



Accelerating Women-centered Local Action and Increasing Impact to Stop Preventable Maternal & Newborn Deaths in Low- and Middle -Income Countries: Case-study in Senegal

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Abstract: There is an urgent need for improvements in maternal and newborn health despite the efforts of numerous stakeholders and the adoption of specific targets as in the Sustainable Development Goals. In 2018, using an evidence-based and design-thinking approach involving communities, three stakeholders (a foundation, an NGO, and a startup) decided to combine their expertise to better understand and potentially revisit the drivers for improving maternal and newborn health. The AIM – Accelerated Impact Model - has been designed as a systemic, needs-led innovation framework for improving maternal and newborn health in low and middle-income countries. The AIM is currently being tested to assess its real-world impact in the Saint-Louis region of Senegal. This paper aims to explain the rationale and methodology for designing this innovative model, as well as presenting hypotheses concerning its impact. This novel, integrated approach is associated with community empowerment and accompanied by “glocal” experts and organizations. It represents the backbone of the AIM method. The first step of the AIM application was the pre-pilot phase, as the population itself identified the health and medical-social barriers contributing to maternal and newborn mortality together with the corresponding corrective measures. The second step integrated co-created projects into a three-pillar program centered on awareness of community engagement, optimizing the attractiveness of the health pyramid base, and the empowerment of women. To test the sustainability of the model, the third step of the AIM approach resulted in the creation of a local pilot team to accelerate the implementation of new co-created projects and optimize existing initiatives supported by local and global sponsors. Over the course of one month, the newly formed “Rawal ak Diam” platform transformed the COVID-19 epidemic into an opportunity to mobilize the community and connect with the authorities. This step was crucial for gaining legitimation for the platform and helped design and implement a

three-pillar program. The community program focus here is on the two first deadlines (the decision to request help and access care) in maternal health while remaining aligned with the Sustainable Development Goal of reducing maternal and neonatal mortality in low- and middle-income countries.

Keywords: Maternal Health, Design Thinking, Ethnography, Community, Empowerment, Evidence Based, Low- and Middle-Income Countries, Determinants of Health

1. Introduction

From 2000 to 2017, the global maternal mortality ratio declined by 38 per cent. Yet each year, around 300,000 mothers still die from pregnancy-related complications [1, 2]. Most of these complications developed during pregnancy and labor are preventable or treatable. Other complications may exist before pregnancy but get worse during pregnancy, especially if they are not managed as part of women's care agendas. Poor women in remote areas are the least likely to receive adequate healthcare. This is especially true for regions with low numbers of skilled health workers, such as sub-Saharan Africa and South Asia, in settings with sub-optimally efficient health systems [3].

In addition, although remarkable progress has been made in recent decades in reducing the number of infant deaths worldwide, the decline in neonatal mortality rates has been slower [4, 5]. Moreover, 2.5 million stillbirths occur each year, and 2.7 million newborns die during the first 28 days of life, including two million in the first week. Most deaths among newborns result from sub-optimal maternal health and poor nutritional status, combined with inadequate care before, during, and after delivery.

If the world community wants to end preventable deaths among women and newborns together with stillbirths by 2030, it is vital to accelerate the impact of maternal and newborn health programs, especially in French-speaking Africa [6].

Philanthropy has played a prominent role in addressing critical health concerns in developing countries. With contributions of USD 12.6 billion between 2013 and 2015, foundations ranked third among the leading sources of funding for health and reproductive health, just behind the United States and the Global Fund to Fight AIDS, Tuberculosis and Malaria [7, 8]. Despite the efforts of many stakeholders and the adoption of specific targets, first in the Millennium Development Goals and now in the Sustainable Development Goals, there is a continuing urgent need for effective maternal and newborn health initiatives [9].

Over the 2010-2020 period, the Sanofi Espoir Foundation supported 33 projects in 24 low- and middle-income countries. The projects focused on improving the training of midwives (basic- and continuous-training) as well as developing digital technology for midwifery. A total of 66 million women were monitored including 1.17 million pregnant women, and 11,494 health workers were trained [10].

While capacity building for nurses and midwives is universally recognized as a key factor for improving maternal health, an excessive focus on this single determinant has

tended to limit the impact of the Foundation's programs dedicated to lowering the maternal and newborn mortality ratio in these settings.

Despite the WHO declaration in 2009 on promoting action on health determinants to reduce health inequalities, interventions often remain focused on creating either medical solutions or solutions that are delivered after people get sick, which is too late in the process [11-13]. Social health factors act as a powerful force against progress in health. Even the most advanced medical interventions are rendered ineffective when people struggle with social isolation, low income, poor nutrition, pollution, lack of access to clean water, education, and transportation, or if they develop low levels of acceptance or compliance with regard to the proposed intervention. This has a major impact on health topics, which form part of a complex social concern such as maternal and newborn health. Barriers to positive, safe pregnancy experiences must be identified and addressed at both the health system and societal levels. [14]

Besides the social factors influencing maternal health, the multiplicity of maternal health interventions at global and local levels, combined with poor or insufficient connections between communities and health authorities, have had the effect of widening the gap between maternal health needs and appropriate responses to them. This top-down approach tends to limit their impact, as both the community and the women themselves are only rarely considered as both healthcare recipients and promoters of care intervention.

It is mandatory that these beneficiaries are included, together with better knowledge of the ecosystems in which they live so as to create truly relevant, field-adapted sustainable solutions. These in turn should be processed using structured management principles adapted to local constraints in order to offer efficient and sustainable improvements in the overall access to healthcare.

In 2018, the decision was taken to revisit the Foundation's maternal health intervention strategy: the aim was to break down silos, create complementary partnerships, and understand and assess the needs, ecosystem and beneficiaries together with their constraints and abilities, with the ultimate aim of deploying and optimizing direct and indirect high-impact actions in the field of maternal health in low- and middle-income countries.

An ability to understand the context may be the key missing component in the wider application of a health determinant-based approach. The impact of each determinant is specific to each context and is performed by applying innovative methodologies such as design thinking or an agile approach fueled and finely-tuned to each field

[15-17].

2. Method

2.1. Saint-Louis in Senegal as a Case-study

Among French-speaking African countries, Senegal is classified as a lower-middle income country but is still far from achieving the sustainable development goal, with a ratio of 315 maternal deaths for 100,000 births [2] and a neonatal death ratio of 21 for 1,000 births [1].

The country hosts the African Center of Excellence in Maternal and Infant Health (CEA-SAMEF) in the University of Cheikh Anta Diop of Dakar. This is one reason that makes Senegal a suitable model for developing a new approach.

