	\$ 0.06 (15)	100%	\$ 12.74	\$ 20.02	\$ 10.92	IP or Family
Mastitis Treatment	incidence	Base Cost: 0.2 High Cost: 0.3 Low Cost: 0.1 (11, 18)	\$ 1.06 (9, 17)	\$ 1.05	\$ 1.05	\$ 1.05	100%	\$ 0.21	\$ 0.31	\$ 0.10	Shared between all three
DI Treatment	incidence	1.095 (19)	\$ 8.73 (2)	\$ 9.11	\$ 9.11 (2)	\$ 9.11 (2)	37% (1)	\$ 3.69	\$ 3.69	\$ 3.69	Shared between all three
ARI/ Pneumonia Treatment	incidence	0.65 (19)	\$ 39.17 (2)	\$ 40.85	\$ 40.85 (2)	\$ 40.85 (2)	68% (1)	\$ 18.06	\$ 18.06	\$ 18.06	Shared between all three
<b>Total Costs</b>								<b>\$ 179.32</b>	<b>\$ 235.64</b>	<b>\$ 143.98</b>	
<b>Average Monthly Costs</b>								<b>\$ 29.89</b>	<b>\$ 39.27</b>	<b>\$ 24.00</b>	

Table 13: Total Costs of Exclusive Use of BMS for One Infant <6 months in Za'atri Refugee Camp, Jordan

Capital Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Basic Preparation Materials	unit	1	\$ 20.00 (20)	\$ 19.80	\$ 19.80 (20)	\$ 19.80 (20)	100%	\$ 19.80	\$ 19.80	\$ 19.80	IP or Family
Feeding Bottles	unit	2	\$ 11.57 (42)	\$ 11.45	\$ 13.89 (42)	\$ 13.27 (42)	100%	\$ 22.90	\$ 27.79	\$ 26.53	IP or Family
Gas Stove	unit	1	\$ 30.00 (26)	\$ 31.29	\$ 69.26 (43)	\$ 49.50 (26)	10%	\$ 3.13	\$ 7.30	\$ 5.33	IP or Family
Salary costs for CHW to provide training session on how to correctly prepare and use BMS to caregiver.	hours	0.5	\$ 1.06 (9, 17)	\$ 1.05	\$ 1.05 (9, 17)	\$ 1.05 (9, 17)	100%	\$ 1.05	\$ 1.05	\$ 1.05	IP or Government
Recurring Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Formula tin (900g)	tin	52	\$ 13.40 (44)	\$ 13.27	\$ 15.82 (45)	\$ 12.29 (46)	100%	\$ 689.79	\$ 822.67	\$ 638.96	IP or Family
Water	liter	4,420	\$ 1.10 (41)	\$ 1.09	\$ 1.47 (41)	\$ 0.84 (41)	100%	\$ 4,814.01	\$ 6,480.39	\$ 3,703.08	IP or Family
LPG	kilogram	442	\$ 0.79 (47)	\$ 0.78	\$ 0.78 (47)	\$ 0.78 (47)	100%	\$ 345.62	\$ 345.62	\$ 345.62	IP or Family
DI Treatment	incidence	1.095 (19)	\$ 8.73 (2)	\$ 9.11	\$ 9.11 (2)	\$ 9.11 (2)	100% (1)	\$ 9.97	\$ 9.97	\$ 9.97	Shared between all three
ARI/ Pneumonia Treatment	incidence	0.65 (19)	\$ 39.17 (2)	\$ 40.85	\$ 40.85 (2)	\$ 40.85 (2)	100% (1)	\$ 26.55	\$ 26.55	\$ 26.55	Shared between all three
<b>Total Costs</b>								<b>\$ 5,932.82</b>	<b>\$ 7,740.77</b>	<b>\$ 4,776.90</b>	
<b>Average Monthly Costs</b>								<b>\$ 988.80</b>	<b>\$ 1,290.13</b>	<b>\$ 796.15</b>	

Table 14: Total Costs of EBF for 54 Infants &lt;6 months in Za'atri Refugee Camp, Jordan

