

# THE FEMALE&FAMILY[E]EDUCATION TRAINING PROGRAM IN SURINAME: AN INITIAL EVALUATION

Luca van Deursen



### **Colophon**

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Author: Luca van Deursen

Commissioning organization: Health[e]Foundation

On-site supervisor: Nadine Pakker

VU supervisor: Thomas van den Akker

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#### **Athena Institute**

Faculty of Science

VU University Amsterdam

De Boelelaan 1085

1081 HV Amsterdam

The Netherlands

#### **Health[e]Foundation**

Amsterdam UMC

Academic Medical Center

Meibergdreef 5

Building 'De Bascule / Panama'

1105 AZ Amsterdam

The Netherlands

**HEALTH [e] FOUNDATION**



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## List of Abbreviations & Definitions

F&F Training	Female&Family[e]Education Training
GP	General Practitioner
LMIC	Low- and middle-income countries
MMR	Maternal Mortality Ratio
WHO	World Health Organisation
GNI	Gross National Income
MZ	“Medische Zending” or Medical Mission
RGD	“Regionale Gezondheidsdienst” or Regional Health Service
MaMS	Maternal Mortality Commission Suriname
PAHO	Pan American Health Organisation
Health[e]Foundation	A non-profit, non-governmental organization based in Amsterdam that aims to train and educate healthcare workers all over the world by providing high quality blended learning programs
Perisur	A Surinamese organization that aims to improve perinatal outcomes for women and their newborns through preventive interventions

## **Abstract**

**Background:** Global maternal and child morbidity and mortality remains high, especially in low- and middle-income countries. These are often preventable and caused by underlying socio-political issues. Suriname is an upper-middle income country struggling with poor maternal and neonatal health outcomes, attributable to poor quality of perinatal care, lack of sufficient education for health professionals, and a lack of knowledge among health professionals. To address these issues, the Female&Family[e]Education training was introduced in Suriname, a blended e-learning training that aims to improve the knowledge, skills and capacity of maternal healthcare workers. This study provides an initial evaluation of this training, to see how blended e-learning can contribute to improved maternal and neonatal health outcomes in Suriname.

**Methods:** A mixed-methods, transdisciplinary approach was taken. In-depth semi-structured interviews were held with 13 participants and six stakeholders. Pre- and posttest data from the online modules were compared to see whether the level of knowledge of participants increased.

**Results:** Participants and stakeholders evaluate the training positively in terms of content and process. The main advantage of blended learning is that participants take responsibility over their own learning process. Main disadvantages include a lack of motivation and interaction among participants. Participants score significantly higher on the post-tests than the pre-tests, indicating an increase in knowledge. Several barriers to applying new knowledge in practice were revealed in the interviews which limit the impact that the Female&Family[e]Education training can have in Suriname. Several suggestions were made on how to improve the impact of the training in the future by stakeholders and participants.

**Conclusions:** Blended e-learning has proven to be an effective and accepted method of increasing the knowledge and capacity of maternal health professionals in Suriname. However, several structural barriers exist which make it difficult to apply new knowledge in practice. These barriers should be addressed in order to maximize the impact of this training in the Surinamese context. The results of this study can inform providers of blended e-learning technologies about the advantages and disadvantages and possible barriers and facilitators to uptake of information.

**Key words:** blended learning, e-learning, medical education, training, maternal health, maternal mortality, neonatal mortality, Suriname, low- and middle-income countries.

## Introduction

The peripartum period carries significant risks for both woman and child. Although global maternal and child mortality and morbidity are declining, numbers remain high, especially in low- and middle-income countries (LMICs).<sup>1</sup> The global maternal mortality ratio (MMR) has declined from 385 to 216 per 100 000 live births between 1990 and 2015, but LMICs still bear 99% of the burden. Where high-income countries have an average MMR of 11 per 100,000 live births, this is much higher in LMICs: 462 per 100,000 live births.<sup>2,3</sup>

Major medical causes of maternal mortality include hemorrhage, preeclampsia and eclampsia, and maternal sepsis.<sup>4</sup> Neonatal deaths account for 45% of all deaths under the age of 5 years globally, and preterm birth and intrapartum-related complications account for 59% of all newborn deaths.<sup>2</sup> Causes of antenatal and neonatal deaths include neonatal sepsis, fetal growth restriction, neonatal asphyxia-related encephalopathy, respiratory distress syndrome, and nutritional deficits.<sup>2</sup>

Many of such maternal and neonatal deaths and illnesses are preventable and often caused by underlying socio-political issues, such as low availability of resources, low quality of care in LMICs, and lack of awareness among pregnant and postpartum women and healthcare professionals of risks and how to mitigate them.<sup>5</sup> Therefore, an effort is being made globally to improve health outcomes for women and children and prevent unnecessary mortality and morbidity. This is in line with Sustainable Development Goal 3, which states that countries should aim to reduce maternal mortality to less than 70 per 100,000 live births and end preventable deaths of newborns and children under 5 years of age.<sup>6</sup>

Suriname is an upper-middle-income country in South America with relatively high rates of maternal and neonatal mortality and morbidity. Suriname has an MMR of 120 per 100,000 live births, higher than all other South American countries except Venezuela, Guyana and Bolivia, which all have a lower GDP per capita and annual expenditure on health than Suriname.<sup>7,8</sup> Rates of under-5 and infant mortality are also high (18.9 and 17 per 1,000 live births, respectively), and one in five newborns has unfavorable health outcomes.<sup>9</sup> These relatively high rates in Suriname can be attributed to poor quality of perinatal care, lack of sufficient education for health professionals, and a general lack of knowledge among women, community health workers and health professionals regarding the risks associated with pregnancy and childbirth.<sup>10</sup>

To address these issues, the 'Care at Hand' project has been initiated in Suriname as a collaboration between Health[e]Foundation and Perisur, which aims to reduce neonatal and

maternal mortality and morbidity with 50% in 5 years, through three complementary initiatives: the Female&Family[e]Education (F&F) training program for health professionals, the Health[e]Communities training program for community health workers, and a smart phone application ‘Lucy’ which aims to inform pregnant women and women who recently gave birth.

The F&F training was developed for maternal health professionals to increase their level of knowledge, confidence and capacity. The training makes use of blended e-learning and consists of a kick-off workshop at the beginning of the training period, a 3-month online program consisting of seven e-health modules, and a follow-up workshop at the end of the training period. The e-modules include ‘Focused Prenatal Care’, ‘Abnormal Labor and Delivery’, ‘Complications before Labor’, ‘Postpartum Hemorrhage’, ‘Hypertensive Disorders of Pregnancy’, ‘Maternal Infections’ and ‘Healthy Newborns and Resuscitation’. In February 2020, the first 36 participants attended the kick-off workshop and started with the first five modules.

This manuscript reports on the results of an evaluation study that aims to gain insight into how participants and stakeholders evaluate the training and what its impact is on knowledge, confidence and capacity of health professionals. This information serves as input for improving the program for future participants, when the program is scaled up within Suriname and possibly other countries. It uses a transdisciplinary approach by including the end-users and relevant stakeholders in the evaluation.

