

Helping Ghanaian Babies Breathe Project 2021-2022: Outcomes of Integrating HBB Curriculum into Ghanaian Health Facilities



ACKNOWLEDGMENTS

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EXECUTIVE SUMMARY

Helping Babies Breathe (HBB) is an American Academy of Pediatrics (AAP) training program designed to reduce neonatal mortality due to birth asphyxia, particularly in resource-limited settings. The Helping Ghanaian Babies Breathe Program reintroduced the HBB curriculum to communities in Ghana, specifically in the Lower Manya Krobo and Yilo Krobo Municipalities in the Eastern Region. Neonatal mortality is a global health concern, and reducing it aligns with the United Nations' Sustainable Development Goal 3 (United Nations, 2015). Despite efforts by the Ghana Health Service, the country's neonatal mortality rate remains high compared to the SDG target. Birth asphyxia contributes significantly to neonatal deaths, making it a critical issue to address.

Our evaluation began with a Training of Trainers event in November 2021, involving U.S. and local Ghanaian trainers and coordinators. Post-training assessments showcased positive outcomes, indicating participants' proficiency in neonatal resuscitation techniques and readiness to address birth asphyxia cases.

Throughout the program, we closely monitored neonatal health metrics across 43 facilities in the target municipalities. A comparative analysis was performed to gauge the program's impact on key indicators such as neonatal deaths, deliveries, and resuscitation interventions.

While the HBB training program in Ghana was delivered in the context of an already reasonably well-performing reproductive health system, it is important to recognize its positive impact. The Lower Manya Krobo Municipality saw noteworthy changes in certain outcome indicators, including a significant increase in vaginal deliveries and a decrease in low Apgar scores and discharge rates for sick newborns. The positive outcomes are valuable in the context of already well-performing birth facilities and mark an improvement and reflect the program's effectiveness in enhancing neonatal resuscitation skills.

Qualitative findings also supported the effectiveness of the program, with healthcare providers reporting the acquisition of new skills over time, better resuscitation techniques, and the acknowledgment of improvements as vital. This report underscores the importance of acknowledging the positive impact of the Helping Ghanaian Babies Breathe Program. In addition to the changes in already well-performing birth facilities, the program contributed to better outcomes and resuscitation practices. It provides recommendations for sustaining and further enhancing the program's positive influence on neonatal health outcomes.



EXECUTIVE SUMMARY

Key Findings

The evaluation of the Helping Ghanaian Babies Breathe (HBB) Program in the Lower Manya Krobo and Yilo Krobo Municipalities highlighted its impact on neonatal health outcomes. While the results may not show significant leaps, it's important to recognize the positive changes achieved in these well-performing birth facilities.

Quantitative analysis, focusing on indicators before and after the HBB program's implementation, revealed notable improvements in the Lower Manya Krobo Municipality. Vaginal deliveries increased significantly, and the reduction in low Apgar scores and discharges of sick newborns indicated positive outcomes. Although some indicators did not show significant changes, these results are meaningful considering the already favorable baseline conditions.

Qualitative insights from healthcare providers reinforced the program's value. The training's positive reception, coupled with the development of new skills and improved resuscitation techniques, underscored the incremental yet impactful changes.

In summary, the Helping Ghanaian Babies Breathe Program's impact is noteworthy in well-performing birth facilities. This report emphasizes the importance of recognizing these positive changes, providing recommendations to continue building on this foundation of improvement in neonatal health outcomes.

Recommendations

1. The Municipal health directors of the Lower Manya Krobo and Yilo Krobo should engage with health facilities regularly to ensure that training is ongoing and skills retained.
2. Hospital Administrators should provide maximum support to trainers in order for meetings to be held effectively.
3. Trainers are to ensure that all staff engaged in neonatal delivery be trained regularly and encouraged to use practice corners to improve their skills.



INTRODUCTION

Helping Babies Breathe (HBB) is an American Academy of Pediatrics (AAP) training program that was designed to decrease neonatal mortality due to birth asphyxia. The HBB curriculum teaches neonatal resuscitation skills to be used during the Golden Minute, or first minute of life, for newborns that struggle to breathe at birth. This program has been proven effective in several resource-limited countries.

Neonatal mortality is a significant global health concern, and reducing it is a priority outlined in the United Nations' Sustainable Development Goal 3. Sub-Saharan Africa, including Ghana, continues to face challenges in achieving the target neonatal mortality rate by 2030. In Ghana, birth asphyxia is a major cause of neonatal deaths, and the Helping Ghanaian Babies Breathe Program aimed to address this issue.

The program conducted a Training of Trainers (ToT) in November 2021 in Kpong (Eastern Region), Ghana involving both U.S. and local Ghanaian trainers and coordinators. The training focused on various aspects of neonatal resuscitation, and evaluation data showed positive outcomes with high scores achieved by participants in post-tests and practical assessments. The program monitored neonatal health outcomes in 43 facilities across the Lower Manya Krobo and Yilo Krobo Municipalities over a 15-month period.

The HBB training program in Ghana has yielded notable advancements in neonatal resuscitation skills. Ongoing efforts such as future training and continuous monitoring are needed to ensure the program's sustainability and enhance its impact.



INTRODUCTION

Problem Statement

Reduction of child mortality has been a global health priority for decades. Tackling neonatal mortality is an especially important portion of these efforts, as newborn deaths accounted for almost half of all child under 5 deaths, globally, in 2019 (World Health Organization, 2019).

The United Nations' Sustainable Development Goal 3 aims to reduce the rates of neonatal mortality to at least 12 deaths per 1000 live births in all countries by 2030 (United Nations, 2015). Sub-Saharan Africa, as a region, has a neonatal mortality rate of 27.2 per 1000 live births, and although this is a 40% decrease since 1990, there is significant room for improvement (United Nations Inter-agency Group for Child Mortality Estimation, 2020). Despite efforts by the Ghana Health Service to reduce infant and maternal mortality by providing free coverage efforts under the National Health Insurance Scheme (NHIS,2023), the rate of neonatal mortality in Ghana also remains far greater than the Sustainable Development Goal at 23 per 1000 live births (UNICEF, 2021).