Recurring Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Salary costs for CHW to provide lactation consultant sessions to caregiver	hours	Base Cost: 135 High Cost: 162 Low Cost: 108	\$ 1.06 (9, 17)	\$ 5.89	\$ 6.28 (9, 17)	\$ 4.19 (9, 17)	100%	\$ 318.03	\$ 339.31	\$ 226.21	IP or Government
Additional water for lactating woman	liter	6,879.6	\$ 1.10 (41)	\$ 1.09	\$ 1.47 (41)	\$ 0.84 (41)	100%	\$ 7,491.88	\$ 10,113.01	\$ 5,778.86	IP or Family
500 kcal of additional food for lactating woman	days	9828	\$ 0.07 (24)	\$ 0.07	\$ 0.11 (15)	\$ 0.06 (15)	100%	\$ 687.96	\$ 1,081.08	\$ 540.54	IP or Family
Mastitis Treatment	incidence	Base Cost: 10.8 High Cost: 16.2 Low Cost: 5.4 (11, 18)	\$ 1.06 (9, 17)	\$ 1.05	\$ 1.05	\$ 1.05	100%	\$ 11.31	\$ 16.97	\$ 5.66	Shared between all three
DI Treatment	incidence	59.13 (19)	\$ 8.73 (2)	\$ 9.11	\$ 9.11 (2)	\$ 9.11 (2)	37% (1)	\$ 199.29	\$ 199.29	\$ 199.29	Shared between all three
ARI/ Pneumonia Treatment	incidence	35.1 (19)	\$ 39.17 (2)	\$ 40.85	\$ 40.85 (2)	\$ 40.85 (2)	68% (1)	\$ 975.04	\$ 975.04	\$ 975.04	Shared between all three
<b>Total</b>								<b>\$ 9,683.52</b>	<b>\$ 12,724.71</b>	<b>\$ 7,725.60</b>	

Table 15: Total Costs of Exclusive Use of BMS for 46 infants <6 months in Za'atri Refugee Camp, Jordan

Capital Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Basic Preparation Materials	set	46	\$ 20.00 (20)	\$ 19.80	\$ 19.80 (20)	\$ 19.80 (20)	100%	\$ 910.80	\$ 910.80	\$ 910.80	IP or Family
Feeding Bottles	bottles	92	\$ 11.57 (42)	\$ 11.45	\$ 13.89 (42)	\$ 13.27 (42)	100%	\$ 1,053.40	\$ 1,278.21	\$ 1,220.40	IP or Family
Gas Stove	unit	46	\$ 30.00 (26)	\$ 31.29	\$ 72.97 (43)	\$ 49.50 (26)	10%	\$ 143.93	\$ 335.64	\$ 245.00	IP or Family
Salary costs for CHW to provide training session on how to correctly prepare and use BMS to caregiver.	hours	23	\$ 1.06 (9, 17)	\$ 1.05	\$ 1.05 (9, 17)	\$ 1.05 (9, 17)	100%	\$ 54.18	\$ 54.18	\$ 54.18	IP
Recurring Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Formula tin (900g)	tin	2808	\$ 13.40 (44)	\$ 13.27	\$ 15.82 (45)	\$ 12.29 (46)	100%	\$ 37,248.65	\$ 44,423.91	\$ 34,504.01	IP or Family
Water	liters	203,302	\$ 1.10 (41)	\$ 1.09	\$ 1.47 (41)	\$ 0.84 (41)	100%	\$ 221,444.30	\$ 298,098.10	\$ 170,341.77	IP or Family
LPG	kilogram	20,332	\$ 0.79 (47)	\$ 0.78	\$ 0.78 (47)	\$ 0.78 (47)	100%	\$ 15,898.57	\$ 15,898.57	\$ 15,898.57	IP or Family
DI Treatment	incidence	50.37 (19)	\$ 8.73 (2)	\$ 9.11	\$ 9.11 (2)	\$ 9.11 (2)	100% (1)	\$ 458.84	\$ 458.84	\$ 458.84	Shared between all three
ARI/ Pneumonia Treatment	incidence	29.9 (19)	\$ 39.17 (2)	\$ 40.85	\$ 40.85 (2)	\$ 40.85 (2)	100% (1)	\$ 1,221.46	\$ 1,221.46	\$ 1,221.46	Shared between all three
<b>Total</b>								<b>\$ 272,909.80</b>	<b>\$ 356,075.33</b>	<b>\$ 219,737.31</b>	