## **Contextual/Theoretical Background**

### *Maternal and Neonatal Health in Suriname*

Maternal death is described by the WHO as “the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes”.<sup>11</sup> Neonatal death or morbidity is defined as a death or morbidity among live births during the first 28 completed days of life, and perinatal mortality refers to the number of stillbirths and deaths in the first week of life.<sup>12</sup>

Generally, a higher Gross National Income (GNI) per capita is associated with improved health outcomes. Suriname transitioned from a lower-middle to an upper-middle income country in 2013, and currently performs relatively well on indicators related to uptake of maternity services compared to a few years ago: most births are attended by skilled health professionals (96% and 77% in the coastal and rural areas, respectively), and antenatal care

visits occur at least once in 91% of pregnant women and four times or more in 67% of pregnant women.<sup>10</sup> However, maternal and neonatal health indicators such as MMR and under-5 mortality have not improved correspondingly, and Suriname performs poorly compared to other middle-income countries in Latin America and the Caribbean. Each year, approximately 10,000 children are born. In 2018, there were 107 neonatal deaths, 180 infant deaths, and 13 maternal deaths.<sup>13</sup>

The leading direct causes of maternal mortality in Suriname are pregnancy-induced hypertension, obstetric and non-obstetric sepsis, and major obstetric hemorrhage.<sup>10</sup> Neonatal deaths account for 53% of all under-5 deaths, higher than the 47% global average, and neonatal and perinatal deaths are largely attributable to preeclampsia, asphyxia, sepsis, prematurity, low birth weight, severe birth defects and a low Apgar score at birth.<sup>9,14,15</sup> Most maternal deaths occur in the urban area of Suriname, where the large majority of the population lives, as a result of both direct and indirect causes.<sup>10</sup>

The relatively and disproportionately high MMR in Suriname can be at least partly explained by substandard care factors. A study by Kodan et al.<sup>10</sup> in Suriname between 2010-2014 that investigated maternal mortality found that in 95% of the cases substandard care factors were found. In more than half of the cases, more than 5 substandard care factors were present. These include (1) professional factors, (2) medical service factors such as wrong or delayed diagnosis, no or inadequate treatment, and poor monitoring and communication, (3) unavailability of diagnostics such as beds, blood for transfusion or supplies and (4) patient factors. With 80% of maternal deaths in the 4-year study period, care provided was below the standard. In 47% of these cases, substandard care factors certainly (21%) or most likely (26%) led to death.<sup>10</sup>

The most important substandard care factors were delay in diagnosis and delay in treatment by health care providers. These issues of delay are illustrated by the three-delay-model, which describes how three main factors affect the outcomes of emergencies during pregnancy: the length of delays in (1) the decision to access care, (2) the identification of and transport to a medical facility and (3) the receipt of adequate and appropriate treatment.<sup>16</sup> The lengths of these delays are affected by socio-economic and cultural factors, accessibility of facilities and quality of care. This highlights the importance of training health professionals, as many deaths may be preventable by reducing delays in the system and improving the knowledge and skills of the staff.

### *The Organization of Healthcare in Suriname*

The first level of care comprises of government-subsidized primary health care facilities. There are 43 public primary health clinics in the coastal area operated by the Regional Health Services (RGD). In this coastal area, there are also approximately 150 private primary care clinics. The 'Medische Zending' (MZ), a faith-based organization in Suriname, runs about 56 public primary health clinics in the non-coastal interior districts.

In total, Suriname has five hospitals, four in the coastal capital Paramaribo, and one in the district of Nickerie. Two are private and three are public. There is good access to healthcare; about 90% of the population lives within 5km of a hospital. However, access to specialized and emergency care for those living rurally remains a challenge for the health system in Suriname, as transportation costs to the capital are high.

About 92% of births occur in one of the five hospitals, 8% in primary health care centers and 2% at home.<sup>17</sup> There are approximately 2.8 midwives and nurses per 1,000 people in Suriname, which is lower than the average 3.5 for upper-middle income countries and 3.8 globally.<sup>18</sup> Because Suriname is a former Dutch colony obstetric residents still follow two years of their training in the Netherlands and obstetric care provision in Suriname is largely influenced by Dutch guidelines.

Research conducted globally has shown that improvements made within neonatal care facilities, such as training of personnel, can reduce mortality and morbidity among neonates.<sup>19</sup> Currently such initiatives are fragmented and often bound to specific projects. Therefore, a more sustainable and integrated approach is needed.

### *Blended learning as a tool for providing sustainable education*

Blended learning combines traditional face-to-face learning and asynchronous or synchronous e-learning to promote learning.<sup>20,21</sup> It stems from the idea that learning is a continuous process, not limited to single events or occasions. It easily reaches a large target population, is cost- and time-effective, and allows participants to take responsibility for their own learning and time-management. Additionally, it allows for individualized and collaborative learning, adapted to the preferences and pace of the users.<sup>21</sup>

Multiple studies have evaluated the effectiveness of blended learning across different disciplines, including the health profession. They indicate that blended learning results in better clinical, critical thinking, problem solving and decision-making skills.<sup>22</sup> Additionally, the learning environment facilitates beneficial interactions between students, teachers and

resources, and allows for greater flexibility and responsiveness in teaching and learning. Blended learning consistently has a positive effect as compared to traditional learning in terms of knowledge acquisition.<sup>21</sup>

Health professionals are expected to stay up to date on changes and advances in medical sciences by continuing their education in their professional life. Blended e-learning is a highly suitable method to facilitate this, as it places the responsibility of learning with the trainee so that they can pace their training and incorporate it into their schedule as they wish. Additionally, online modules can be updated regularly to reflect the latest developments in the field.<sup>23</sup>

The main disadvantage of blended learning is that learners may feel isolated in their virtual learning environments and that the social component of learning is often lacking.<sup>21,22</sup> Therefore the workshops of F&F program are important to make participants feel a stronger connection to the training and its purpose.

Additionally, e-learning requires access to and familiarity with electronic devices such as smartphones or laptops and a location with sufficient electricity supply and a stable internet connection. In Suriname there are 987,000 mobile phone subscriptions, which is 175% of the population, suggesting many people have more than one subscription.<sup>24</sup> Internet access is common and widely available in Paramaribo, where approximately 66% of the population lives and where the trainings will initially take place. Therefore, urban Suriname is a suitable location to implement a blended e-learning training.

#### *The Female&Family Blended E-learning program*

The Female&Family[e]Education program was originally developed for midwives in Rwanda and has also been successfully implemented in Ethiopia from 2015 to 2019 with positive results. Over 1000 midwives were successfully trained, the midwives evaluated the program positively, and the post-tests proved that the skills and knowledge of the participants had increased significantly compared to the pre-tests (12.4 and 19%, respectively).

The seven modules offered in Suriname have all been translated to Dutch and the content has been adjusted in collaboration with local experts so that guidelines, examples, and information provided is appropriate for the Surinamese culture and context.

During the kick-off workshop, the current status of maternal and neonatal health in Suriname is reviewed, the program is introduced, the participants complete a clinical case study to assess their clinical skills, and the e-learning component is demonstrated.

In the three following months, the participants complete the e-learning course that consists of seven self-study modules, created and developed by experts in the field of maternal and neonatal health. Each module starts with a pre-test, which can be completed once, to establish the participants knowledge prior to starting the training. After completing a module, a post-test is administered to determine whether the level of knowledge of the participant has improved. This test can be repeated indefinitely.

At the end of the three-month e-learning period, a two-day follow-up workshop is organized. One day consists of lectures by guest speakers, the other includes a skills training. The same clinical case exercise will be presented to the participants, and the difference in scores between the first workshop and the second will contribute to the evaluation of the improvement of skills of the participant. At the time of this evaluation, 5/7 modules were offered and the participants had not attended a follow-up workshop yet.

## **Objectives**

The F&F training aims to improve health outcomes for women and newborns by strengthening the knowledge and capacity of maternal healthcare workers. In total, 120 health workers will be enrolled in the training over two years; approximately 80 midwives, 10 gynecologists, 20 GPs, and 10 obstetric/gynecologic nurses. So far, 36 have been enrolled in the program; 4 nurses, 21 midwives, and 11 GPs. The objective of this study is to provide an initial evaluation of the F&F training by taking a transdisciplinary approach.