In addition, the government of Senegal has created the “Badiene Gox (BG) initiative”, a specifically Senegalese approach that is part of an integrated community system fighting against maternal and neonatal mortality. BGs are women with leadership qualities who can help move forward awareness about maternal health by acting at the level of “health huts” [18].

These interventions operate in tandem with the Senegalese National Strategy for Gender Equality and Equity developed with the support of the UN Women Senegal Program Presence and are aligned with the Senegal Emerging Plan which aims to eliminate gender inequalities [19]. Senegal is seen as a pioneering example of women’s inclusiveness in African society and of the community’s role in maternal health intervention design.

The team decided to focus on the Saint-Louis department of Senegal because it could offer three different yet accessible terrains (urban area, semi-urban area, and rural area), along with universities and an incubator to provide an optimal context for proof of concept, implementation, and sustainability.

2.2. AIM, Accelerated Impact Model

When reflecting on which social projects to support, the usual approach is to begin with what organizations can bring to the table, their capacity to deliver, and hence their estimated impacts. This project aims at shifting this paradigm. It starts by defining and measuring the impact beforehand. By starting with identifying the local impact and how to maximize it, the next step becomes to reflect on how best achieving that impact. The AIM, Accelerated Impact Model, has been developed to help actors navigate effectively in complex environments and accelerate the impact of their decisions, as the name suggests.

The complementarity of the original team’s expertise and its networking power were key when launching this innovative women-centric action, yet also for ensuring stakeholder engagement as a whole:

- a. a foundation serving a vision via an international network combined with maternal health expertise in low- and middle-income countries,
- b. an international NGO known for its maternal healthcare

interventions, especially in Senegal, enabled by the existence of a local network,

- c. A start-up implementing an innovative, user-centered methodology.

The NGO played a critical role in co-creating care action prototypes in underserved healthcare settings, in ensuring the mutual acceptance of the project between global and local stakeholders, installing trust, and building empathy. The NGO’s experience in care intervention design helped fine-tuning the explorations driven by design thinking. It also facilitated the understanding and adoption by authorities and communities in the Saint-Louis region of the innovative design thinking methodologies inspired by the start-up ethos. It was critical for this innovative project to be able to benefit from such a “cultural translator” that enabled the joint definition of a common value proposition and the co-creation of a shared roadmap involving local authorities and communities.

The AIM is grounded in a combination of different approaches, including Design Thinking, Agile, Lean Start-Up and Digital expertise, all adapted to local circumstances [17, 20, 21, 22, 23, 24]. While the combination of the above approaches has proved its value in various domains such as Operations, Human Resources; and Healthcare in India [25], this was the first time these methods were used in Africa in the philanthropic field and applied to maternal and neonatal health.

The team had no pre-existing hypothesis before it began to meet a wide range of stakeholders and explore ideas with them. Using a comparative approach, they studied the urban areas of Saint-Louis (Pikine, Guet’Ndar, Diamaguene), as well as suburban (Ngallele, Gandon, Mpal) and rural areas (Rao and its surrounding villages). In each area, experts interviewed and observed women and their families, health professionals, community leaders, and representatives of non-profits in order to gather insights from every viewpoint. These qualitative ethnographic data were enriched with extensive quantitative data research on Saint-Louis in order to begin identifying the “root causes” of maternal and newborn health challenges in the data collected.

This pilot approach involved an end-to-end mobilization of the women and their community and worked actively to bring together global and local issues in order to fight silo-induced problems.

2.3. AIM Immersion and Mapping Phases for Maternal and Newborn Health

The pre-pilot started in 2018 with the first phase of the AIM - Accelerated Impact Model - dedicated to understanding local ecosystems in Saint-Louis as represented in Figure 1. The Saint-Louis region has three hospitals (1 hospital/319,201 inhabitants), seven health centers (1/ 136,800 inhabitants), 111 health posts (1/8,950 inhabitants), and 177 dispensaries. Beside physicians (nine general practitioners, 49 specialists) and a pharmacist specializing in medical biology, healthcare professionals mainly cover midwives (92), nurses (49), and nursing auxiliaries (86). It is important to note that the number

of midwives increased by 35% between 2014 and 2015. In addition, the region currently numbers nearly 1,000 associations involved in such diverse areas as health,

agriculture, education, and promoting citizenship rights, demonstrating both the existence of a local dynamic and a certain degree of complexity.