## ii. Refugees in the Azraq Refugee Camp

The Azraq refugee camp was established in April 2014, and currently houses over 36,000 Syrian refugees (48). As such, the Azraq refugee camp is the second largest established camp for Syrian refugees within Jordan. In 2016, the United Nations Population Fund reported that there was an average of 70 births per week among the camp's residents (49), while the aforementioned UNHCR report found that only 38.2 percent of infants experienced EBF (10). Similar to the Za'atri refugee camp, the camp's refugee population receives humanitarian assistance from a variety of actors including the Jordanian Ministry of Health, UN agencies including UNICEF and WFP, and over a dozen humanitarian aid non-governmental organizations (NGOs) (48). Based on the reported EBF versus BMS usage rates, the total cost estimates for the larger population of 100 infants were divided between 38 infants experiencing EBF and 62 infants experiencing exclusive BMS usage.

Since the Azraq refugee camp has the same relative geographic location as the Za'atri refugee camp, the total costs estimated for a single infant who experiences either EBF or BMS usage in the Azraq refugee camp from birth until six months would be the same as what was calculated for the Za'atri refugee camps. Therefore, the cost tabulations for the single infant population will not be shown for either EBF or BMS and instead, the tables that follow are solely for the larger population size.

Table 16: Total Costs of EBF for 38 Infants <6 months in Azraq Refugee Camp, Jordan

Recurring Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Salary costs for CHW to provide lactation consultant sessions to the caregiver	hours	Base Cost: 95 High Cost: 114 Low Cost: 76	\$ 1.06 (9, 17)	\$ 5.89	\$ 6.28 (9, 17)	\$ 4.19 (9, 17)	100%	\$ 223.80	\$ 238.77	\$ 159.18	IP or Government
Additional water for lactating woman	liters	4841.2	\$ 1.10 (41)	\$ 1.09	\$ 1.47 (41)	\$ 0.84 (41)	100%	\$ 5,272.07	\$ 7,116.56	\$ 4,066.61	IP or Family
500 kcal of additional food for lactating woman	days	6916	\$ 0.07 (24)	\$ 0.07	\$ 0.11 (15)	\$ 0.06 (15)	100%	\$ 484.12	\$ 760.76	\$ 380.38	IP or Family
Mastitis Treatment	incidence	Base Cost: 7.6 High Cost: 11.4 Low Cost: 3.8 (11, 18)	\$ 1.06 (9, 17)	\$ 1.05	\$ 1.05	\$ 1.05	100%	\$ 7.96	\$ 11.94	\$ 3.98	Shared between all three
DI Treatment	incidence	41.61 (19)	\$ 8.73 (2)	\$ 9.11	\$ 9.11 (2)	\$ 9.11 (2)	37% (1)	\$ 140.24	\$ 140.24	\$ 140.24	Shared between all three
ARI/ Pneumonia Treatment	incidence	24.7 (19)	\$ 39.17 (2)	\$ 40.85	\$ 40.85 (2)	\$ 40.85 (2)	68% (1)	\$ 686.14	\$ 686.14	\$ 686.14	Shared between all three
<b>Total</b>								<b>\$ 6,814.33</b>	<b>\$ 8,954.42</b>	<b>\$ 5,436.54</b>	



Table 14: Total Costs of Exclusive Use of BMS for 62 Infants &lt;6 months in Azraq Refugee Camp, Jordan