## **Conceptual Framework**

For this evaluation an adapted version of the Kirkpatrick model was used (figure 1). This model, developed for evaluating training programs, describes four levels of evaluation: reaction, learning, behavior and results.<sup>25</sup> The first level was adjusted based on Kaufman's model of Learning Evaluation, by splitting it up into 'input' and 'process'.<sup>26</sup> Input is defined as the materials that are used to complete the training. Process evaluates how the participants evaluate the training process itself. Level two evaluates whether the training provided the participants with new knowledge and skills, and level three describes whether and how it changed the behavior of the participants. The last level, 'results' in Kirkpatrick's original model, was substituted for 'future'. This was done because at an initial evaluation it is not possible to determine what the long-term results of this training are in terms of health

outcomes. Therefore, it focuses instead on how such results can be maximized in the future by increasing the impact of the training.

A main critique on Kirkpatrick’s model is that it does not consider influencing individual or contextual factors.<sup>27</sup> Such factors are described thoroughly in another evaluation model, the I-Tech Training Evaluation Framework, and were added to this model.<sup>28</sup> These factors include ‘individual factors’, which mostly influence level 1 and 2 of the model, and ‘organizational factors’, which mostly influence level 3 and 4.

Besides participants, it is also important to evaluate the expectations and reactions of stakeholders to the training. Many have contributed to the development implementation

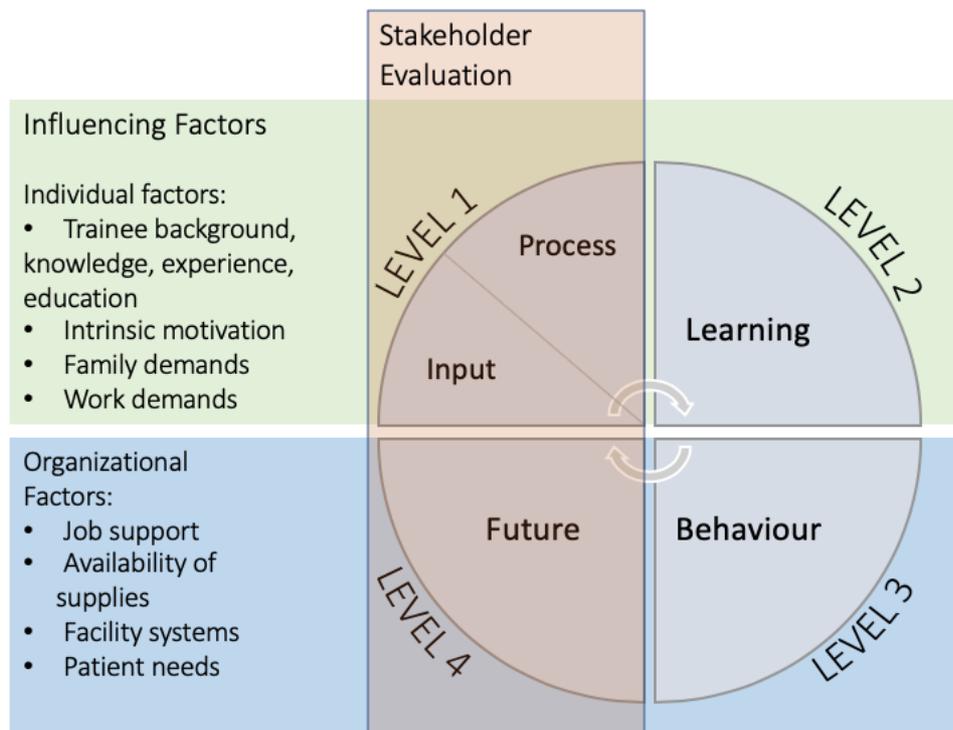


Figure 1. Adjusted version of Kirkpatrick's Model of Training Evaluation

process and including them in the evaluation is critical for the continuity of the project.

The hierarchical pyramidal design of the original model received critique as, depending on the purpose of your evaluation, the first levels can be of equal or higher importance.<sup>27</sup> At this stage of project, evaluating level 1 and level 2 is crucial, and no less important than level 3 and 4. This is reflected in the circular rather than hierarchical design of the new model, where each level contributes equally to the evaluation.

## **Research Questions**

The main research question is: ‘How can the Female&Family[e]Education program contribute to a reduction in maternal and neonatal mortality and morbidity rates in Suriname?’

The following sub-questions follow from the conceptual framework:

1. How is the Female&Family[e]Education program currently being received by the participants and stakeholders in Suriname, in terms of process and input?
2. How has the Female&Family[e]Education program influenced the level of knowledge, skills and capacity of maternal health professionals in Suriname?
3. To what extent do the participants feel like they have or will be able to improve their clinical skills and/or behavior at work as a result of this training?
4. How do participants and stakeholders see the future of this training in Suriname?
5. How do individual, organizational and contextual factors influence how this training is evaluated by participants and stakeholders?

## **Methodology**

### *Research Design*

A transdisciplinary approach was taken in this evaluation study. Scientific knowledge was combined and integrated with experiential knowledge of local and societal actors in order to jointly define real-world problems and work towards a feasible solution. Thereby, the research project benefits from different perspectives originating outside the academic realm.

This was realized by including the end-users, the participants of the training, and key stakeholders in the evaluation process. Stakeholders include gynecologists, the departments of gynecology & obstetrics at the hospitals in Paramaribo, the RGD, the MZ, the obstetrics study program, the Quality of Care group in Suriname, the Commission Maternal Mortality Suriname (MaMS), the Ministry of Health, and the PAHO. Qualitative data was collected in the form of interviews. In addition, quantitative data derived from daily evaluations and the pre- and posttest scores were analyzed.

### *Quantitative Data*

41 people participated in the kick-off workshop and filled out a daily evaluation at the end with several questions on a Likert scale of 1-5, ranging from 'Strongly Disagree' to 'Strongly Agree'. The questions were about the workshop in general, the presentations and activities, and the demonstration of the e-learning modules. These data were analyzed using descriptive statistics.

Thirty-six out of the 41 participants of the kick-off workshop started the e-learning component in January 2020. Their scores on the pre- and posttests that are embedded into each of the modules were captured by an automated Learning Management System, and were compared to evaluate whether the training has influenced their level of knowledge and skills. This data was not normally distributed, therefore a Wilcoxon signed-rank test was used to test whether the post-test scores were significantly higher than the matched pretest scores, for each module. All assumptions for this test were met.

Additionally, the data were categorized to analyze how profession or place of work influenced knowledge gain in participants. The completion rates of the modules were measured as well. All quantitative data were analyzed using IBM SPSS software (version 26.0).

### *Qualitative Data*

Thirteen participants were interviewed: seven midwives, two nurses and four general practitioners (GPs). Convenience sampling was used to select participants. Participants were invited per e-mail, phone calls or via a personal message. Participants who completed the training and participants still in the process of completing the modules were invited. Additionally, all 12 key stakeholders were invited for an interview. Six stakeholders responded and were interviewed about their expectations of training, what it could contribute to the quality of care in Suriname, and how the impact can be increased further. These stakeholders included a maternal health specialist from the PAHO, the vice director of the Ministry of Health in Suriname, and four gynecologists. One of these gynecologists is chair of the Quality of Care group in Suriname, one is head of the Maternal Mortality Suriname Commission, and two were involved in adjusting the content of the modules to the Surinamese context.