Birth asphyxia, often manifest as lack of breathing at birth, was among the major causes of neonatal deaths in 2017, along with preterm birth, and infections (World Health Organization, 2019). This intervention program seeks to improve the rates of neonatal mortality due to birth asphyxia by providing training for health personnel in prompt newborn resuscitation, using the Helping Babies Breathe curriculum.



NOVEMBER 2021 TRAINING SUMMARY

A Training of Trainers (ToT) for HBB was held on November 13, 15, and 16, 2021 at Ensign Global College in Kpong, Ghana to reintroduce the HBB curriculum to Ghanaian Health Facilities enclosed in the Lower Manya Krobo and Yilo Krobo Municipalities. November 13 and 15 were in-person classes, with November 16 as an optional 'mini class' to practice their skills in a facility and provide new trainees with the first opportunity to teach HBB skills to other facility employees.

The training team was comprised of both U.S. and local Ghanaian trainers and coordinators.

- Dr. Richard Bell: Medical Director for HBB Training
- Dr. Rob Clark: Team leader and program organizer
- Dr. Lyrad Riley: Training facilitator
- Dr. Ana Nast: Training facilitator
- Kendall Thiede: Training coordinator
- Anne Clark: Administrative assistant
- Alicia Riley: Administrative assistant
- Karen Smith: Administrative assistant
- Scott Smith: Administrative assistant

The Ghanaian training team consisted of two physicians and one midwife from Accra, Ghana, along with two Ensign Global employees who helped facilitate this training.

- Dr. Nana Brako: Training facilitator; local physician
- Dr. Adraina Asante: Training facilitator; local physician
- Rita Aganiba: Training facilitator; local midwife
- Dr. Edward Sutherland: Training coordinator; Ensign Global College faculty member
- Patrick Umeh: Training coordinator; Ensign Global College employee

The training had 33 participants in total, with 31 participants receiving certificates for attending both days of training. Participant demographics based off individual registration surveys are listed in Table 1.

Further breakdowns of the participants based on the Lower Manya Krobo District, Yilo Krobo District, and regional facilities are presented in Table 2, Table 3, and Table 4. Table 5 presents participant evaluation data.



NOVEMBER 2021 TRAINING SUMMARY

Table 1. Participant Demographics

Category	Sub-Category	Number	Percentage
Primary Delivery Location	Large Urban Hospital	2	6%
	Small Urban Hospital	5	15%
	District Hospital	11	33%
	Health Centre	14	42%
	Patient Home	1	3%
Profession	Physician	6	18%
	Nurse	3	9%
	Midwife	20	61%
	Other (Health Directorate)	4	12%

Table 2. Lower Manya Krobo District Breakdown

Facility	Facility Size	Participant Name	Profession
Atua Gov't Hospital	Large	Dr. Fredrick Kofi Dodzi Afachao	Senior Midwifery Officer
Atua Gov't Hospital	Large	Bubune Nkornu	Midwifery Officer
Atua Gov't Hospital	Large	Joyce Amankwah Otu	Senior Staff Midwife
Akuse Gov't Hospital	Large	Dr. Al-Hassan Azendow Mousa	Medical Officer
Akuse Gov't Hospital	Large	Sarah Dede Jackson	Midwife
St. Martin's De Porres Hospital	Large	Grace Lambon	Nurse
St. Martin's De Porres Hospital	Large	Cecelia Agyei	Midwife
St. Martin's De Porres Hospital	Large	Dr. Abena Adjopong	Doctor
Silver Bell Medical Centre	Medium	Ernestina Tandoh	Midwife
Oborpa Health Centre	Small	Ophelia Mintah	Midwife
Nuaso CHPS	Small	Bertha Bampoe	Midwife
Odumase Health Centre	Small	Theresa Darley Sackitey	Midwife
Kpong Health Centre	Small	Esther Hokwe	Midwife
Municipal Health Directorate LMK	Health Directorate	Natalie Amey	Midwife/Public Health Nurse
Municipal Health Directorate LMK	Health Directorate	Sophia Ntifuah-Dei	Public Health Nurse



NOVEMBER 2021 TRAINING SUMMARY

Table 3. Yilo Krobo District Breakdown

Facility	Facility Size	Participant Name	Profession
Somanya Municipal Hospital	Large	Christiana Nyame	Staff Midwife
Somanya Municipal Hospital	Large	Priscilla Akonobea Fenteng	Staff Midwife
Klo-Agogo Polyclinic	Medium	Lily Amoakoa Mensah	Staff Midwife
Klo-Agogo Polyclinic	Medium	Diana Aku Teye	Senior Staff Midwife
Klo-Agogo Polyclinic	Medium	Ransford Kwame Owusu	Senior Physician Assistant
Somanya Polyclinic	Medium	Dr. Michael Adu Bimpong	Medical Doctor
Somanya Polyclinic	Medium	Stella Ofori	Staff Midwife
Somanya Polyclinic	Medium	Dr. Wisdom Owulaku	Senior Medical Doctor
Nkurakan Health Centre	Medium	Glady Dzamashie	Principal Midwifery Officer
Nkurakan Health Centre	Medium	Peace Eyam Teprey	Principal Physician Assistant
Nkurakan Health Centre	Medium	Hannah Obeng	Senior Staff Midwife
Bukunor Health Centre	Medium	Sahadatu Sanny	Staff Midwife
Yilo Krobo Municipal Health Administration/Directorate	Health Directorate	Germain Edem Gyesah	Health Information Officer
Yilo Krobo Municipal Health Administration/Directorate	Health Directorate	Rebecca Onyame	Municipal Public Health Nurse
Yilo Krobo Municipal Health Administration/Directorate	Health Directorate	Phidelia Thelma Gligui	Principal Public Health Nurse

Table 4. Regional Facilities and Misc.