Capital Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Basic Preparation Materials	unit	62	\$ 20.00 (20)	\$ 19.80	\$ 19.80 (20)	\$ 19.80 (20)	100%	\$ 1,227.60	\$ 1,227.60	\$ 1,227.60	IP or Family
Feeding Bottles	unit	92	\$ 11.57 (42)	\$ 11.45	\$ 13.89 (42)	\$ 13.27 (42)	100%	\$ 1,053.40	\$ 1,278.21	\$ 1,220.40	IP or Family
Gas Stove	unit	62	\$ 30.00 (26)	\$ 31.29	\$ 69.26 (43)	\$ 49.50 (26)	10%	\$ 194.00	\$ 452.39	\$ 330.21	IP or Family
Salary costs for CHW to provide training session on how to correctly prepare and use BMS to caregiver.	hours	31	\$ 1.06 (9, 17)	\$ 1.05	\$ 1.05 (9, 17)	\$ 1.05 (9, 17)	100%	\$ 365.15	\$ 389.58	\$ 259.72	IP or Government
Recurring Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Formula tin (900g)	tin	3224	\$ 13.40 (44)	\$ 13.27	\$ 15.82 (45)	\$ 12.29 (46)	100%	\$ 42,766.97	\$ 51,005.24	\$ 39,615.72	IP or Family
Water	liter	274,040	\$ 1.10 (41)	\$ 1.09	\$ 1.47 (41)	\$ 0.84 (41)	100%	\$ 298,468.41	\$ 401,784.40	\$ 229,591.08	IP or Family
LPG	kilogram	27,404	\$ 0.79 (47)	\$ 0.78	\$ 0.78 (47)	\$ 0.78 (47)	100%	\$ 21,428.50	\$ 21,428.50	\$ 21,428.50	IP or Family
DI Treatment	incidence	67.89 (19)	\$ 8.73 (2)	\$ 9.11	\$ 9.11 (2)	\$ 9.11 (2)	100% (1)	\$ 618.43	\$ 618.43	\$ 618.43	Shared between all three
ARI/ Pneumonia Treatment	incidence	40.3 (19)	\$ 39.17 (2)	\$ 40.85	\$ 40.85 (2)	\$ 40.85 (2)	100% (1)	\$ 1,646.32	\$ 1,646.32	\$ 1,646.32	Shared between all three
<b>Total</b>								<b>\$ 367,768.77</b>	<b>\$ 479,807.67</b>	<b>\$ 295,937.98</b>	

### **iii. Refugees in host communities**

As previously stated, a large majority of Syrian refugees within Jordan (approximately 530,000 individuals) do not live in either of the aforementioned camps but in host communities throughout the country. However, most refugees are not legally able to work and are consequently living at or below the poverty line while being reliant on humanitarian assistance to meet their basic needs (39). Additionally, the estimated EBF rate of infants is an estimated 19.1 percent (10), which is lower than both refugee camps. Therefore, given both the need of this population subgroup and their lower EBF rates, it was logical to conduct the cost estimation exercise among this population in addition to the refugee camps above. Based on the reported EBF versus BMS usage rates, the total cost estimates for the larger population of 100 infants were divided between 19 infants experiencing EBF and 81 infants experiencing exclusive BMS usage.

Since the refugees living in the host communities have the same relative geographic location as the refugees living in the aforementioned refugee camps, the total costs estimated for a single infant who experiences EBF or BMS usage from birth until six months would be the same as what was calculated for the refugee camps. Therefore, the cost tabulations for the single infant population will not be shown for either EBF or BMS and instead, the tables that follow are solely for the larger population size.

Table 18: Total Costs of EBF for 19 Infants &lt;6 months in Host Communities within Jordan