These semi-structured interviews were conducted using an interview guide, based on the adjusted Kirkpatrick Model. The interview guide was expanded after each interview if new relevant concepts or themes emerged. The interviews were exploratory in nature, to

determine the experiences and opinions of the participants and stakeholders regarding the training. They were conducted via WhatsApp calling or Skype and were transcribed and coded with Atlas.ti. Deductive coding was used to examine how the data fits the constructs of the model. If important concepts were identified during the coding process that did not correspond to the concepts of the model, new codes were added to ensure all useful information was captured.

All participants gave verbal informed consent. Ethical approval for the project was granted by the Commission on Research Involving Human Subjects of the Ministry of Health in Suriname. Ethical approval from the Amsterdam UMC was not necessary according to the BETCHIE guidelines, as the research complies with the Code of Ethics for Research involving Human Participants from the Faculty of Science.

## Results

Table 1 and 2 show the baseline characteristics of the participants of the training and the interviews, respectively.

*Table 1. Baseline characteristics of training participants*

Quantitative Data			
Number of participants		36	
Finished Course		12	(33%)
Gender	Male	2	(6%)
	Female	34	(94%)
Profession	Midwives	21	(58%)
	Nurses	4	(11%)
	General Practitioners	11	(31%)
Place of Work	RGD	20	(56%)
	MZ	4	(11%)
	Hospital	11	(31%)
	Other	1	(3%)

*Table 2. Baseline characteristics of interviewees*

Qualitative Data			
Number of interviews		19	
Participants		13	
Finished course at time of interview		6	(46%)
Gender	Male	0	(0%)
	Female	13	(100%)
Profession	Midwives	7	(54%)
	Nurses	2	(15%)
	General Practitioners	4	(31%)
Place of Work	RGD	10	(77%)
	MZ	2	(15%)
	Hospital	1	(8%)
Stakeholders		6	

During the interviews several important themes emerged. These were grouped according to the constructs of the adjusted Kirkpatrick model, as shown in table 3.

Table 2. Themes from interviews structured according to constructs of the Adjusted Training Evaluation Model.

Construct in Adjusted Kirkpatrick's Training Evaluation Model	Themes that emerged from the semi-structured in-depth interviews
1. Level 1 – Reaction	
1.1. Input	Evaluation Kick-Off Workshop Evaluation E-Learning Modules
1.2. Process	Advantages E-Learning Disadvantages E-learning Overall Experience and Support Influencing Factors
2. Level 2 – Learning	Acquired Knowledge
3. Level 3 – Behavior	Willingness to Change Behavior Factors Affecting Ability to Change Behavior
4. Level 4 – Future of Training	Stakeholder perceptions Health professionals' perceptions Influencing Factors

1. *Level 1 – Input*

1.1. Kick-Off Workshop

Participants evaluated the kick-off workshop in terms of content and presentation. The content was considered useful and informative. It helped to clarify what was expected of the participants and what they could expect from this training. *“Yes, I really enjoyed that the kick-off workshop was given. Because we heard so much, but we didn't know what to expect, so it was very good. Everything became clear on how we had to work with it [the modules].”*

– Midwife, RGD, female

The interactive parts of the workshop, including the quiz, were especially enjoyed. The presentations were evaluated as clear, motivating, easy to follow and well-organized. Although some found the presentations a bit lengthy, most agreed that this was necessary and

better than doing it hastily. “At first I thought, the whole day, pff, but it was so interesting that I didn’t even notice the time. So that was very good, yes!”- GP, MZ, female.

The average answers to the questions of the daily evaluation assessing the kick-off workshop can be found in table 4. The only suggestions for improvement included a better internet connection, and possibly another location.

Table 3. Mean likert scale scores for the daily evaluations. 1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly disagree.

	Mean (SD)	N (missing)
<b>Workshop in General</b>		
Content of workshop was new for me	3.78 (1.0)	40 (1)
Content of Workshop relevant for daily work	4.45 (0.60)	40 (1)
Facilitators presented enthusiastically and motivated me	4.50 (0.60)	40 (1)
Facilitators presented in an interactive way	4.48 (0.60)	40 (1)
The workshop was well organized	4.39 (0.63)	41
<b>Introduction Health[e]Foundation</b>		
Was the presentation clear?	4.32 (0.57)	41
Will you use the information from the presentation in daily practice?	4.20 (0.75)	41
<b>Maternal and Neonatal Epidemiology presentation</b>		
Was the presentation clear?	4.21 (0.57)	39 (2)
Will you use the information from the presentation in daily practice?	4.15 (0.75)	39 (2)
<b>Demonstration E-learning course</b>		
Was the demonstration clear?	4.20 (0.60)	41
Do you feel confident to complete the F&F training online, via USB stick or in the mobile app?	4.22 (0.57)	41

## 1.2. E-learning Modules

### 1.2.1. Positive Aspects Modules

The participants described the modules as detailed and informative. It was easy to navigate through the different modules and topics and the information was easy to understand. The sub-quizzes present in the modules were also evaluated positively, as this made it more interactive and fun to learn. It was appreciated that the modules provided evidence-based information and methods, as many had not experienced this during other

trainings or during their education. One of the stakeholders seconded this: *“Because people don’t really have the culture of reading here, they will learn more from evidence-based. Why certain things are done or not done, so that they understand the background. I get the idea that is not really the way they are usually taught here, it is still very school-like”*. The modules enabled participants to stay up to date on recent developments in this field, and they described the modules as a good test of their knowledge on the subjects.

### 1.2.2. Negative Aspects Modules

The main disadvantage was that the modules do not show which posttest answers participants answered incorrectly, they only show the percentage score. This made it harder to improve scores and made participants insecure when applying new knowledge or skills, as they do not know whether they understood certain parts of the modules correctly. Many had to repeat the post-tests many times, often without improving their scores, which was a large source of frustration and demotivated many participants to carry on.

*“I was really struggling to get the 100%, but because I had no idea what I was doing wrong, eventually I just said you know what, I’ll just leave it. I was happy to get above 70%, at some point I was just stressing about my answers”*. – Midwife, RGD, female.

Some participants found the modules too lengthy, with large paragraphs making the content hard to digest. However, most agreed it was necessary. *“I have to say, and I keep saying it, the information is necessary. Some modules took me weeks, but it is worth it. You reach your goal, and the effort and energy you put in is not for nothing, it will definitely pay off”*. – Midwife, rural RGD, female.

### 1.2.3. Relevance for Daily Work

The extent to which the modules were perceived as relevant for daily work varied per profession and geographical location. The GPs working in the coastal area found the modules less relevant as they do not see many pregnant women; they are seen by midwives instead and almost always deliver in the hospital. Therefore, they cannot always apply what they learned. The two GPs who work for the MZ did find the modules relevant. *“I find the subjects very interesting. They really are things that you experience in the field”*. Women often come to see them before going to the hospital, so it is important to recognize dangerous conditions and know when a referral is necessary. They found prenatal care, abnormal births and complications during delivery especially useful. *“If I were to think about having to do a*

*breech delivery in the inland, I wouldn't dare to. But if someone comes in already pushing, and there is no opportunity to transport them to the city, you want to know how to handle correctly”.*

The two nurses found the prenatal care module the most helpful as well. They cannot apply everything in their daily work, as they are usually not present at deliveries as they are usually done in hospitals, not in clinics.