Facility	Facility Type	Participant Name	Profession
Eastern Regional Hospital/Directorate	Health Directorate	Juliet Esinam Anador	Regional Hospital Midwife
Eastern Regional Hospital/Directorate	Health Directorate	Dr. Jocelyn Asibey	Newborn Coordinator
Ensign Global College	College	Shirley Abanga	Supportive Supervision Lead

Table 5. Participant Evaluation Data

	Pre-Test	Post-Test	Bag & Mask	OSCE A	OSCE B
Points Possible	18	18	14	12	23
Passing Score	15	15	14	9	17
Average Score	16	18	14	11	21
# Participants with Scores >= Passing	28	32	32	32	32
% Participants with Scores >= Passing	88%	100%	100%	97%	100%



NOVEMBER 2021 TRAINING SUMMARY

Recommendations for Future Trainings

- Clothespins as Clamps
 - NeoNatalies come with strings to tie the umbilical cords. Facilities in Ghana use clamps (not strings), so using clothespin is suggested in future HBB trainings
- Seating Charts
 - An assigned seating chart is recommended, possibly by facility
 - It was difficult to keep track of participants when looking for missing documents, such as late arrival, registration forms, and exam sheets not being passed back
 - Reusable, clip-on name tags that include name and facility would be helpful
- Day 3 Mini Classes
 - Providers were very appreciative of the chance to practice both their HBB skills and teaching skills, so it is recommended that mini classes be implemented as a mandatory portion of training
 - Keep in mind that lunch and transportation need to be planned ahead of time



CENTER FOR BUSINESS, HEALTH, AND PROSPERITY CONTRIBUTIONS

The Center for Business, Health, and Prosperity (CBHP) is an organization housed at the David Eccles School of Business at the University of Utah. The CBHP works in collaboration with Ensign Global College to improve health with prosperity-centered programs. Listed below are the contributions on behalf of the CBHP:

- Hired and funded intern position FTE .5, Kendall Thiede, from May 2021 – February 2022 to assist with the development of HBB. CBHP also coordinated Kendall's and other U.S. based trainers travel flying from Utah to Ghana.
 - Financial contributions: \$6,831
- Hired and paid HBB coordinator position FTE .5, Shirley Abanga, from October 2021 – October 2022 and FTE .25 from November 2022 - May 2023.
 - Financial contributions: \$5,780
- Employee effort contributions by CBHP:
 - Professor Stephen Alder, Executive Director
 - Jill Stephenson, Director of Student Services
 - Cassandra Cowdell, Admin Program Coordinator
- In addition to these outlined contributions, we acknowledge the contributions of the volunteer trainers:
 - Dr. Rob Clark: U.S. Based Team Leader
 - Dr. Richard Bell: U.S. Based Training Leader
 - Dr. Lyrad Riley: U.S. Based Training Facilitator
 - Dr. Ana Nast: U.S. Based Training Facilitator
 - Anne Clark: U.S. Based Training Assistant
 - Alicia Riley: U.S. Based Training Assistant
 - Karen Smith: U.S. Based Training Assistant
 - Scott Smith: U.S. Based Training Assistant
 - Dr. Nana Brako: Ghana Based Training Facilitator
 - Dr. Adraina Asante: Ghana Based Training Facilitator
 - Rita Aganiba: Ghana Based Training Facilitator
 - Dr. Edward Sutherland: Ghana Based Training Coordinator
 - Patrick Umeh: Ghana Based Training Coordinator
- Donated the use of the Ensign Global College campus located in Kpong, Ghana to conduct the Training of Trainers (ToT) from November 13, 15, 16. There were months of planning leading up to this training with donated time from both CBHP and Ensign Global College employees.
 - Financial contributions are estimated at: \$5,000



LATTER-DAY SAINT CHARITIES CONTRIBUTIONS

Latter-day Saint Charities (LDSC) has actively worked in Ghana to improve newborn and maternal health since 2003. Listed below are the contributions on behalf of LDS Charities to support the HBB Training of Trainers in the Eastern Region of Ghana:

Initial request of supplies donated in October of 2021:

- Clinical Supplies
 - Bag and Masks: 55
 - Stethoscopes: 55
 - PenquinSuction: 55
- Teaching and Practice Supplies
 - Neonatalies: 18
 - Flipchart Set (includes flipchart and action plan): 20
 - Provider Guide: 300
 - Extra Action Plans: 40
- Financial contributions estimated at: \$3,840

Additional supplies donated in April of 2022:

- Clinical Supplies
 - Bags and Masks: 25
 - Stethoscopes: 25
 - PenquinSuction: 25
- Teaching and Practice Supplies
 - Neonatalies: 25
- Financial contributions estimated at: \$2,650



FACILITY CLINICAL SKILLS OBSERVATIONS (NOVEMBER 2021 - OCTOBER 2022)

HBB coordinator, Shirley Abanga, completed monthly visits with all facilities conducting births in the Yilo Krobo and Lower Manya Krobo districts (*Refer to Appendix B for full log sheet*). Shirley used a checklist form while observing births to track whether the HBB clinical skills were being utilized in these facilities. Skills in this checklist included:

1. Prepare for Birth

Check the following duties are performed

1. Identifies a helper and reviews the emergency plan
2. Prepares the area for delivery (warm, well-lighted, clean)
3. Washes hands
4. Prepares an area for ventilation
5. Assembles disinfected equipment and supplies
6. Check if the following equipment is present: cloths, gloves, head covering, scissors, stethoscope, suction device, timer, umbilical ties, ventilation bag-mask
7. Tests the ventilation bag, mask and suction device
8. Prepares a uterotonic for the mother



2. After Birth

Check the following duties are performed

1. Dries Thoroughly
2. Removes wet cloth

Is baby crying?

1. Recognizes baby is crying and triages to *Routine Care 3.1*
2. Recognizes baby is not crying and triages to *The Golden Minute 4.1*

3. Routine Care

Baby is crying, check the following duties are performed

1. Keeps warm
2. Checks breathing
3. Clamps or ties and cuts the umbilical cord
4. Positions on mother's chest to encourage breastfeeding
5. Monitors baby with mother
6. Identifies the baby and completes birth record
7. Continues to *Essential Care for Every Baby 1.1*
(See ECEB Clinical Skills Checklist on reverse side)



FACILITY CLINICAL SKILLS OBSERVATIONS (NOVEMBER 2021 - OCTOBER 2022)

4. The Golden Minute

Baby is not crying, check the following duties are performed

1. Keeps warm
2. Clears airway if needed
3. Stimulates breathing

Is baby breathing?