Recurring Costs											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Salary costs for CHW to provide lactation consultant sessions to the caregiver	hours	Base Cost: 47.5 High Cost: 57 Low Cost: 38	\$ 1.06 (9, 17)	\$ 5.89	\$ 6.28 (9, 17)	\$ 4.19 (9, 17)	100%	\$ 111.90	\$ 119.39	\$ 79.59	IP or Government
Additional water for lactating woman	liter	2420.6	\$ 1.10 (41)	\$ 1.09	\$ 1.47 (41)	\$ 0.84 (41)	100%	\$ 2,636.03	\$ 3,558.28	\$ 2,033.30	IP or Family
500 kcal of additional food for lactating woman	days	3458	\$ 0.07 (24)	\$ 0.07	\$ 0.11 (15)	\$ 0.06 (15)	100%	\$ 242.06	\$ 380.38	\$ 207.48	IP or Family
Mastitis Treatment	incidence	Base Cost: 7.6 High Cost: 11.4 Low Cost: 3.8 (11, 18)	\$ 1.06 (9, 17)	\$ 1.05	\$ 1.05	\$ 1.05	100%	\$ 3.98	\$ 5.97	\$ 1.99	Shared between all three
DI Treatment	incidence	20.805 (19)	\$ 8.73 (2)	\$ 9.11	\$ 9.11 (2)	\$ 9.11 (2)	37% (1)	\$ 70.12	\$ 70.12	\$ 70.12	Shared between all three
ARI/Pneumonia Treatment	incidence	12.35 (19)	\$ 39.17 (2)	\$ 40.85	\$ 40.85 (2)	\$ 40.85 (2)	68% (1)	\$ 343.07	\$ 343.07	\$ 343.07	Shared between all three
<b>Total</b>								<b>\$ 3,407.17</b>	<b>\$ 4,477.21</b>	<b>\$ 2,735.56</b>	

*Table 19: Total Costs of Exclusive Use of BMS for 81 Infants <6 months in Host Communities within Jordan*

<b>Capital Costs</b>											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Basic Preparation Materials	unit	81	\$ 20.00 (20)	\$ 19.80	\$ 19.80 (20)	\$ 19.80 (20)	100%	\$ 1,603.80	\$ 1,603.80	\$ 1,603.80	IP or Family
Feeding Bottles	unit	162	\$ 11.57 (42)	\$ 11.45	\$ 13.89 (42)	\$ 13.27 (42)	100%	\$ 1,854.89	\$ 2,260.93	\$ 2,148.96	IP or Family
Gas Stove	unit	81	\$ 30.00 (26)	\$ 31.29	\$ 69.26 (43)	\$ 49.50 (26)	10%	\$ 253.45	\$ 560.99	\$ 422.42	IP or Family
Salary costs for CHW to provide training session on how to correctly prepare and use BMS to caregiver.	hours	40.5	\$ 1.06 (9, 17)	\$ 1.05	\$ 1.05 (9, 17)	\$ 1.05 (9, 17)	100%	\$ 477.05	\$ 508.96	\$ 339.31	IP or Government
<b>Recurring Costs</b>											
Name of Item	Unit	Units Required	Cost Per Unit	Base Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	High Cost Per Unit in 2019 USD	Percentage Attributed	Total Base Cost	Total High Cost	Total Low Cost	Actor Bearing Costs
Formula tin (900g)	tin	4,212	\$ 13.40 (44)	\$ 13.27	\$ 15.82 (45)	\$ 12.29 (45)	100%	\$ 5,872.97	\$ 66,635.87	\$ 51,756.02	IP or Family
Water	liter	358,020	\$ 1.10 (41)	\$ 1.09	\$ 1.47 (41)	\$ 0.84 (41)	100%	\$ 389,934.54	\$ 524,911.88	\$ 299,949.64	IP or Family
LPG	kilogram	35,802	\$ 0.79 (47)	\$ 0.78	\$ 0.78 (47)	\$ 0.78 (47)	100%	\$ 27,995.30	\$ 27,995.30	\$ 27,995.30	IP or Family
DI Treatment	incidence	88.695 (19)	\$ 8.73 (2)	\$ 9.11	\$ 9.11 (2)	\$ 9.11 (2)	100% (1)	\$ 807.95	\$ 807.95	\$ 807.95	Shared between all three
ARI/ Pneumonia Treatment	incidence	52.65 (19)	\$ 39.17 (2)	\$ 40.85	\$ 40.85 (2)	\$ 40.85 (2)	100% (1)	\$ 2,150.83	\$ 2,150.83	\$ 2,150.83	Shared between all three
<b>Total</b>								<b>\$ 480,950.78</b>	<b>\$ 627,436.52</b>	<b>\$ 387,174.23</b>	

#### IV. Discussion of Results from Total Cost Estimation Exercises

Across all of the case studies, it is clear that the total cost of EBF for a single infant under six months is notably less expensive than the total cost of BMS use for a single infant within the same timeframe as shown in the table below.