The seven midwives were interviewed found the modules highly relevant for their daily work and suitable for their current level of expertise. However, some midwives found certain protocols in the modules more suitable for the second line of care. *“For example, eclampsia, we do not see it that much. Of course, you have to know how to respond if you get someone like that, but we rarely see it in the first line.”* Others found it especially useful for the first line, as they do not have many tools or gynecologists present like in hospitals. Midwives need to know how to respond immediately, prevent unnecessary referrals to hospitals, and prepare patients for second line care if necessary. Subjects like prenatal care, hypertension and fluxes were considered very important as they are things that occur frequently. According to a midwife who works for the RGD in a district, healthcare workers in the districts require a higher level of training than those who work in the city. *“Midwives who work in the city, under a gynecologist, they have it easier. And those who work at the clinics in the city, too, they can quickly bring people to the hospital. We in the districts, it is more difficult for us. We really need extra training that is similar to a gynecologists' level.”*

#### 1.2.4. Appropriateness for Surinamese Context

There was some disagreement about the extent to which the modules are appropriate for the Surinamese context. While most participants agree that the modules have mostly been well adjusted to the local protocols and guidelines, some thought the content was not always applicable in the local context. This made it hard to answer the case-based questions.

For example, the protocol for abnormal presentations of the child differs, as in Suriname they would plan for a C-section, while the module provides information on how to turn the child into the correct position. *“I asked the gynecologist once why they immediately plan a C-section. He said they don't take that chance in Suriname, because they have experienced situations in the past where a uterus rupture occurred, or the baby died. But then I wonder how they do it in the Netherlands, and why we cannot do it that way here.”* – Midwife, RGD, female. Another example is the start-up dosage of magnesium used to treat

hypertension. The stakeholders considered it very important that the content matched the national protocols.

#### 1.2.5. Suggestions for Improvement

The following subjects were proposed as possible additions to the modules: managing emotions, family planning, anemia and the use of ‘pimba’ in Suriname, breastfeeding and postnatal depression. One stakeholder advocated for a more holistic approach being taken in the modules. The theory included in the modules is purely medical, and the modules may benefit from more contextual information, such as what to do if there is an emergency and you cannot reach a hospital in time, or how to reach women who come in far too late for prenatal care.

Several participants wanted additional options for online communication between participants to be incorporated into the online learning system, so facilitate discussion about the theory and cases. Another suggestion that was made often is to change the post-test so that it informs the participant about what answers are correct or incorrect, either after completing the module or at the end of the training period. Finally, it was suggested that the modules give an indication of the time it takes to complete a module prior to starting it.

## 2. *Level 1 – Process*

### 2.1. Advantages E-learning

The most frequently mentioned advantage of e-learning as compared to other training methods is that it can be completed in participants’ own time, at their own pace. Being able to go back and read the information at any time to refresh their knowledge was seen as a benefit as well. Some participants indicated that they have irregular, demanding jobs and family obligations, and that the mobile application allows them to work on the modules whenever they have a free moment, as they always have their phones with them. *“I had to take my mother to the doctor, and while we were in the waiting room, I was just sitting and reading the modules, it was actually nice to spend the time reading all the information”*. – Midwife, RGD, female.

Additionally, participants appreciated that it is far less costly, as they do not have to travel to training locations or take days off, which is especially beneficial for those living in rural districts.

This study was conducted during the COVID-19 pandemic, and many participants and stakeholders highlighted that online learning is especially useful in this situation as it provides a way to continue with trainings for health workers without any health risk.

*“I think seeing the COVID situation, e-learning and the capacity of e-learning should only be strengthened! (...) It should always be a complementary option to face-to-face [learning].”* – Stakeholder, gynecologist, male.

*“Also, in these times with the corona virus, I feel safer following my trainings from home than coming together in a group.”* – Midwife, RGD, female.

## 2.2. Disadvantages E-learning

One main disadvantage is motivation, according to stakeholders and participants. Freedom to complete the modules at your own pace often leads to procrastination. *“When you organize a seminar or symposium, you know that there is a beginning and an end, but completing the modules requires a lot of discipline and planning”.*

Another disadvantage is the difficulty of exchange and interaction. Questions are not asked as easily and not responded to as quickly, and it is not possible to learn from each other and correct or motivate each other during the training. *“The physical, practical trainings are very important. We see that they correct and observe each other, give input for evaluations, have good suggestions for each other, and there is a lot of interaction also between the different institutions.”* – PAHO, female.

Related to this is that many topics in this field require demonstrations and practical training sessions. *“I have had the theory, but theory and practice are two things. So even if I have learned how to turn a baby that is in a breech position, I have never learned how to do it myself, have never practiced it, and I will never do it. I will just call an ambulance and bring her to the hospital, and if she doesn't reach the hospital I will just do the breach delivery.”* Midwife, rural RGD, female.

## 2.3. Overall experience and support

Most of the participants were happy to have followed the training and reflected positively upon the experience. Most of the midwives and nurses chose to participate in order to stay up to date on developments in the field, to be able to treat their clients in the best possible way. Those who work in the inland hoped the training would make them less dependent on the hospitals for support.

All participants would recommend the training to their colleagues. They appreciated the frequent support from the Health[e]Foundations through the group chats. Several discussed the modules with each other at work, but many preferred to work alone as they did not want to depend on others for help or because they wanted to test themselves and their level of knowledge. Many of the participants would like more opportunities for exchange to be created for them.

The stakeholders' main concern during the process of development and implementation was that the content of the modules needed to be verified by all gynecologists to ensure that it reflects their local and national practices. The gynecologists found it most important that the midwives learn about their methods rather than learning new methods or skills.

#### 2.4. Influencing Factors

Several individual and contextual factors played a role in how the participants reacted to the input and the process of the training. Participants with previous experience with trainings or e-learning were more open and eager to participate compared to those without experience. Participants who had busy personal and work lives admitted that this training did not always have priority and struggled to find the time to complete the modules. Some participants struggled to successfully complete some of the posttests and depending on their own level of intrinsic motivation, this either motivated them to keep trying or worked as very demotivating. *“Well I’m not sure [if I will continue] because I am a little demotivated, well not a little, a lot actually, I am someone who likes to persevere and if I see that on the 5<sup>th</sup> try it doesn’t work, I think that’s just where it ends for me.”* – Nurse, hospital, female.

Contextual factors such as place of living and function also had an influence, as this influenced the relevance of the training for the participants.

### 3. Level 2 - Learning

#### 3.1. Acquired knowledge

All participants felt they learned something from the training. The training served mostly as a refresher, with several new topics or more in-depth information on certain topics.

To see whether knowledge of the participants actually improved for each of the five modules, the pre- and posttest scores were compared. The Wilcoxon signed rank test showed that for each module, the participants scored significantly higher on the posttests than on the

pretests ( $Z = -2.874, p = 0.004$ ;  $Z = -4.437, p < 0.001$ ;  $Z = -4.554, p < 0.001$ ;  $Z = -4.224, p < 0.001$ ;  $Z = -4.158, p < 0.001$ , for modules 1-5 respectively). Figure 3 shows the mean scores on the pre- and posttests for each of the modules. On average, the participants improved their scores with 17.9 points out of 100 ( $N = 32, SD = 7.77$ ), which is an increase of 32.1% compared to the average pre-test scores.