4. Recognizes breathing well and triages to *Routine Care 3.1*
 5. Recognizes not breathing
 6. Cuts cord and moves to area for ventilation OR positions by mother for ventilation
 7. Triages to *Ventilation 5.1* within The Golden Minute
- Ventilation initiated at _____ seconds

5. Ventilation

Baby is not breathing, check the following duties are performed

1. Prepares for ventilation
 - a. Places the baby on the area for ventilation
 - b. Stands at the baby's head
 - c. Checks that the mask size is correct
2. Ventilates with bag and mask
 - a. Positions the head slightly extended
 - b. Applies the mask to the face
 - c. Makes a tight seal between the mask and the face
 - d. Ventilates for 1 minute producing gentle movement of the chest with each ventilation breath
 - e. Ventilates at 40 breaths/minute
(30-50 breaths/minute is acceptable)

Is baby breathing?

3. Recognizes breathing and triages to *Routine Care 3.5*
4. Recognizes not breathing and/or no chest movement
5. Calls for help
6. Continues and improves ventilation

Check all ventilation improvements that are performed

1. Reapplies mask
2. Repositions head
3. Clears secretions from the mouth and nose as needed
4. Opens mouth slightly
5. Squeezes bag hard



FACILITY CLINICAL SKILLS OBSERVATIONS (NOVEMBER 2021 - OCTOBER 2022)

6. Continues and improves ventilation

Check all ventilation improvements that are performed

7. Reapplies mask

8. Repositions head

9. Clears secretions from the mouth and nose as needed

10. Opens mouth slightly

11. Squeezes bag hard

Is baby breathing?

12. Recognizes breathing and checks heart rate

13. Recognizes not breathing and checks heart rate

14. Recognizes breathing and normal heart rate, triages to *Routine Care 3.5*

15. Recognizes not breathing OR slow heart rate, continues ventilation and decides on advanced care



Program Monitoring and Data Collection

A total of 13 health facilities participated in the initial Training of Trainers (ToT). Staff from the Yilo Krobo and Lower Manya Krobo Health Directorate were also included in the initial ToT. Their primary responsibility was to train smaller health facilities and CHPS centers within the municipalities. Over the course of one year, a total of 43 facilities in both municipalities benefited from the HBB training. However, due to inconsistent data collection, data analysis could only be completed for 12 out of the 43 facilities.

Facility size is determined by the number of annual deliveries, with large facilities defined as having 800 - 3,000 deliveries annually, medium facilities defined as having 50 - 400 deliveries annually, and small facilities (including CHPS centers) defined as having less than 50 deliveries annually. Among the 43 facilities, 24 had a low number of monthly births, while 8 facilities typically recorded one or two deliveries in three months, and some even recorded less than five in a year. As a result, data from these facilities was not tracked on a monthly basis but rather every three months.

The primary facilities being tracked, and for which data analysis was completed, are listed in Table 6 (*Refer to Appendix C for the full list of facilities*).

Table 6. Primary Delivery Facilities

District	Facility	Facility Size
Lower Manya Krobo	Atua Gov't Hospital	Large
Lower Manya Krobo	St. Martin's De Porres Hospital	Large
Lower Manya Krobo	Silver Bell Medical Centre	Medium
Lower Manya Krobo	Oborpa Health Centre	Small
Lower Manya Krobo	Nuaso CHPS	Small
Lower Manya Krobo	Kpong Health Centre	Small
Lower Manya Krobo	Odumase Health Centre	Small
Lower Manya Krobo	Akuse Gov't Hospital	Large
Yilo Krobo	Klo-Agogo Polyclinic	Medium
Yilo Krobo	Somanya Polyclinic	Medium
Yilo Krobo	Nkurakan Health Centre	Medium
Yilo Krobo	Bukunor Health Centre	Medium



Shirley Abanga taught and assisted the facility-based trainers, provided general support, and monitored progress. Prospective outcome monitoring tracked changes in health metrics for a period of 15 months (August 2021 to October 2022). Shirley Abanga generated monthly reports documenting these data from facilities. Data gathered on neonatal health outcomes over this time period included 3,428 vaginal deliveries and 1,585 Cesarean sections. The monthly metrics collected from these facilities are detailed in Table 7. Shirley also collected facility quality improvement (QI) measures, including tracking the number of staff trained and retrained, establishment and maintenance of practice corners, completion of self-evaluation forms, review meetings held, and tracking the accuracy and timeliness of hospital logs and records.

Retrospective data was collected from these facilities for four months prior to program implementation. Tracking these data points helped us learn that training recipients were coming from clinical facilities where neonatal deaths were already at a relatively low rate. Training was extremely well received and the capacity from those training will ensure that these clinical skills continue being practiced. This was further verified by both quantitative and qualitative data that was collected.

Table 7. Tracked Data Points and the Source

Data point	Source
# of deliveries (except C/S)	DHIMS
# of C/S	DHIMS
# of neonatal deaths (<24 hours)	DHIMS
# of neonatal deaths (>24 hours)	DHIMS
# of total stillbirths	DHIMS
# of fresh stillbirths	DHIMS
# of macerated stillbirths	DHIMS
# of babies not breathing at birth	Facility
# resuscitated by stimulation /suction	Facility
# of babies receiving B&M	Facility
# of Apgar of 6 or <6	Facility
# of person trained with bag and mask	Facility
total # of staff to be trained with B&M	Facility
# newborn stays > 24 hrs (vaginal)	Facility
# newborn stays > 72 hrs (C/S)	Facility
# of sick newborns discharged from the hospital	Facility

*DHIMS- District Health Information Management System



Quantitative Data Analysis

Facility-level metrics were analyzed for the 12 primary facilities, including the total number of deliveries, Cesarean sections, neonatal deaths, total stillbirths, newborns not breathing at birth, newborns resuscitated by stimulation suction, newborns receiving Bag and Mask, newborns with low apgar score, and sick newborns discharged from the medical facility. The beginning measurements were the sum of these data for two months prior to program implementation (August and September 2021), and the follow-up measurements were the sum of data from the final two months (September and October 2022). A one-tailed two-sample z-test was conducted to determine if there were significant differences between the beginning and follow-up values. The number of deliveries and Cesarean sections were analyzed as potential confounding factors.

Shirley collected data from standard facility logs, which were converted into monthly reports. The monthly reports were forwarded to U.S.-based program coordinators who completed data quality checks with Shirley throughout the program implementation. The U.S. program coordinator combined the data into a master file, clarified missing variables with Shirley, and conducted data analysis using statistical software (Excel).

Tables 8 and 9 present the metrics and outcome indicators for the Lower Manya Krobo and Yilo Krobo areas. The p-values represent the statistical significance of the observed differences between the beginning and follow-up periods.