*Table 20: Comparison of Total Costs in 2019 USD for a Single Infant*

<b>Location of Case Study</b>	<b>EBF Base Cost (Low and High Costs in Brackets)</b>	<b>BMS Base Cost (Low and High Costs in Brackets)</b>	<b>Cost Differences Between EBF and BMS Base Costs (Low and High Costs in Brackets)</b>
Iraq	\$124.16 [\$112.15 and \$240.08]	\$3961.47 [\$3,274.93 and \$8,780.55]	\$3,837.31 [\$3,162.67 and \$8,540.47]
Indonesia	\$78.46 [\$57.47 and \$142.76]	\$1,819.51 [\$1,066.24 and \$4,415.55]	\$1,741.05 [\$1,008.77 and \$4,272.79]
Syrian Refugees Living in Jordan	\$179.32 [\$143.98 and \$235.64]	\$5,932.82 [\$4776.90 and \$7,740.77]	\$5,753.50 [\$4,632.92 and \$7,505.13]

The magnitudes of the base cost differences range from approximately 23.2 amid a natural disaster setting in Indonesia to approximately 33.1 among the Syrian refugees living in Jordan. While the magnitudes of these differences vary based on the set of prices used (base cost, high cost, or low cost), they are still notable. For example, the lowest magnitude is approximately 18.6, which is based on Indonesia's estimated low cost totals, while the highest magnitude is approximately 36.6 based on Iraq's high cost estimates.

Given the entirely plausible reality that an infant born amid an on-going humanitarian emergency response could be EBF for the few months of its life before its caregiver switches to BMS use, it is important to understand the average monthly cost differences between BMS use and EBF for each case study. This information is shown in the table below for each case study using the base, high, and low costs.

*Table 18: Average Monthly Cost Savings for EBF and BMS Use for a Single Infant in 2019 USD*

<b>Location of Case Study</b>	<b>Average Monthly Savings in Base Costs (Low and High Monthly Savings in Brackets)</b>	
Iraq	\$639.56	[\$525.13 and \$1,423.42]
Indonesia	\$290.17	[\$168.14 and \$712.13]

Syrian Refugees in Jordan	\$ 958.91	[\$772.15 and \$1,250.86]
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These average monthly cost differences represent the amount of cost savings that could be achieved by having one additional infant EBF for one additional month instead of relying on BMS. If this were to occur, these cost savings could potentially be re-invested in other health interventions. For example, based on the monthly difference between the base costs among the Syrian refugees living in Jordan (958.91 USD), responding humanitarian organizations could purchase approximately 2420 measles single-dose vaccines (50), which is one of the most important vaccines that is distributed during a humanitarian response. If this cost difference was expanded to cover the entire six-month period (5137.25 USD), a total of approximately 14,529 measles vaccines could be purchased (50). Importantly, these cost savings and calculations for their use are only calculated for the single infant to allow for the ease of comparison across the case studies. Yet, it is extremely unlikely that a humanitarian responder would only encounter one caregiver and infant under the age of six months and would instead encounter a larger population of caregivers and infants. Therefore, if a majority of the infants could each be EBF for an additional month, the true amount of the potential cost savings would be much larger. This would in turn lead to even higher amounts of money that could be re-invested in other health interventions such as mass measles vaccination campaigns as discussed earlier.

The final key takeaway is that the total combined costs to care for a larger population of infants (some of whom are EBF and some of whom receive BMS) will vary immensely depending on the pre-existing EBF rate of infants under six months. These differences are best demonstrated by the Syrian refugees living within Jordan, as the different EBF rates between Za'atri refugee camp, Azraq refugee camp and the host communities equate to vastly different total combined cost amounts as shown in the table below.