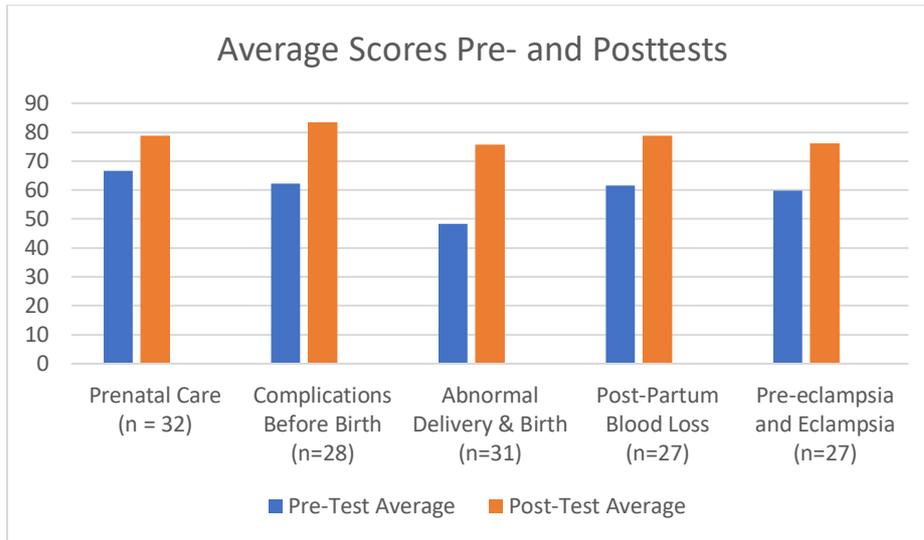


Figure 2. Bar chart of mean pre- and posttest scores for modules 1-5.

Of all participants, midwives scored highest on both pre- and posttests, followed by GPs and nurses (figure 4). GPs showed greatest improvements in score. A Wilcoxon signed rank test indicated that the difference in pre- and posttest scores was significant for midwives ( $n = 18, p < 0.001, Z = -3.682$ ) and GPs ( $n = 10, p = 0.005, Z = -2.803$ ), but not for nurses ( $n = 4, p = 0.068, Z = -1.826$ ).

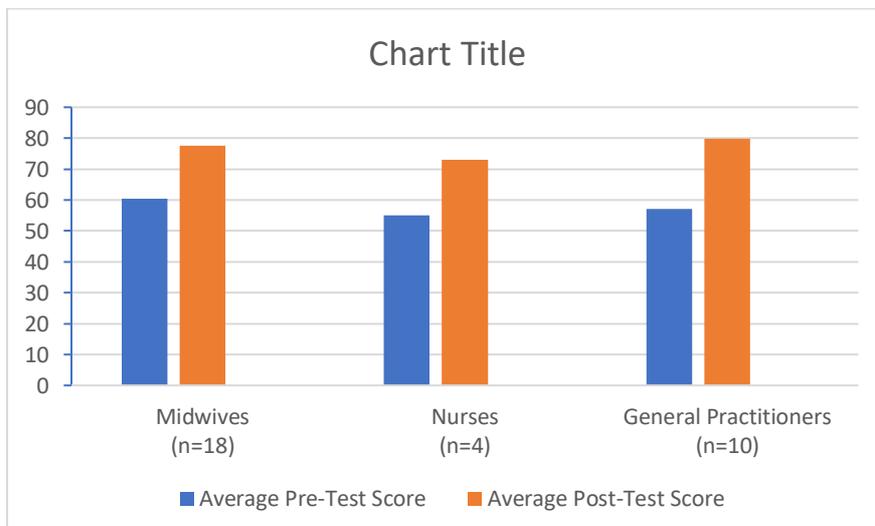


Figure 3. Bar chart showing the average scores and the increase in scores of all modules per profession.

On average, healthcare workers who are employed by the RGD had the highest level of knowledge before starting the training, followed by employees of the hospitals and those who work for the Medische Zending (figure 5). The posttest scores of employees of the Medische Zending were highest. These participants also had the highest increase in average score. A Wilcoxon signed rank test indicated that the differences between the pre- and posttest scores were significant for the RGD (n= 18,  $p < 0.001$ ,  $Z = -3.725$ ) and hospitals (n=9,  $p = 0.011$ ,  $Z = -2.547$ ) but not for the MZ (n=4,  $p = 0.68$ ,  $Z = -1.826$ ).

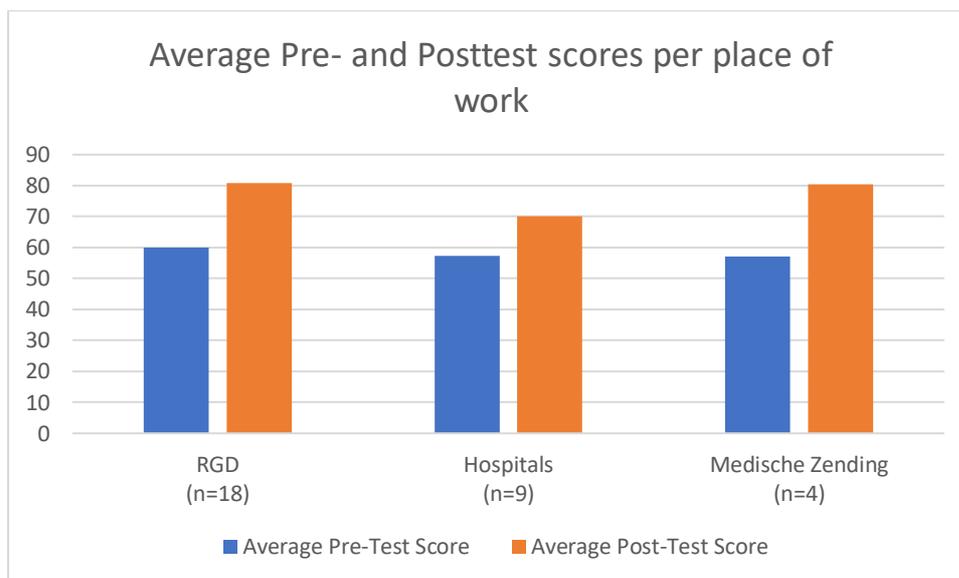


Figure 4. Bar chart to show the average pre- and posttest scores per place of work

#### 4. Level 3 – Behavior

##### 4.1. Willingness to Change Behavior

Several midwives indicated that they already apply knowledge they acquired.

*“Especially with the prenatal care, to really be aware of when women need to come in for a check-up or echo, the medication they have. So I apply it already, because some things really were overlooked, or were seen too late.”* – GP, MZ, female.

Participants were curious to see how new knowledge could be applied in daily practice. Several midwives had already discussed what changes could be applied at their workplace with their superiors.

##### 4.2. Factors Influencing Ability to Change Behavior

Several factors influenced the ability of participants to change their behavior and apply what they learned.

#### 4.2.1. Availability of Supplies

Lack of supplies was a barrier to implementing changes, especially in the districts and health clinics. Procedures like assisted deliveries cannot be done in some clinics, as they only have supplies to stabilize and transport patients. Other examples include a lack of tools for measuring blood loss with fluxes, a lack of IV fluid, not being able to make cardiotocography's or treat sepsis or a severe bleeding, and a lack of personnel. The modules did suggest various alternative supplies that could be used in certain cases, and midwives and nurses are used to improvising, enabling them to carry out procedures despite the lack of supplies.

#### 4.2.2. Difference Theory & Practice

Participants indicated that the theory and methods in the modules are correct, but that actual procedures and methods can differ in practice. *"I noticed that the midwives themselves have different experiences because they really work in practice, and they have to adjust certain things or do things differently, because in practice it works a bit different."* – GP, MZ, female. Midwives and nurses often use their experience and intuition, instead of always adhering to protocols in every situation.

#### 4.2.3. Support from Workplace

Several midwives felt frustrated that they could not apply new knowledge or methods because the GP or gynecologist who supervises them uses a different method. *"I told him the other day, I said doctor I followed a training, and pregnant women should not get Adalat during their pregnancy, it should be used only after the women has given birth. You should give Aldomet. But then he was just like, ah, that's just theory. In practice that's perfectly fine. And I cannot say anything about it, so I just left it."* – Midwife, rural RGD, female.