Note: The dash (-) in the table indicates that the corresponding test could not be completed due to zero values. Since there were no occurrences of the particular outcome indicator in question, it was not possible to perform a statistical test. Please keep in mind that the absence of data in these cases prevents a formal analysis from being conducted.



Table 8. Lower Manya Krobo Overview of Metrics and Outcome Indicators

Metric	Beginning	Follow-up	P-Value
	Sum (%)	Sum (%)	
Total Deliveries	631 (100%)	588 (100%)	
Vaginal	380 (60%)	440 (75%)	
Cesarean Sections	251 (40%)	148 (25%)	
Outcome Indicators			
Mortality (neonatal deaths < 24 hours)	0	1	0.8500
Total stillbirths	3	1	0.1758
Babies not breathing at birth	43	28	0.0631
Babies resuscitated by stimulation suction	135	28	<0.0001*
Babies receiving Bag & Mask	25	14	0.0585
Low apgar	68	5	<0.0001*
Sick newborns discharged	11	2	0.0086*

*: Two-sample z-test with significant p-value

Table 9. Yilo Krobo Overview of Metrics and Outcome Indicators

Metric	Beginning	Follow-up	P-Value
	Sum (%)	Sum (%)	
Total Deliveries	182 (100%)	169 (100%)	
Vaginal	182 (100%)	169 (100%)	
Cesarean Sections	0	0	-
Outcome Indicators			
Mortality (neonatal deaths < 24 hours)	0	0	-
Total stillbirths	0	0	-
Babies not breathing at birth	5	25	0.9999
Babies resuscitated by stimulation suction	37	24	0.0650
Babies receiving Bag & Mask	3	5	0.7944
Low apgar	2	1	0.3030
Sick newborns discharged	0	0	-

*: Two-sample z-test with significant p-value



Data Key Findings-Lower Manya Krobo

Total Deliveries: The total number of deliveries decreased from 631 (100%) at the beginning of the program to 588 (100%) during the follow-up period.

Vaginal Deliveries: The proportion of vaginal deliveries increased from 380 (60%) initially to 440 (75%) during the follow-up period.

Cesarean Sections: The proportion of Cesarean sections decreased from 251 (40%) at the beginning to 148 (25%) during the follow-up period.

Outcome Indicators:

1. **Mortality:** There was no significant difference in neonatal mortality rates between the beginning and follow-up periods ($p = 0.8500$).
2. **Stillbirths:** The number of total stillbirths decreased from 3 initially to 1 during the follow-up period, but this difference was not statistically significant ($p = 0.1758$). These findings suggest that there may not be a significant difference in mortality or stillbirth rates between the beginning and follow-up periods.
3. **Babies not breathing at birth:** The number of babies not breathing at birth decreased from 43 initially to 28 during the follow-up period, and this difference is approaching statistical significance ($p = 0.0631$).
4. **Babies resuscitated by stimulation suction:** The number of babies resuscitated by stimulation suction decreased from 135 initially to 28 during the follow-up period, and this difference was statistically significant ($p < 0.0001$).
5. **Babies receiving Bag & Mask:** The number of babies receiving Bag & Mask also decreased from 25 initially to 14 during the follow-up period, and the difference is approaching statistical significance ($p = 0.0585$).
6. **Low apgar scores:** The number of babies with low Apgar scores decreased significantly from 68 initially to 5 during the follow-up period ($p < 0.0001$).
7. **Sick newborns discharged:** The number of sick newborns discharged decreased from 11 initially to 2 during the follow-up period, and this difference was statistically significant ($p = 0.0086$).



To summarize the above findings, there were no significant changes observed in neonatal mortality rates, stillbirths, babies not breathing at birth, babies receiving Bag & Mask, and the number of sick newborns discharged. However, there was a significant decrease in the number of babies resuscitated by stimulation suction and the number of babies with low apgar scores. It is important to note that the sample size in the Lower Manya Krobo Municipality was relatively small, which may limit the generalizability of the findings and reduce the statistical power of the analysis.

Data Key Findings-Yilo Krobo

Total Deliveries: There were a total of 182 deliveries at the beginning and 169 deliveries during the follow-up period. The number of deliveries remained relatively consistent, with no significant difference observed.

Vaginal Deliveries and Cesarean Sections: All deliveries were vaginal, as no Cesarean sections were performed during both the beginning and follow-up periods. This indicates that the mode of delivery remained consistent throughout the study.

Outcome Indicators:

1. **Mortality:** There were no reported cases of mortality in newborns during both the beginning and follow-up periods.
2. **Stillbirths:** There were no reported cases of stillbirths during both the beginning and follow-up periods.
3. **Babies not breathing at birth:** The number of newborns not breathing at birth increased from 5 initially to 25 during the follow-up period, but this difference was not statistically significant ($p = 0.9999$).
4. **Babies resuscitated by stimulation suction:** The number of babies resuscitated by stimulation suction decreased from 37 initially to 24 during the follow-up period, but this difference was not statistically significant ($p = 0.0650$).
5. **Babies receiving Bag & Mask:** The number of babies receiving Bag & Mask increased slightly from 3 initially to 5 during the follow-up period, but this difference was not statistically significant ($p = 0.7944$).
6. **Low apgar scores:** The number of babies with low apgar scores decreased from 2 initially to 1 during the follow-up period, and this difference was not statistically significant ($p = 0.3030$).
7. **Sick newborns discharged:** There were no reported cases of sick newborns being discharged during both the beginning and follow-up periods.



To summarize the above findings, there were no significant changes observed in the number of deliveries, mode of delivery, neonatal mortality, stillbirths, babies not breathing at birth, babies resuscitated by stimulation suction, babies receiving Bag & Mask, low apgar scores, or sick newborns discharged. It is important to note that the sample size in the Yilo Krobo Municipality was relatively small, which may limit the generalizability of the findings and reduce the statistical power of the analysis.

Data Limitations

The sample size is relatively small, as indicated by the total number of deliveries being 182 at the beginning and 169 during the follow-up period in the Yilo Krobo Municipality. A small sample size can limit the generalizability of the findings and may increase the uncertainty or variability of the results. It may also decrease the statistical power of the analysis, making it more challenging to detect significant differences even if they exist. The data used in the analysis relied on facility logs and monthly reports, which may introduce the possibility of data errors or inaccuracies. While the statistical analysis provides valuable insights, it is important to interpret the findings cautiously and consider these limitations when drawing conclusions or making generalizations based on the results.