*Table 19: Comparison of Total Combined Costs in 2019 USD for a Population of 100 Syrian Refugee Infants Based on Current Feeding Practice Rates*

<b>Location</b>	<b>Total Combined Bae Costs (Total Combined Low and High Costs in Brackets)</b>	
Za'atri Refugee Camp	\$282,593.32	[\$227,462.91 and \$368,800.03]
Azraq Refugee Camp	\$374,583.10	[\$301,374.51 and \$488,762.09]
Host Communities	\$484,357.95	[\$389,909.79 and \$631,913.73]

The differences shown above demonstrate how the current EBF practice rate within a given location affect the total costs of a humanitarian response to the issue of infant feeding within that context as well as where there is the potential for the largest amount of cost savings in the response through having more infants EBF for longer as opposed to receiving BMS.

## **V. Recommendations**

Based on all of the case studies' total cost estimations, it is obvious that the less expensive option across all locations and price points is for infants to be exclusively breastfed whenever possible. Indeed, there are financial savings benefits from having even one infant in any of the locations have an additional month of EBF before being moved to a BMS. These savings could then be otherwise spent by the responding humanitarian actors, or state-level actors in question on other necessary health interventions such as childhood vaccination campaigns among the affected population, or increased investment in an improved water and sanitation system, which could lower overall incidence of diarrheal illnesses. If the money saved accrued to the family in question, then it too could be better spent on any number of goods or services that the family deemed necessary.

Based on all of this information and solely when looking at the financial implications of the provision of BMS in a humanitarian response, a clear recommendation emerges for humanitarian response organizations to encourage any caregiver who either gives birth during a humanitarian response or who already has an infant and is capable of breastfeeding, to exclusively breastfeed the infant in question. As stated in an earlier section, this is not a recommendation to deny BMS

to infants whose caregivers are unable to exclusively breastfeed or infants who are without caregivers at all. Nor has this paper delved into the bioethics of the appropriate mechanisms (if any) to persuade a caregiver in a humanitarian emergency to EBF an infant in their care if they are able. However, the information from these total cost estimations should be used by humanitarian response organizations to better understand the true financial repercussions of BMS provision versus EBF while developing standard operating procedures for future field-based responses in which decisions regarding whom should receive BMS must be made.

## **VI. Conclusion**

As humanitarian responders and government partners continue to respond to humanitarian emergencies around the world and decide how to best prioritize the available funding, it is necessary to look at all activities and analyze the true cost implications of those decisions. The total costs of EBF versus BMS use among infants between the ages of zero to six months vary drastically depending on the method used regardless of location. Importantly, even one additional month of EBF for one infant can have a cost savings of hundreds of dollars per month. Additionally, the data from the Syrian refugees living in Jordan demonstrate the population-level cost differences that emerge in scenarios where there are higher existing EBF rates.

In summary, while all infants within a humanitarian crisis should receive appropriate feeding of some sort, humanitarian response organizations should consider these cost differences along with the proven health benefits of EBF for infants under the age of six months in order to best create standard operating procedures for how to best address this issue moving forward.



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## **MPH Goals Analysis**

In my goals analysis that I completed at the start of the MPH program, I stated that I wanted to focus my degree on building up the ‘hard skills’ of public health such as biostatistics and understanding how to intervene on various diseases development pathways, both of which I was able to accomplish within this capstone. Additionally, I stated that I wanted to focus my capstone project on an issue within humanitarian health that was reality-based and relevant to field practice to better prepare myself for a hopeful career in field-based project implementation and service delivery. Again, I was able to accomplish this goal with this capstone as this entire paper is about a topic that is playing out time and again across various humanitarian responses.

As the academic year progressed, my interest in the total cost and cost implications of specific public health interventions (particularly within the humanitarian field) grew as there is never enough money to do everything and hard decisions have to be made regarding what to prioritize. This capstone allowed me to dive into one of those difficult scenarios as I calculated cost estimations for exclusive breastfeeding versus breast milk substitutes within different humanitarian scenarios to hopefully begin a conversation about if the status quo is the best way for the humanitarian world to be spending its limited funds.