Other midwives who work independently in clinics did feel that they had some freedom to implement change or at least discuss possible changes with their superiors. However, the final decision and responsibility always lies with the gynecologist or doctor. *"I can tell him what I think and how I see it, but I cannot bend his policies. I have to follow his policies, whether I agree or not."* Therefore, participants would like them to follow the same training, or for everyone to use the same protocols.

#### 4.2.4. Uniformity

A major barrier to implementing change is a lack of uniformity across various domains; between the 1<sup>st</sup> line and the 2<sup>nd</sup> line of care, between different hospitals, between the district clinics and the coastal clinics, and amongst gynecologists and doctors themselves.

Gynecologists of different hospitals adhere to different guidelines, and often use their own judgment which makes it hard for nurses and midwives to stick to protocols. *“In all 5 hospitals there are different gynecologists, and they all have their own policy. And unfortunately, these protocols are not on paper. So really, we work from memory, we know this gynecologist adheres to these guidelines, so with this patient we do it this way.”* – Nurse, hospital, female.

This also causes additional delays in the system. *“Now with the COVID situation, nurses and midwives are being loaned out from one hospital to another. We should not have to be trained to work in a new hospital, to see how they work there. There should just be uniformity so that people can just go and help.”*

Additionally, methods used can differ per hospital or clinic and therefore midwives in the first line cannot always apply new methods because patients are eventually transferred to the 2<sup>nd</sup> line of care, where such methods are not used. An additional problem is that many Cuban doctors work in Suriname to reduce the shortage of healthcare workers, and not all Cuban doctors are aware of the Surinamese protocols.

The gynecologists do think that there is uniformity. *“Yes, they [methods used] are totally the same. Because we were present at the protocol meetings, all of us. We went to the workgroups, everyone gave their opinion, and the protocols that are not live yet, but that we all know a lot about, they are the same. We do not differ at all.”* Some said there might be a minimal difference, but that the essence of what they do when, is the same everywhere. They also deemed it very important that the midwives adhered to their methods. *“The training they receive needs to be congruent with what we do, you see. It cannot, it may not deviate, and that’s why all of us [gynecologists] have read it and adjusted it.”*

#### 5. Level 4 – Future

Stakeholders as well as the end-users of the training were asked about how they saw the future of this training and how the impact can be increased.

### 5.1. Stakeholder Perceptions

According to stakeholders the training should be formalized and institutionalized to increase the sustainability. They agreed that a blended e-learning project like the F&F training has more potential for sustainability than other projects, because the online platform remains accessible even after the project ends.

Several stakeholders suggested making the training compulsory and coupling accreditation points to it. However, making the training compulsory may bring complications with it, as it may not be possible for those in very remote areas to participate due to lack of internet access or transport to the city.

Additionally, the training should be expanded to include more simulation and skills trainings for subjects like emergency obstetrical care, in combination with the e-learning modules. This would make the training more dynamic, and face-to-face trainings will likely motivate participants to complete the modules in time, according to several stakeholders.

Stakeholders recommend offering different modules to different types of maternal health care workers. *“Everyone requires a different level of training. You cannot give one training to different groups, so you would have to adjust that. But that is a huge task.”* – Stakeholder, PAHO. Currently, the modules include information for both the 1<sup>st</sup> and 2<sup>nd</sup> line of care, making parts of the training unnecessary for different types of healthcare workers. The modules are considered too detailed for GPs, which may cause them to quit due to lack of time or interest. One stakeholder who had previously organized similar trainings suggested having joint kick-off and follow-up sessions for all participants with more thematic content and adjusting the e-learning modules to the different functions and levels.

### 5.2. Health professionals' Perceptions

According to the midwives the same training can be offered to all participants. Only nurses may require a different training, as they are not familiar with the in-depth material and the medical terminology in the modules. One GP thought the training was suitable to include in the medical study program, because it is too elaborate for a refresher training. Otherwise, it was suggested that the modules could be offered as separate trainings, so that GPs can choose which subject they want to refresh. Another GP said that the training should be offered as the full package to private GPs, as they often do deliveries and check-ups themselves and need to know all the theory.

### 5.3. Suggestions for Increasing Impact

The main suggestion for increasing impact was that all maternal healthcare professionals should follow this training, so everyone is on the same page regarding protocols, leading to more uniformity and a higher quality of care. It was also suggested that participants should be invited as groups per hospital, including all gynecologists, nurses and midwives. That way, they can review the protocols and discuss how to implement them at their place of work.

Additionally, the subjects included should be discussed with different healthcare professionals beforehand, to ensure that they focus on subjects where the biggest impact can be made. Audits can help to determine what the main causes of maternal mortality in Suriname are. This should be done in collaboration with the Quality of Care group as well as the educational organizations. Several stakeholders highlighted the importance of a multisectoral approach. The developments in the field should be actively monitored, so the modules should be updated with new protocols when necessary.

### 5.4. Influencing Factors

A large barrier to implementing changes is the political and social system in Suriname. The high rates of maternal mortality are largely attributable to delays in the system. It is difficult to get women from districts to hospitals in time, and in hospitals the organizational system causes a lot of unnecessary delay as well. *“The whole health sector needs to be organized differently. The trainings are good, but we need structural adjustments in the healthcare sector, in order to really reduce the number of mother and child mortalities.”* – Midwife, rural RGD, female.

There is a lack of coordination for initiatives to improve the quality of care, and therefore many projects work parallel to each other instead of with each other. Most of the functions that coordinate such projects are voluntary, and therefore it is not prioritized. *“In Suriname it is very difficult to get everyone to look in the same direction. It sounds easy, but it is very difficult, because everyone has their own agenda (...)”* In recent years many commissions have been set up, but they need to be strengthened.

Additionally, gynecologists often view new initiatives as a threat to their authority and do not always appreciate it when the current healthcare system receives criticism from outside. *“You see that with audits as well, they [gynecologists] find those disconcerting, they*

*don't want to air their dirty laundry, while the midwives feel that need far more, as they are closer to the patient and want to do well.*" – Stakeholder, male.

This makes it difficult to improve the quality of care, as the gynecologists often educate and instruct the midwives and the nurses. If they are not willing to make adjustments, it is unlikely that others can. *"We see that when midwives are made aware of new developments, new technologies, a certain frustration arises because they cannot implement everything. Due to the lack of supplies, the lack of opportunities to take initiative, and there are people who are potentially very able, but there is a heavy hierarchical structure among the nurses and midwives, making it difficult for initiatives to be carried out."* – Stakeholder, female.

## **Discussion**

### *Main Findings*

This study evaluated the F&F training, using the adjusted Kirkpatrick's model to answer the research questions.

The first level of the model evaluates the reaction of the participants and stakeholders to 'input' and 'process' of the training. The participants were satisfied with kick-off workshop and e-learning modules. The main advantages of blended learning mentioned support what was found in the literature.<sup>21</sup> A benefit not found in the literature, related to the current global COVID-19 pandemic, is that blended e-learning facilitates following large parts of trainings at a distance. This allows health professionals to continue their training even when it is not possible to organize seminars or workshops.

The relevance of the modules for daily work differed per participant. Although informative, the content of the modules was not always relevant for daily practice, which negatively affected motivation in some cases. This supports the literature on this topic, which identifies relevance as particularly predictive of adult learners' decisions to drop or persist in online learning.<sup>29</sup> Location and profession seem important indicators of whether information was found relevant as well. It was hypothesized that urban Suriname was the most suitable location for this training, but this evaluation shows that it may be equally or more suitable for participants from rural in Suriname. The training might therefore also benefit from providing a more 'holistic' approach to care in the modules.

It was expected that 'blended' learning as opposed to fully online learning would help motivate and engage the participants, as the main disadvantage of e-learning is that learners

may feel isolated.<sup>21,22</sup> Results indicate that although these moments of interaction are indeed essential, most participants desire more opportunities for engagement and discussion with the other participants, also throughout the 3-month e-learning period.