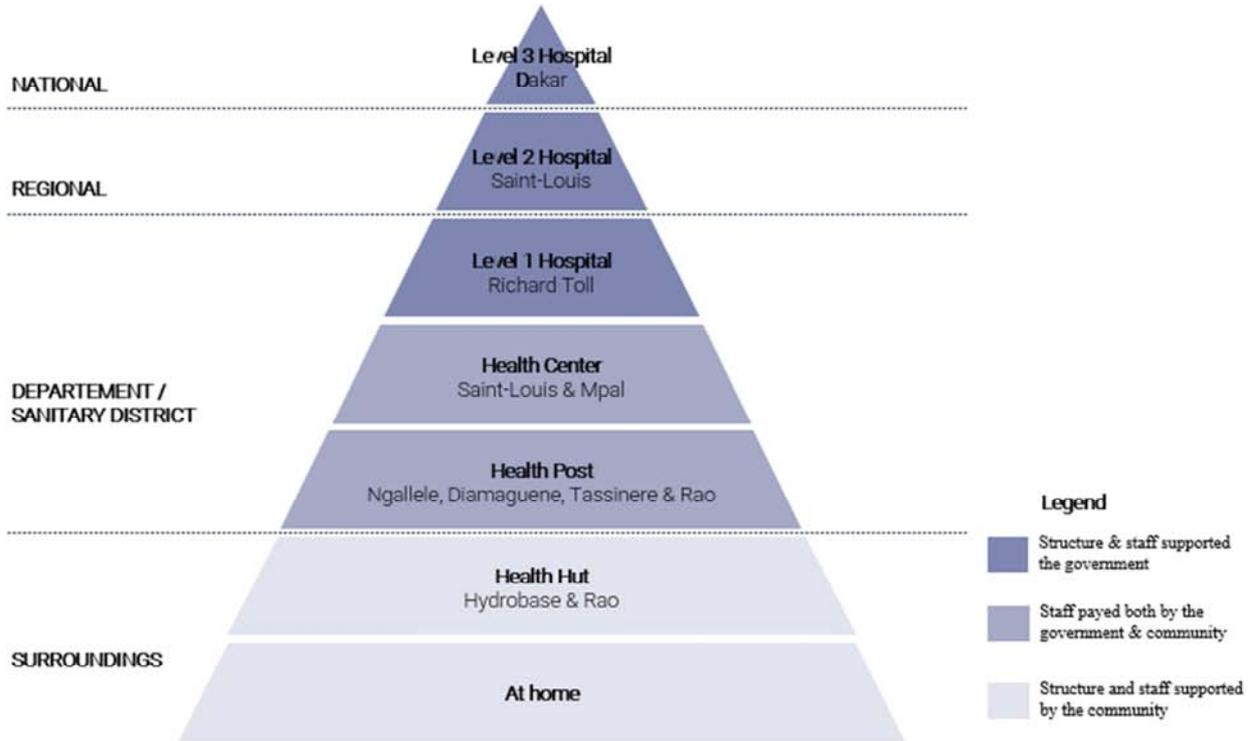


Figure 1. The influence pyramid of the sanitary ecosystem in Saint-Louis.

There are four main co-existing layers according to the referring system: national, regional, district, and peripheral. These various strata are supported by the state and/or community.



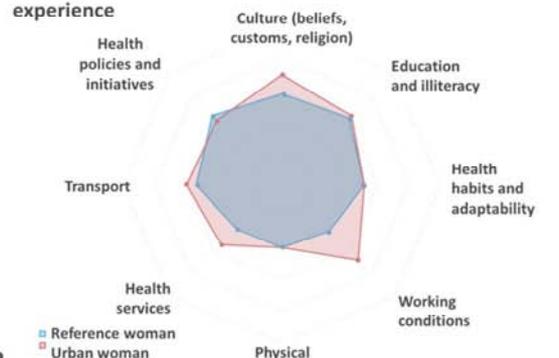
Nafi
35 years old, married to a farmer
Lives in Rao
Peulh
Pregnant with her sixth child
Works in the fields

“ I am proud to be pregnant again. Pregnancy does not change my daily life: I continue to work in the fields and to do housework. ”

Biography
Nafi grew up in a remote rural village in the southern part of the St. Louis district, 12 km from the town of Rao. The youngest of a farming family, she began helping with household chores, cooking, and taking care of younger children at a very young age. The conditions are precarious, with no electricity or drinking water in the village. Community and religious life play a commanding role in their daily life, and the marabout is highly influential within the community.

“My whole family works in the fields around the village. I never went to school. I can neither read nor write. I was married at the age of 16 to a man from my village. I have five children, I gave birth twice at the health post of Rao and three times at home, accompanied by the matron in whom my family has full confidence.”

The impact of determinants on her health maternal experience



Medical risk factors

- Sixth pregnancy
- Anaemias and nutritional deficiencies
- High blood pressure
- Women's age

Health structures attended

- Rao health post
- Saint-Louis regional hospital

Actors & key initiatives of her experience



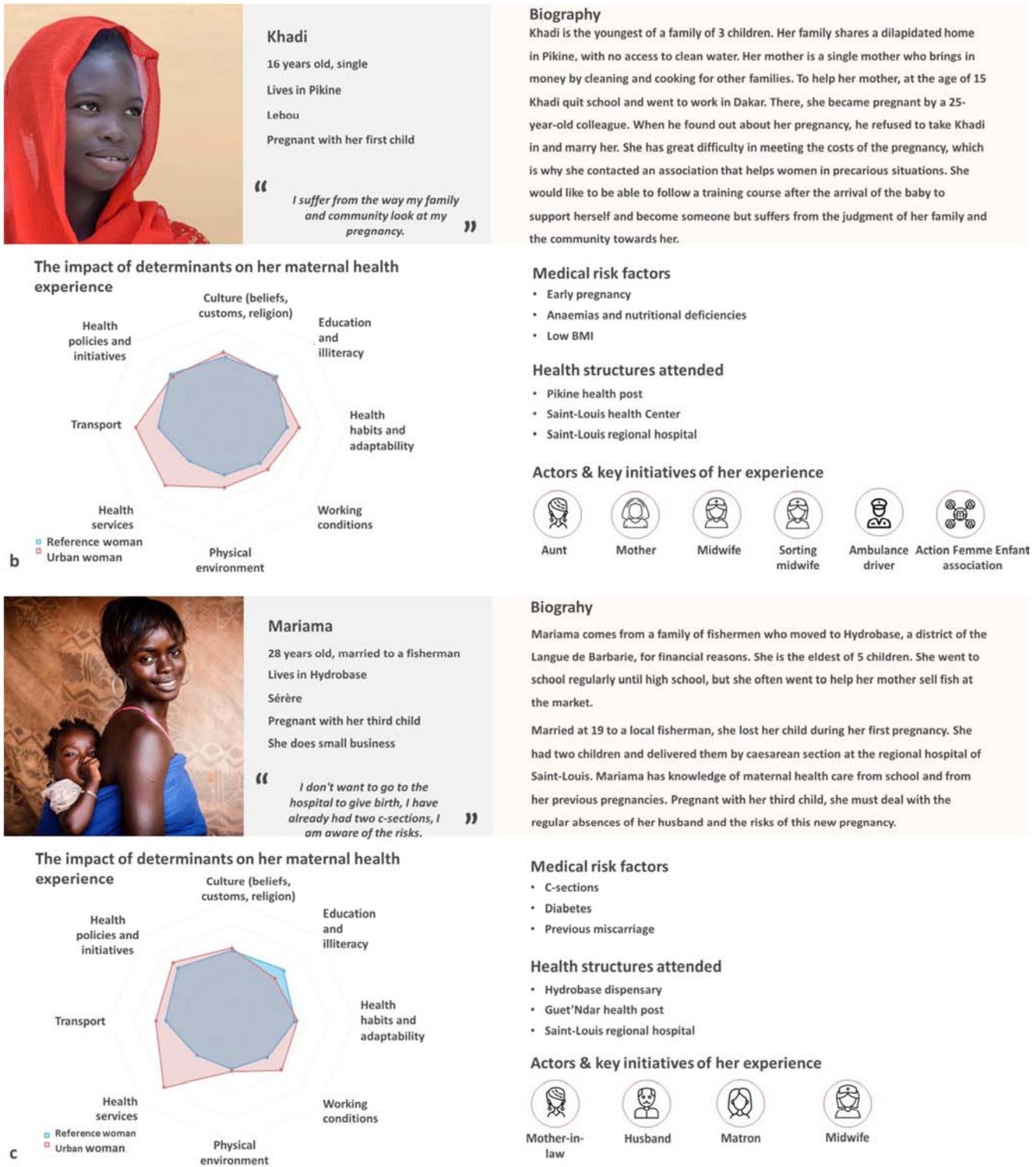


Figure 2. Representations of fictive women from Saint-Louis rural (a), urban (b), and semiurban (c) areas used to align on woman-centricity and the actual experiences, and health determinants.