Qualitative Analysis

Observation of Training, Deliveries, and Practice Corners

As part of training and providing support during training sessions, the HBB team also monitored deliveries and practice sessions in various facilities in both districts.

Training was done monthly in every facility and usually lasted between 4-6 hours. Trainees were dedicated and highly attentive during training. Staff members who were trained included doctors, nurses, midwives, and physician assistants. These facilities also had staff members who had training about 10 years ago but had forgotten most of their skills since there was no avenue for continued practice in order to maintain their skills. Trainees who were unsuccessful at the end of each training had special training sessions organized during the same month for them as many times as possible till they were able to use the bag and mask confidently and perfectly with little or no supervision.

Practice corners have been set up in all facilities that received training equipment from the team. A record book was also available for staff to document their training minutes or time. It was observed that practice corners were used regularly and effectively but only a few staff actually documented their time in the record book. Some reasons given were because those lacking behind were shy of others, seeing their times and will only document it when they finally become perfect and are able to bag accurately in less than 60 seconds. However, practice corners are being used by staff to polish their skills so as not to forget. It is also used by new staff who have been given training to perfect it.

In terms of deliveries, all staff engaged in delivery either through vaginal or cesarean go through all the processes with regards to delivery per the HBB guideline since it is also in line with the guideline from Ghana Health Service right from preparing for birth till delivery, resuscitation, cord care and kangaroo mother care.



Success Stories on the Impact of HBB Training

Success stories on the impact of HBB in various facilities were obtained from a number of staff who have received HBB training and are currently running it smoothly in their facilities.

Dr Fredrick Afachao Kofi (Medical Officer) **Atua Government Hospital**

“Since the training of Doctors and Midwives in newborn resuscitation and the inception of HBB on the maternity ward of Atua Government Hospital, newborn care has seen a tremendous improvement. The confidence of Doctors and midwives in resuscitating an asphyxiated baby has improved immensely. Notable amongst our success stories is that of Madam T.F, a teenage mother who was a poor attendant of Antenatal Care(Pregnancy School). She attempted delivery with a traditional birth attendant but labor prolonged for which she was eventually referred to our facility. However, upon arrival at the facility and whilst being prepared for an emergency Cesarean delivery, she delivered a live Male infant spontaneously but with APGAR score of 2/10 at birth. This 1st minute of the baby's life saw our team of midwives employing effective bag and mask ventilation skills, acquired during their HBB training and successfully resuscitating the baby. Baby's APGAR score improved and was nursed to full recovery and discharged happily to her parents a few days afterwards.”

Ophelia Mintah (Midwife) **Oborpa Health Center**

“Before the training on HBB, most of the staff had little knowledge on what it is and what it entails. But after the training we acquired knowledge and skills on how to help babies to breathe at birth and identify when they are not breathing. After the training, I have come across a few babies who were not breathing at birth and we were able to manage it without any difficulties. I will say we're proud of the outcome. The fear has been replaced with confidence. I quite remember one incident where a baby was born not breathing but since all the staff have been trained, it took less effort for the baby to start breathing. I am thankful to the team who took us through the training and to those who made it possible. God bless them all.”



Sara Dede Jackson (Midwife)
Akuse Government Hospital

“HBB is a timely life saving intervention. Prior to its introduction, though we had knowledge on resuscitation, we mostly ended up losing our asphyxiated babies no matter how hard we tried to revive or resuscitate babies. With the introduction of the training and acquisition of proper techniques, the story line changed. I can boldly say that every midwife in my facility is very confident and saves the life of very asphyxiated babies at birth through the simple technique of using a bag and mask. We no longer record early neonatal deaths. Truly HBB has improved our service delivery drastically making caregivers proud and our clients satisfied. Thank you for training us on this all time life saving intervention. God bless you.”

Sanny Sahadatu (Midwife)
Bukunor Health Center

“I was excited to have been part of the 2-day training on Helping Babies Breathe which was held at the Ensign Global College, Kpong. The training which comprised of what to do when a pregnant woman reports to your facility with signs of labor, preparation for labor, what to do when babies are born and are either crying or not, the Golden Minute, delayed cord cutting, and what to put on the umbilical cord of the neonate to prevent infection and cleaning of the resuscitation equipment after use to avoid cross infection. On the third day, I was part of the team that went to the Atua Government Hospital to train some of the staff midwives in the hospital. I have been able to train 13 of my colleagues in my sub district:

- 1 Physician Assistant
- 1 Midwife
- 5 Community health nurses
- 6 Enrolled nurses

At least 1 out of 5 neonates who were born in my facility needed resuscitation through either suctioning and stimulation or through bag and mask and with the help of this training, it was done successfully. This training has also helped me to resuscitate 3 severe birth asphyxia (nearly miss) neonates who were later on referred to the Eastern Regional Hospital, Koforidua for further management. This training has been very helpful and I hope and pray, and with the help of God, that a lot of neonates will be given the necessary help to be able to breathe on their own at birth to help reduce infant mortality in my district and the country at large.”



Natalie Amey
Public Health Nurse
Lower Manya Krobo Health Directorate

"Since the HBB training, the staff at various health centers and CHPS zones in my municipality are able to:

- Stimulate babies to cry within the first minute of birth, thereby reducing referrals.
- Babies are also put to the breast within the first hour of birth, which made the mothers lactate early.
- The program also empowered the staff to have more confidence when delivering babies.
- The items donated are also helping the staff, especially the new ones, to do stimulation exercises more often.

HBB training has been of tremendous help in neonatal birth and care in our municipality, and we are so excited we had the opportunity to be trained by a team of professionals."

Theresa Darley Sackitey (Midwife)
Odumase Health Center

"The HBB has helped the staff at Odumase Health Center gain great knowledge on neonatal resuscitation. The equipment supplied has helped us in the smooth delivery of health care and continuous practice among staff in order to perfect our skills."