The second level assessed knowledge gain. The level of knowledge of participants increased as a result of this training, as expected. Participants scored the lowest on the ‘abnormal delivery and birth’ module. This may reflect that the content of this module was not fully adjusted to the Surinamese context according to the participants, as many abnormal deliveries are not carried out in practice. The highest posttests scores were for ‘complications before birth’, and this is also where the biggest increase in average test scores was seen. This module was considered especially helpful, as it is important to know when to refer patients and what warning signs to look out for.

Midwives had the highest pre- and posttest scores, followed by GPs and nurses. This is likely because the training was considered most relevant by the midwives, as they deal with the content of the modules every day. Nurses and GPs are not as specialized for maternal healthcare. Nurses may have lower scores because they receive a lower level of education. Employees of the RGD generally scored higher than those from the MZ and hospitals, possibly because they are the most involved in first line care. This also reflects the fact that most maternal and neonatal deaths in Suriname occur in urban hospitals due to substandard care factors.<sup>10</sup>

The third level evaluates realized or expected behavior changes after the training. Although most participants were eager to learn and apply new knowledge to improve the quality of care, many persistent structural barriers limit their ability to do so. Due to the strong hierarchical structure present within the Surinamese healthcare system, nurses and midwives were most affected by these barriers. The last two factors of the three-delay-model seem most affected.<sup>16</sup> Delays in the identification of and transport to a medical facility are, besides inadequate knowledge of health professionals, often a result of large distances between care facilities in Suriname and a lack of political will to change existing structures. Delays in receiving adequate and appropriate treatment are at least partially due to a lack of uniformity, a lack of organizational structure within hospitals, a lack of materials and the strong hierarchical structure in the Surinamese healthcare system. These barriers limit the impact the F&F training can have in Suriname. It is therefore important to involve stakeholders and get maternal health issues on the political agenda as well instead of focusing only on increasing knowledge and skills.

The fourth and final level of the adjusted Kirkpatrick model evaluates the possible future of this training in Suriname. Related to the third level, it is important to ensure that a multi-sectoral approach is taken when scaling up, to increase sustainability and political awareness and interest. Suggestions were made to make the training mandatory or to implement it into the educational programs for nurses, midwives or GPs. A major disadvantage is currently that participation is on a voluntary basis. According to the literature, voluntary trainings often exclude those who needs the training the most, as those who are most motivated are most likely to participate.<sup>30</sup> Another suggestion to increase motivation to participate was to give accreditation points upon completion. Additionally, although the training was well-received by nurses, GPs and midwives, most participants agreed that it might be better to provide separate trainings for each type of maternal healthcare worker, so the content can be adjusted to their level of expertise and their daily work. Despite several structural and organizational barriers, most interviewees were certain the training would contribute to a reduction of the maternal and neonatal mortality and morbidity rates.

### *Strengths and Limitations*

A major strength of this study is that a large percentage (36,1%) of the participants of the training were interviewed. The subset of interviewed participants represented the total study population well in terms of profession and place of work (table 1 and 2), making results more generalizable. A mixed-methods approach was taken, allowing the quantitative results to support the qualitative results for level 1 and 2 of the evaluation model. Another strength is the transdisciplinary approach that was taken. Involving stakeholders and end-users of the training leads to a more comprehensive evaluation and provides opportunities for improving the training and increasing its impact. It also enabled thorough reflection on the context in which the training was introduced, to identify the underlying factors affecting the impact this training can have.

A main limitation of this evaluation is that not all participants had finished the training at the time of evaluation, due to the corona crisis or personal reasons. This produced incomplete data but did provide the opportunity to ask why participants dropped out or became demotivated. Due to COVID-19, the follow-up workshop had to be postponed and could not be evaluated, and some interviews were shorter than planned or had to be cancelled. Another limitation is that interviews were voluntary and convenience sampling was used to select participants. Those who felt less engaged with the training may not have responded to the invitation. Additionally, only participants of the training were interviewed,

but it may also be important to understand why certain groups did not sign up. Furthermore, many key stakeholders did not respond to the invitation, and important opinions and perspectives may have been missed. No controlled design was used, so causality between the training and increased knowledge or skills cannot be determined.

### *Reflection on Model*

The Kirkpatrick Model has proven to be a useful model to evaluate the F&F training. Although several adjustments had to be made to incorporate a transdisciplinary approach and make it suitable for a mid- rather than end-term evaluation, the model helps to structure the interviews and results and allows for new concepts or themes to emerge from the data without being too restrictive. Adding ‘influencing factors’ to the model enabled an evaluation of the training in light of the Surinamese context, rather than just evaluating the training itself. The model is useful because it systematically evaluates many aspects of a training, which all contribute to the overall evaluation.

### *Suggestions and Recommendations*

Once this project finishes, future research should focus on assessing whether or not the maternal and neonatal mortality and morbidity rates actually decline. Whereas this evaluation study looks at the training itself and how it can contribute to this end goal, it does not quantitatively measure whether training has an impact on these figures.

Additionally, it would be interesting to see whether in the future this training actually impacts the behavior of the healthcare workers, and whether changes last over time. More research should be done into the other causes of high mortality and morbidity ratios. This research revealed many institutional and structural barriers to improving the quality of care in a sustainable way. These should be addressed in order to improve the sustainability of this project.

Besides this, it would be interesting to look at the population of healthcare workers who did not join the training by the end of the project period. As the stakeholders indicated, it is likely that these are the ones who need additional training the most.

Based on the results of this evaluation, it is recommended that future blended e-learning trainings should place more emphasis on the practical skills that are required, as these are important and cannot always be replaced by online trainings. Additionally, more regular and organized opportunities for interaction should be offered as part of the training, to

allow participants to discuss and exchange knowledge and ideas even during the e-learning period. Additionally, the content of the training should be thoroughly discussed with the stakeholders and the end-users before developing it, to ensure it matches the needs of the target population as closely as possible.

## **Conclusion**

This evaluation study took a transdisciplinary approach, by involving the end-users of the training as well as the stakeholders in the evaluation. The evaluation has shown that the training is generally well-received by the participants and that it contributes significantly to knowledge acquisition. The participants are eager to learn and to apply their new knowledge in practice, but this is sometimes complicated by recurring structural and institutional barriers, such as a lack of uniformity in the healthcare system, a strong hierarchy among healthcare workers, and lack of government support and structure which limits sustainability. Several suggestions were made to adapt and improve the training in the future, to increase its impact on maternal and neonatal mortality and morbidity ratios.

Because it is a mid-term evaluation, this study cannot quantitatively determine the impact of the F&F training on maternal and neonatal mortality and morbidity in Suriname. However, the results do describe in what manner the training can contribute, now and in the future, to improved health outcomes and improved quality of care, what factors facilitate or complicate this, and how its impact can be increased.

The information provided by the interviewees in this evaluation provides an insight into how the participants experience the training and involving them in the research process provides new perspectives and ideas on how the training can be improved for future participants. The stakeholder interviews provided an awareness of how this training functions within the larger Surinamese context, and what is necessary to increase sustainability and impact of the training. Overall, this study provides useful information on how e-learning technologies such as the F&F training can contribute to improved quality of care for mother and child by providing additional education for maternal healthcare workers. The results of this study can therefore also inform other providers of e-learning technologies about the advantages and disadvantages of e-learning and the barriers and facilitators to uptake of the information in the modules, providing them with additional input for developing technologies. It thereby contributes to the growing body of literature on e-health and the global efforts to increase the quality of care in LMICs.

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