During the immersion phase, more than one hundred interviews were conducted amongst stakeholders across the entire health pyramid, including the authorities, the community, and women in the Saint-Louis region. Sixteen international and Senegalese experts (gynecologists, anthropologists, sociologists, Corporate Social Responsibility experts, health specialists, doctors, NGO experts, regional

advisors, and researchers) were also consulted and interviewed. In addition, a series of ethnographic observations were carried out in one hospital, two health centers, four health posts, and two dispensaries. Local representatives of nine initiatives were interviewed.

Three “personas” were also constructed from the collected data to illustrate women’s journeys in these three

geographical locations. Each “persona” includes a short biography describing their personal situation, their medical risk factors,

their connection to the local health structure, their links to surrounding actors and initiatives, and a mapping of the influence of the determinants (Figure 2). Each “persona” represents a given category of women in Saint-Louis. For example, in Figure 2a, Khadi represents young women living in a rural area and suffering from the community stigma of being single and pregnant. All the information listed in her profile aids understanding by digging deeper into who she is and what she does. This makes it possible to give a voice to the beneficiaries and keep them at the center of the overall approach.

Qualitative analysis resulted in the creation of a women’s ecosystem mapping that made it possible to identify the real problems and needs of women via a systemic approach, covering all medical and social factors corresponding to the eight determinants. These determinants were selected from the list made by the

WHO and adapted to the reality of women’s experience of maternal and newborn healthcare.

Once collected, all the data were analyzed using a woman-centered approach. From this analysis, the experts then mapped the entire experience of fictive and representative women for the three geographical areas studied. These maps reflect the real experience of women through 13 different steps in their maternal health journey, categorized into four parts (before pregnancy, ante-natal, post-natal, and childbirth). Practically-speaking, each observation was prioritized together with the women and health professionals, and then classified according to the determinants-in-health categories, so that the potential impact of each determinant could be rated or a specific period. This transformation of qualitative data into quantitative indicators produced a graph illustrating the experience period when health determinants have the most influence, the impact of key stakeholders groups, and the existing initiative to apply a unique, holistic view of the composition of these women’s experiences (Figure 3).

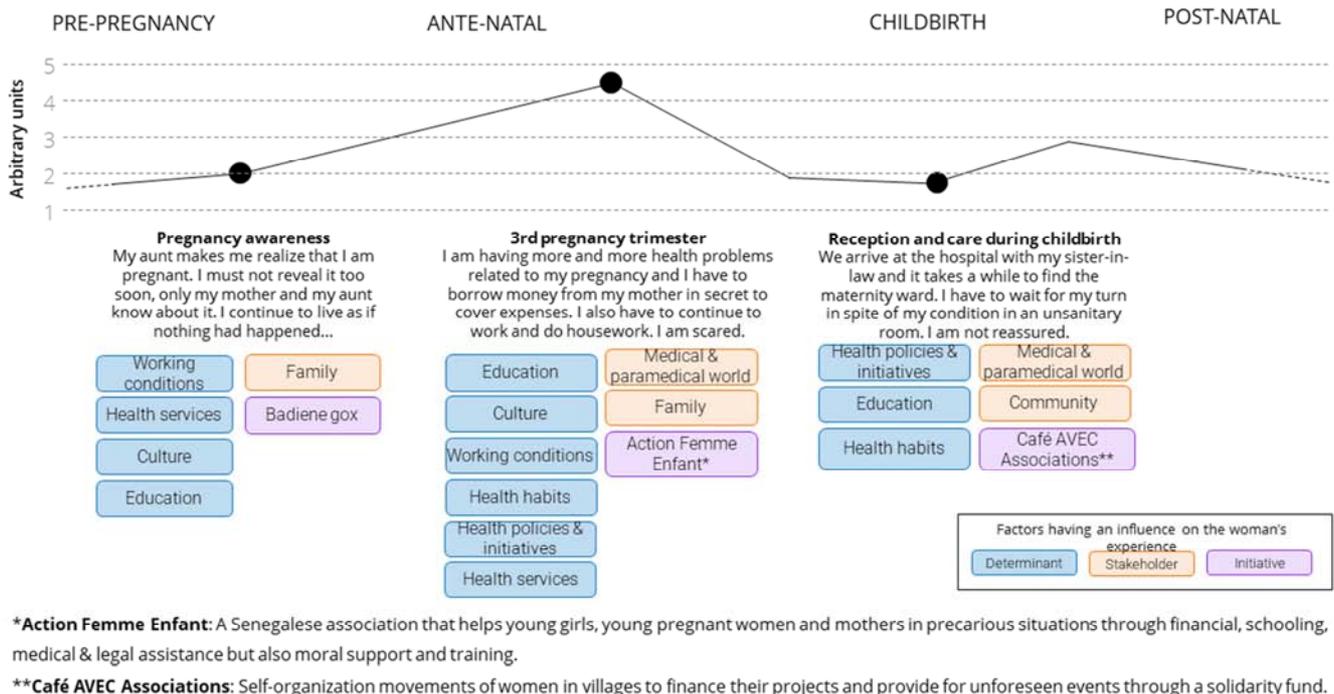


Figure 3. Simplified graph: references to woman's experience.

This graph highlights the impact of identified determinants on the experience of a pregnant woman. The impact of the determinants on her experience is correlated with the higher curve.

2.4. AIM Validation Phase for Maternal and Newborn Health

The overall data set for the analysis and especially the impact of determinants on the four defined stages of the women’s health journey were presented for validation to the St Louis stakeholders from local organizations, institutions, health authority representatives, women and families, and healthcare professionals. More than ten

validation sessions were conducted to evaluate the determinants’ impact on the women’s health journey. An additional feedback session was held in Dakar with health institutional representatives.

Co-creation workshops were a key step in the AIM approach. Experts adapted co-creation methods to guide local stakeholders to agree on pragmatic, reachable, and impactful solutions, using all existing drivers from stakeholders to initiatives, non-profits, and available technologies.