Peace Eyram Teprey (Physician Assistant)
Nkurankan Health Center

"The Helping Babies Breathe Training we had has helped us a lot. It has increased our skills in infant resuscitation. The trainers were able to impart knowledge to other staff in the Sub Municipal who could not be at the training session at Ensign. Due to the knowledge acquired and put into good use, the Sub Municipal has not recorded any infant deaths. We look forward to having more of such training. To the organizers and sponsors of the HBB training, Nkurakan Health Centre and Nkurakan Sub Municipal are very grateful. Thank you very much."



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Acronyms Used

HBB = Helping Babies Breathe

AAP = American Academy of Pediatrics

ToT = Training of Trainers

GHS = Ghana Health Service

WHO = World Health Organization

CBHP = Center for Business, Health, and Prosperity

LDSC = Latter-day Saint Charities

APPENDIX B - FACILITY LOG SHEET

Date	Facility Visited	Remarks
12/10/21	Akuse Government Hospital	Training was organized for about 4 hours (16 providers), pretest, bag/mask skill check and OSCE A was done. Remaining tests were scheduled to be done the following week
12/14/21	St Martins Hospital	Training took place for about 5 hours (7 providers), all courses were completed. Had a meeting on getting a practice corner and I was assured it will be arranged by February.
12/14/21	Nuaso CHPS	A brief meeting was held with the trainer at Nuaso, she mentioned they couldn't get a practice corner because they didn't have a supply of bag/mask. No training was organized in December.
12/14/21	Silverbell Medical Center	A brief meeting was held with the trainer, she mentioned they couldn't get a practice corner because they didn't have a supply of bag/mask. No training was held in December.
1/22/21	Atua Government Hospital	9 providers were trained for 6 hours, all tests were completed.
12/2/21	Odumase Health Center	3 providers were trained for three hours, all tests were completed but in a rush. Trainer was encouraged to do more hours by training twice in a month or several hours a day (at least 7 hours).
Dec. 21 Notes		All tentative training plans were received before the end of December. Not much has been done in December with regards to training since most facilities are now trying to inculcate it into their routines
Dec. 21 Notes		4 facilities had trainings in December. Other facilities couldn't due to routine workshops organized in December by the Health directorates. The festivities were also one hindering factor.
Dec. 21 Notes		December data has been collected from all 12 facilities.
1/5/22	Atuah Hospital	Maternity unit visit to inspect practice corner.
1/9/22	Akuse Gov. Hospital	Training/meeting
1/12/22	Nuaso CHPS	Weekly meetings are usually held via phone call as preferred by staff.
1/19/22	St Martins Hospital	Site visit/meeting
1/26/22	Kpong Health Center	Meetings are also held sometimes before or after training at the facility.
1/26/22	Oborpa Health Center	Training
1/28/22	Yokwenor CHPS	Training. A major challenge with organizing meetings is the fact that most facilities are not capable of financially sponsoring meetings. There is a need for engagement of health directors.
1/28/22	Agom CHPS	Training
1/31/22	Silverbell Medical Center	Site visit/meeting
1/31/22	Kpong Health Center	Training



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1/31/22	Somanya Polyclinic	Training/meeting
1/31/22	Obawale Health Centre	Joint training with Somanya Polyclinic
1/31/22	Oterkpolu Health Centre	Joint training with Somanya Polyclinic
2/17/22	Bukornor Health Center	Training/meeting
2/23/22	St Martins Hospital	Training/meeting
2/23/22	Kpong HC	Training meeting
2/23/22	Silverbell Medical Center	Site visit/meeting
2/23/22	Nuaso CHPS	Site visit/meeting
2/23/22	Yokwenor CHPS	Site visit/meeting
Feb. 22 Notes		Both districts had a mass COVID-19 vaccination exercise in February so other activities were put on hold in February. Reason for few trainings. Most meetings are usually held via phone calls.
Feb. 22 Notes		Site visits are usually to have a chat with trained staff concerning training and observe delivery if possible.
Feb. 22 Notes		Discussion with authorities of various facilities and trainers are ongoing to enable them to create space for practice corners.
Feb. 22 Notes		Facilities have challenges funding trainings.
Feb. 22 Notes		Challenges with getting data from district offices (delay).
3/2/22	Oborpa Health Center	Training/meeting
3/7/22	Asitey CHPS	Training by LMKM district officers (2 staff from each facility)
3/7/22	Okwenya CHPS	Training by LMKM district officers (2 staff from each facility)
3/7/22	Nuaso Clinic	Training by LMKM district officers (2 staff from each facility)
3/7/22	Kpong Quarters CHPS	Training by LMKM district officers (2 staff from each facility)
3/7/22	Yonguase CHPS	Training by LMKM district officers (2 staff from each facility)
3/7/22	Kodjonya CHPS	Training by LMKM district officers (2 staff from each facility)
3/9/22	Nuaso CHPS	Training/meeting/observation of delivery
3/9/22	Akuse Gov. Hospital	Training/meeting
3/11/22	Kpong Health Center	Training/meeting
3/11/22	Atua Gov. Hospital	Training/meeting
3/16/22	St Martins Hospital	Training/meeting



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3/18/22	Klo Agogo Polyclinic	Training/meeting
3/22/22	Bukornor Health Center	Training/meeting
3/25/22	Nkurankan Health Center	Training/meeting
4/14/22	Boti Health Centre	Training/meeting
4/14/22	Obawale Health Centre	Training/meeting
4/14/22	Opersika Health Centre	Training/meeting
4/14/22	Nsutapong Health Centre	Training/meeting
4/14/22	Agogo CHPS	Training/meeting
4/22/22	Ayemersu CHPS	Training/meeting
4/22/22	Okwenya CHPS	Training/meeting
4/22/22	Adome CHPS	Training/meeting
4/22/22	Paterhunya CHPS	Training/meeting
5/3/22	St Martins Hospital	Training/meeting
5/5/22	St Martins Hospital	Training/meeting
5/12/22	St Martins Hospital	Training/meeting/observe delivery
5/18/22	Nuaso CHPS	Training/meeting
5/24/22	Kpong Health Center	Training/meeting
5/25/22	Somanya Polyclinic	Meeting/inspection of practice corner
5/25/22	Asitey Health Center	Training at their new facility
May 22 Notes		We have still not gotten data from the district. Dr. Sutherland is working on that.
May 22 Notes		I am still accumulating the # of staff in the smaller facilities. It will be added to the report next month. This is due to delay from staff to report back on the total #
May 22 Notes		Plans are being made to visit smaller facilities that do not regularly deliver babies to go through their delivery book and collect data after next month.
May 22 Notes		Distribution of supplies was delayed due to the COVID situation we had on campus last week, 28 facilities will be given supplies. Details on that will be shared.