Experts conducted two co-creation workshops in

Ousmane Ngom Health Center in Saint-Louis, with the support of the medical region and the district authorities. Two additional co-creation sessions took place, one in the premises of the non-profit Action Femme Enfant in Pikine, and another at the Rao Health Post. All these workshops were conducted in November 2019 by a multidisciplinary team. Forty-five stakeholders were involved in these workshops, bringing health professionals, health

representatives, non-profits and NGO stakeholders, community members, and governmental stakeholders around the table. These included a majority of women already involved in maternal and neonatal health work. During the workshops, cards specially designed for the project were used to increase creative and disruptive thinking when producing solutions (Figure 4).

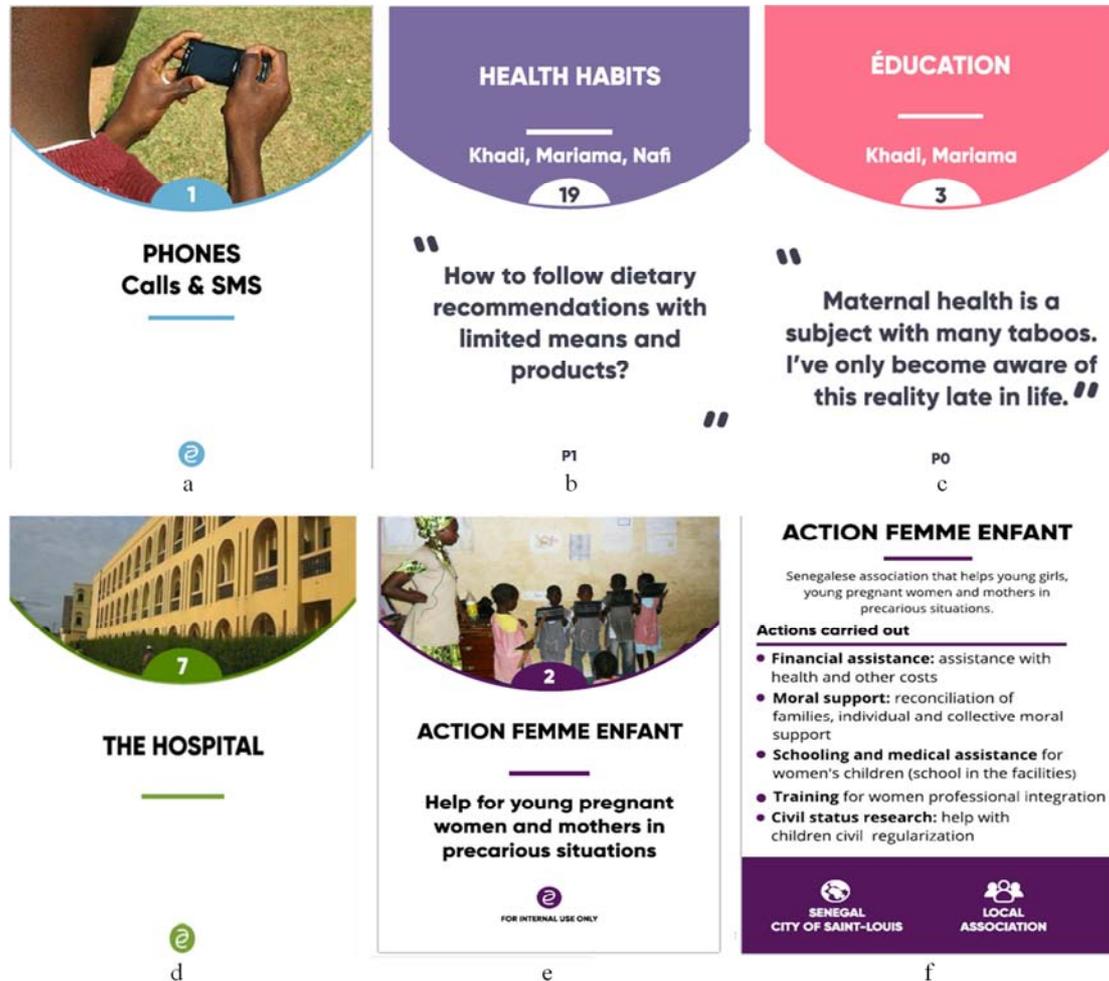


Figure 4. Example of cards used to generate solutions, based on women's needs (a and b) using existing levers (c, d, e, f and g) to increase creative and disruptive thinking.

3. Results

3.1. In Senegal, an Insights-generation Pre-pilot Based on AIM Took Place in Autumn 2018 in the Saint-Louis Département

No matter the persona, the graphs (Figure 3) showed that both pre- and post-natal stages are influenced simultaneously by various social determinants in health, while childbirth is most impacted by health services and health policy. The analysis also highlighted a number of differences regarding the impact of specific determinants between urban, rural, and semi-urban areas. For example, in urban areas, the lack of financial means for using transport

such as taxis prevents most young girls from going to health facilities. Indeed, many of them suffer from stigma, and if they cannot benefit from the privacy provided by a taxi to take them to a health facility, they would rather not go. Although the public transport network is fairly well-developed and cheap inside the city, most pregnant women do not want to be seen using them. This transport issue affects both decisions about consulting a medical expert and the ability to access urban health facilities. Finally, all the factors influencing the selected key moments were analyzed using a two-axis matrix to guide both the process of prioritizing needs (Figure 5) and the co-creation workshops on solutions. Eighty-two solutions were validated.

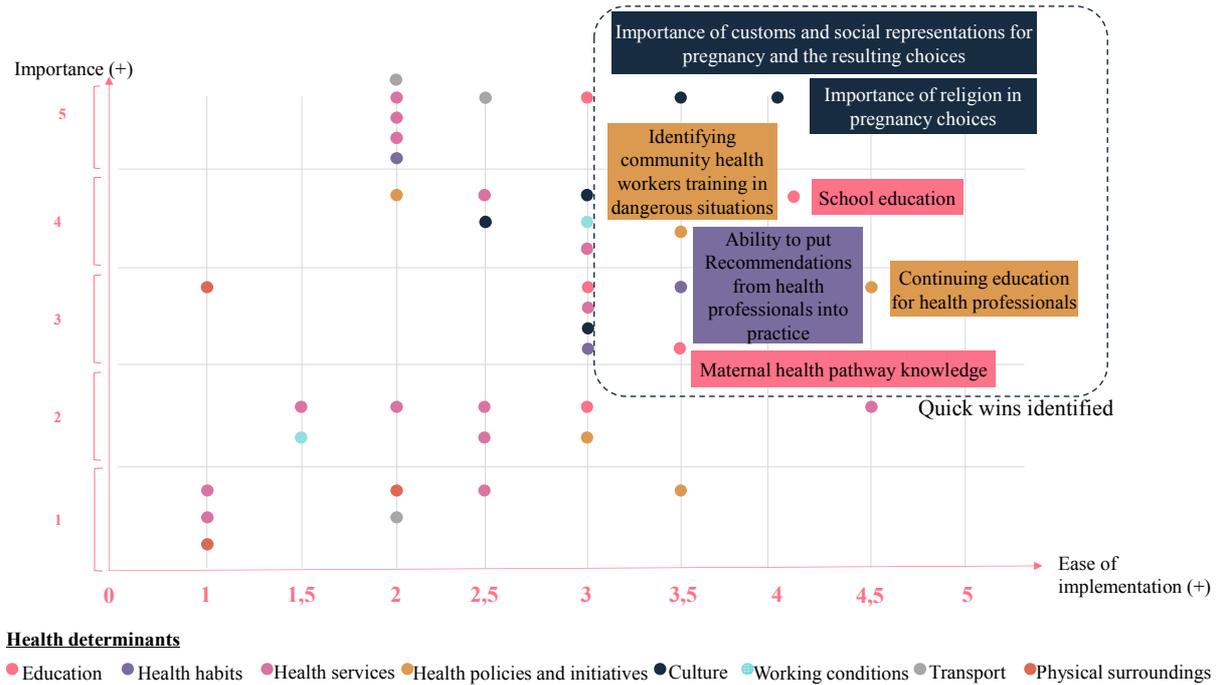


Figure 5. Example of a Prioritization Matrix to specify a targeted, impact-based action.

3.2. A Three-pillar Maternal Health Program as a Pilot to Promote Women and Community Engagement and Empowerment

The 82 validated solutions produced by the AIM methodology were analyzed and categorized into a unique multi-determinant, multi-area, multi-actor program. The care intervention program was in this way articulated around three key pillars: (1) from awareness to engagement (2) the attractiveness of health posts, a cornerstone of the Senegalese health pyramid, and (3) women’s autonomy and empowerment (Figure 6).

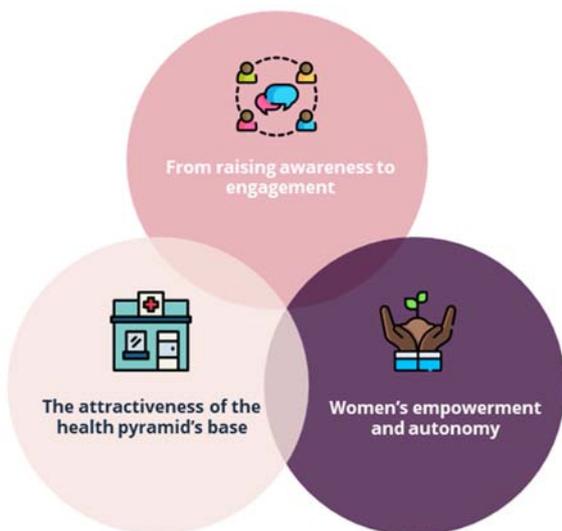


Figure 6. Program to be articulated around three pillars. The program derives from the analysis and consolidation of the 82 solutions co-created with the community.

The “awareness-to-engagement” pillar not only covers the delivery of information to women and their families via different media, formats and locations. The challenge is also to promote empowerment in the community in order to engage in awareness activities and good practices, and to take on board the importance of the maternal health pathway. This approach includes a number of existing awareness-raising actions which are often fragmented and limited in time. By engaging and joining together a multiplicity of local actors, the objective is to go beyond the status quo.

The “attractiveness of the base of the health pyramid” pillar emerged from the observation that health posts are places for first contact between women and national health facilities. However, women do not systematically go to these posts due to long waiting times (there are too few reception areas and care services are limited). As a result of this low attendance rate, health centers and hospitals are often over-congested. This pillar therefore involves strengthening both the services and the overall quality of the health post system, as well as the manner in which patients are received and supported.

The third, “empowerment of women” pillar is closely linked to the other two, based on the observation that women without financial means or the consent of their families will not attend a health facility. It is therefore vital to work on both the financial and decision-making empowerment of women so as to make women the owners of their own pregnancy pathway.

To coordinate collective action and build the community’s capacities, the Foundation with the help of the international NGO created a platform called “Rawal ak Diam” (from the Wolof language meaning “cope peacefully” plus the contraction of the pilot sites’ names - Rao and Diamaguene) in Saint-Louis. The AIM methodology is used by the Rawal ak

Diam platform to guide the community as a pilot project for the three-pillars program.

3.3. Towards the Validation of the AIM Program Approach

“Rawal ak Diam” is consists of a core team of local members and is supported by local and global members (experts in public health and maternal health, NGO, funders, etc.). The platform’s role as a broad-based catalyst is to accelerate local maternal initiatives by promoting confederation between local stakeholders (associations, health and administrative authorities at a local level) and guide the actors and associations selected to contribute to the maternal health three-pillar program.

Within a month, the newly formed “Rawal ak Diam” team was operational enough to mobilize and empower the community to contribute to the emergency response to the COVID-19 health crisis, while building the action plan of the three-pillar program together with the community and the support of local and global experts.

This pandemic has created an opportunity for the platform to demonstrate its added value to the community by implementing new, locally designed activities to respond to the COVID-19 crisis in the two pilot sites - Rao and Diamaguene as a priority, but also more generally in the Saint-Louis region. This rapid engagement was combined with the continuing maintenance of maternal healthcare based on the program’s three pillars.

Rawal Ak Diam helped mobilize the community to support prevention and patient care in the sanitary district of Saint-Louis. The team promoted communications and community awareness by designing and circulating simple, direct messages via local channels and by organizing awareness caravans in the neighborhoods. Rawal Ak Diam helped a local association to manufacture masks to AFNOR standards.

To ensure that the health system kept functioning, especially for managing maternal and child health during the pandemic and to "Accelerate the local impact" in this area, the community set up patient-screening processes at the entrance to health posts and centers. As a community representative, Rawal Ak Diam warned early health authorities about the increase in home deliveries, especially in rural areas.

By acting pragmatically, the team helped supply protective equipment (hydroalcoholic solutions, FFP2 masks for healthcare professionals, and hand-washing kits), and coordinated closely with the district health authorities and groups of young people to limit the spread of the virus.