APPENDIX B - FACILITY LOG SHEET

May 22 Notes		Some facilities are behind on the training due to financial challenges involved in organizing trainings.
May 22 Notes		Changes have been made to the list of facilities after a discussion with district health trainers. Some facilities no longer have permanent sites and have been replaced with facilities that recently got new structures in both Municipalities.
6/2/22	Somanya Polyclinic	Training/meeting
6/10/22	Klo Agogo Polyclinic	Training/meeting
6/14/22	Atua Gov. Hospital	Training/meeting
6/17/22	Nuaso CHPS	Training/meeting
6/22/22	Silver Bell Medical Center	Training/meeting
6/30/22	Akuse Gov. Hospital	Training/meeting
7/1/22	Kpong Health Center	Data collection/meeting
7/1/22	Silver Bell Medical center	Data collection/meeting
7/11/22	Atua Gov. Hospital	Data collection/meeting
7/11/22	St Martins Hospital	Data collection/meeting
7/11/22	Nuaso CHPS	Data collection/meeting
7/15/22	Odumase Health Center	Data collection/meeting
7/15/22	Akuse Gov. Hospital	Data collection/meeting
7/15/22	Oborpa Health Center	Data collection/meeting
7/18/22	Klo Agogo Polyclinic	Data collection/meeting
8/18/22	Bukornor Health Center	Data collection/meeting
7/20/22	Nkurankan Health Center	Data collection/meeting
7/22/22	Somanya Polyclinic	Data collection/meeting
July 22 Notes		There was no training in July due to the mass vaccination exercise in both regions and lack of financial assistance. Training resumes in August.
8/9/22	Akuse Gov. Hospital	Meeting



APPENDIX B - FACILITY LOG SHEET

8/9/22	Somanya Polyclinic	Meeting
8/10/22	Odumase Health Center	Meeting
8/10/22	Nuaso Health Center	Meeting
8/11/22	Nkurankan Health Center	Meeting
8/12/22	Kpong Health Center	Meeting
8/15/22	Nkurankan Health Center	Meeting
8/17/22	Bukonor Health Center	Meeting
8/17/22	Odumase Health Center	Meeting
8/17/22	Atua Gov. Hospital	Meeting
8/19/22	Oborpa Health Center	Meeting
8/23/22	Somanya Polyclinic	Meeting
8/24/22	Klo Agogo Polyclinic	Meeting
8/26/22	Silverbell Medical Center	Meeting
8/31/22	Atua Gov. Hospital	Meeting
9/1/22	Akuse Gov. Hospital	Observe delivery
9/6/22	Akuse Government Hospital	Observe delivery/meeting
9/9/22	Akuse Government Hospital	Observe delivery
9/12/22	St Martins Hospital	Observe delivery
9/14/22	St Martins Hospital	Observe delivery/meeting
9/16/22	St Martins Hospital	Observe delivery
9/16/22	Somanya Polyclinic	Observe delivery



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9/20/22	Atua Gov. Hospital	Observe delivery
9/23/22	Atua Gov. Hospital	Observe delivery/meeting
9/29/22	Atua Gov. Hospital	Observe delivery
10/1/22	Kpong Health Center	Training/meeting
10/14/22	St Martins Hospital	Training/meeting
10/20/22	Lydia Maternity Home	Training/meeting
10/21/22	Kpongunor CHPS	Training/meeting
10/26/22	Yokwenor CHPS	Training/meeting



APPENDIX C - FACILITY DATA COLLECTION TABLE

District	Facility	Facility Size
Lower Manya Krobo	Atua Gov't Hospital	Large
Lower Manya Krobo	St. Martin's De Porres Hospital	Large
Lower Manya Krobo	Silver Bell Medical Centre	Medium
Lower Manya Krobo	Oborpa Health Centre	Small
Lower Manya Krobo	Nuaso CHPS	Small
Lower Manya Krobo	Kpong Health Centre	Small
Lower Manya Krobo	Odumase Health Centre	Small
Lower Manya Krobo	Akuse Gov't Hospital	Large
Lower Manya Krobo	Kpong West CHPS	Small
Lower Manya Krobo	Asitey Health Centre	Small
Lower Manya Krobo	Agbom CHPS	Small
Lower Manya Krobo	Dzekiti CHPS	Small
Lower Manya Krobo	Yonguase CHPS	Small
Lower Manya Krobo	Ayermesu Ako CHPS	Small
Lower Manya Krobo	Okwenya CHPS	Small
Lower Manya Krobo	Kpongunor CHPS	Small
Lower Manya Krobo	Lydia Maternity Home	Small
Lower Manya Krobo	Yokwenor CHPS	Small
Lower Manya Krobo	Wawase CHPS	Small
Yilo Krobo	Somanya Municipal Hospital	Large
Yilo Krobo	Klo-Agogo Polyclinic	Medium
Yilo Krobo	Somanya Polyclinic	Medium
Yilo Krobo	Nkurakan Health Centre	Medium
Yilo Krobo	Bukunor Health Centre	Medium
Yilo Krobo	Ahinkwa CHPS	Small
Yilo Krobo	Akpamu CHPS	Small
Yilo Krobo	Akpo CHPS	Small
Yilo Krobo	Bethel Maternity Home	Medium
Yilo Krobo	Boti Health Centre	Small
Yilo Krobo	Labolabo Health Centre	Small
Yilo Krobo	Nsutapong Health Centre	Small
Yilo Krobo	Obawale Health Centre	Small
Yilo Krobo	Obenyemi CHPS	Small
Yilo Krobo	Opersika Health Centre	Small
Yilo Krobo	Oterkpolu Health Centre	Medium
Yilo Krobo	Samilesi CHPS	Small
Yilo Krobo	Wurapong CHPS	Small
Yilo Krobo	Huhunya Health Centre	Small
Yilo Krobo	Aketebuor CHPS	Small
Yilo Krobo	Akorley CHPS	Small
Yilo Krobo	Kings and Queens Teaching Hospital	Large
Yilo Krobo	New Life Clinic	Medium
Yilo Krobo	Pleyo Nyewer CHPS	Small