The lessons learnt from these first Rawal Ak Diam-based actions included the realization that there was an opportunity to rapidly improve connections with the local health authorities to fully incorporate community actions in Saint-Louis’ regional COVID-19 response outcomes.

In parallel with COVID-19 crisis management, the Rawal Ak Diam platform built the three-pillars action plan in coordination with district and rural associations and local authorities. As a program prerequisite, the quality of the

health structures of the two pilot areas played a critical role in ensuring a response to the needs identified with respect to health services for maternal health. The creation of a delivery room at the Diamaguene health post (which has existed since 1974) and the rehabilitation of the maternity unit adjacent to the Rao health post were foundational actions for the program. In addition, the local and global members of the broader platform (Foundation, international NGO, start-up, and experts) stepped up the local team’s capacities to build a logical framework, select relevant outputs, outcomes and impact indicators and align these with national and international standards.

4. Discussion

The “three delays” model (delays in deciding to seek care, in reaching a care source, and in receiving adequate healthcare) described by Thaddeus and Maine highlights the need for a more integrated approach to fight maternal and newborn mortality [26]. In the Saint-Louis region, the Accelerating Impact Model (AIM) resulted in targeting the first two kinds of delay. The program’s objective was to empower women by enhancing their knowledge, self-confidence, commitment, and autonomy (financial and familial) throughout their healthcare pathway. In parallel, to increase the attractiveness of the health posts, it was crucial to optimize these primary healthcare points (in terms of reception, equipment, and consultation) so as to enlist women and free up busy hospitals. This focus was also linked to the what the women beneficiaries requested themselves. However, the AIM, as described, is able to target these three types of delays as the needs and priorities identified are closely linked to the entire ecosystem.

Community-based care is already described as a promising path to achieve significant changes to healthcare [27]. In addition, including patient experiences and patient-reported outcomes can also help improve research and establish new methodologies [28]. Applying design thinking methodology to the health sector for the communities, the education of health professionals was recently reviewed [29], highlighting the benefits but also the need and opportunity for further research in order to elucidate the potential role of this methodology in healthcare training and practice. The present AIM project describes the application of design thinking methodology to maternal and newborn health in the development aid context [30]. This model aims to change the way of working in the health sector by designing actions that positively impact maternal and neonatal health in low- and middle-income countries.

As a result of design thinking methodology, the project was able to engage with different local stakeholders in maternal and newborn health. But beyond this engagement, the AIM project also played an important role in connecting stakeholders who are traditionally used to acting inside their own separate silos - for example, the community, regional health services, and at the level of national health policy. This was a major change with regard to the understanding of women’s experiences. It provided the capacity to identify the

local roots of underlying causes, to anticipate the intricate dependencies within complex environments, and to characterize needs. This kind of understanding can never be omniscient, but this approach goes to the heart of any topic on the table. In the specific perspective of improving maternal and newborn care, the AIM project is like a solution prototype, playing a supporting role so as to gain critical insights of both nuisances and enablers with the aim of identifying needs before any care solution is adopted or implemented.

The ecosystem mapping showed more than 1,000 associations involved in providing solutions across various action domains including the improvement of maternal and neonatal health, which means that the risk of making a sub-optimal or diluted impact were very real. As described by Kruk et al. [28], it was critical to analyze and identify existing reliable initiatives and determine ways of sharing these before creating new options. The value of the AIM model lies in activating the collective intelligence of a variety of experts involved both inside and outside the zone of impact, thereby increasing the diversity of possible viable solutions. Opportunity analyses developed during immersion trips at the end of 2018 and beginning of 2019 offered a fertile ground for fighting against fragmentation and building synergistic actions in the field. The model considers that the involvement of all local stakeholders in a real-world ecosystem is critical, prior to designing and implementing solutions in the field. In addition, global organizations can assist local NGOs and the community to leverage their leadership and implement smart processes based on their subject-area know-how.

Beyond this collective approach, the AIM - Accelerated Impact Model - was able to rationalize decision-making and help choose where to act, based on options with maximum impact and that could be measured and monitored. Prioritization was based on what was the most important action for women, basing the feasibility of any action on a list of common criteria. Identifying the largest opportunities for impact led first of all to gaining time: actionable insights from the field helped identify the major opportunities for impact in the lives of the women in question. The AIM also helped deliver a return on experience from other stakeholders and partners in the care ecosystem on what works well or less well prior to designing and implementing any solution.

The AIM project in Saint-Louis was a pilot program targeting geographically limited areas enabling a holistic approach to be applied to maternal health issues by optimizing the interactions of local networks. It was essential to opt for this small-scale approach, given the fragmented nature of the existing organizations and initiatives. The Saint-Louis ecosystem was both favorable and critical, with the presence of universities and incubators, for anchoring a methodology of knowledge transmission in order to enhance community autonomy and promote social entrepreneurship around initiatives to sustainably improve maternal health [31, 32]. It should be possible to scale up the project over an extended geographic area with trained, sustainably dynamic and autonomous communities who can synergize their networks and ways of working, by sidelining competitive behavior (e.g.,

between local, local/global and global stakeholders) so as to implement and accelerate higher-level, high-impact actions.

The duration of the project was also an important factor, as well as involving a huge risk. Activities such as identifying champions, mapping the landscape, and using data to make cases, facilitating community outreach, analyzing baseline data to identify key issues and gaps, and creating a common agenda all took considerable time. In parallel, the entire community was engaged by virtue of its public determination and expectations. As no concrete project was launched during this phase, at certain points the team sensed a degree of weariness among participants. It was important to introduce direct health interventions, perhaps less impactful than expected, such as a health caravan for multiple disease screening, yet such decisions enabled the AIM project to maintain the trust and confidence of the various stakeholders. It is clear that the AIM project's complexity and duration in attempting to achieve a real systemic change may make it more challenging to adopt such a methodology.

The Foundation/NGO/start-up team was key to providing leadership and innovative design at the start of the project but showed certain limitations over time, especially due to the lack of local leadership. A backbone structure was important for bringing this leadership out and acting locally with appropriate agility. The platform, consisting of several professionals with experience in humanitarian programs and community health, was given the role of bringing together the needs that had been identified, the impactful solutions, and the local stakeholders who had been appropriately empowered to deploy the program activities. The platform aims to reduce the fragmentation of effort by working closely with stakeholders in the field and always starting by using existing materials on awareness or other opportunities. The platform needs to regularly conduct co-creation workshops to keep the list of needs and possible solutions up to date and extend their reach and impact. The platform also monitors activities and outputs every one to three months so as to readjust the activities plan and break down the complexity of longer-term activities into smaller-scale tasks. This reduces uncertainty by making it easier to follow up and continuously measure the funding dedicated to them.

In order to lead a sustainable three-pillar program, the now-incubated "Rawal ak Diam" platform needs to grow successfully and gain an autonomous status while integrating Senegalese and international ecosystems. The study has enabled us to identify specific critical factors for the sustainable positive impact of this work. At the individual care program recipient level, the constant focus on understanding their challenges and meeting their evolutive needs is key to ensuring the persistent relevance of the care solution focus. At the maternal health level, the power of community as a driving force for implementing and continuously quality improving the program will be critical for a long-term impact. In the broader field of care intervention design in underserved settings, the systemic focus combined with pain point and bottleneck identification via ethnography studies help to strengthen the provision and acceptance of care interventions.

Last but not least, steady involvement at the academic level will enable the cultivation of reverse innovation and scaling of the impact potential beyond the initial scope. University involvement during the AIM appropriation and validation stages is key to contributing to sustainability and to accompanying the scaling-up phase to be implemented first on a Saint Louis region scale.

5. Conclusion

To continue to reduce maternal and newborn mortality, the “three delays” should be targeted by developing a fully integrated approach. Beyond recommendations and guidelines, a human-centric model, e.g., introducing genuine dialog between patients, healthcare workers and the authorities, is one of the challenging but crucial links needed to leverage maternal health actions. Solutions and processes also need to be integrated into the community system, in addition to their inclusion in the strategies of the health authorities. The holistic program developed together with the AIM methodology centered on women, community, and health professionals’ needs is designed to implement inter-connected solutions to enhance actionable levers on maternal health and could therefore automatically contribute to the seventeen Sustainable Development Goals. The community’s ability to apply the co-creation methodology may be able to change the paradigm for stimulating a healthcare action strategy in the field and enrich regional healthcare policies to create impactful maternal healthcare actions. Community capabilities will grow as new solutions are identified, implemented, and integrated in a relevant manner into all existing initiatives.

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References

- [1] UN Inter-agency Group for Child Mortality. (2020). A Neglected Tragedy The global burden of stillbirths. Retrieved from Report of the UN Inter-agency Group for Child Mortality Estimation: <https://childmortality.org/wp-content/uploads/2020/10/UN-IG-ME-2020-Stillbirth-Report.pdf>
- [2] UN Maternal Mortality Estimation Inter-Agency Group. (2019). Maternal mortality: Levels and trends 2000 to 2017. Retrieved from WHO: <https://www.who.int/publications/i/item/9789241516488>
- [3] The Lancet Maternal Health Series: Global Research & Evidence. (2016). Lancet maternal health series. Retrieved from Lancet: <https://www.thelancet.com/series/maternal-health-2016>
- [4] Filippi, V., Chou, D., Ronsmans, C., Graham, W., & Say, L. (2016). Levels and Causes of Maternal Mortality and Morbidity (3 ed., Vol. 2). Washington (DC): Black RE, Laxminarayan R, Temmerman M, et al., editors. doi: 10.1596/978-1-4648-0348-2_ch3.
- [5] Horton, R. (2019). Offline: The false narrative of “tremendous progress”. Lancet, Vol 394, 1129. doi: [https://doi.org/10.1016/S0140-6736\(19\)32208-1](https://doi.org/10.1016/S0140-6736(19)32208-1)
- [6] Yap Boum, Y. M. (2020). Burden of disease in francophone Africa 1990–2017: the triple penalty? The Lancet Global Health, 8 (3), E306-E307. doi: [https://doi.org/10.1016/S2214-109X\(20\)30040-1](https://doi.org/10.1016/S2214-109X(20)30040-1)
- [7] OECD Development Centre, P. (2019). 2019_Health_policy_note. Retrieved from https://www.oecd.org/development/networks/2019_Health_policy_note.pdf
- [8] OECD. (2018). Private Philanthropy for Development. The development dimension, OECD publishing, 1-132. doi: <https://doi.org/10.1787/9789264085190-en>
- [9] Lancet maternal health] Horton, R. (2019). Offline: The false narrative of “tremendous progress”. Lancet, Vol 394, 1129. doi: [https://doi.org/10.1016/S0140-6736\(19\)32208-1](https://doi.org/10.1016/S0140-6736(19)32208-1)
- [10] Sanofi Espoir Foundation. (2021). Brochure 2020-2021 of the Foundation. Retrieved from Sanofi Espoir Foundation: <https://www.fondation-sanofi-espoir.com/-/media/Project/One-Sanofi-Web/Websites/Global/Sanofi-Espoir-Foundation/Home/Publication/brochure-of-the-foundation/2020-2021-brochure-fondation-EN.pdf?la=en&hash=2468234F651FB81549F8DB2BD237DB8E>
- [11] Women and Gender Equity Knowledge Network. (2007). Unequal, Unfair, Ineffective and Inefficient Gender Inequity in Health: Why it exists and how we can change it. Final Report to the WHO Commission on Social Determinants of Health. Retrieved from https://www.who.int/social_determinants/resources/csdc_med ia/wgekn_final_report_07.pdf

- [12] WHO. (2012). Déterminants sociaux de la santé. Retrieved from https://www.who.int/social_determinants/fr/
- [13] WHO. (2012). Social determinants approach to maternal deaths. Retrieved from WHO Maternal, newborn, child and adolescent health: https://www.who.int/maternal_child_adolescent/epidemiology/maternal-death-surveillance/case-studies/india-social-determinants/en/
- [14] Humanitarian innovation fund. (2016). Linking interventions to cultural ceremonies and practices to reduce intimate partner violence among displaced populations in humanitarian crises. Retrieved from https://www.elrha.org/wp-content/uploads/2019/04/HIF-Final-Report-2019_0201-FINAL.pdf
- [15] Brown, T., & Wyatt, J. (2010). Design thinking for Social Innovation. Stanford Social Innovation Review, A préciser. Retrieved from https://ssir.org/articles/entry/design_thinking_for_social_innovation
- [16] Roberts, J. P., Fisher, T. R., Trowbridge, M. J., & Bent, C. (2016, March). A design thinking framework for healthcare management and innovation. *Healthcare*, Elsevier, 4 (11), 11-14. doi: 10.1016/j.hjdsi.2015.12.002.
- [17] Brown, T. (2008). Design Thinking. Harvard Business Review, 1-10. Retrieved from <https://readings.design/PDF/Tim%20Brown%2C%20Design%20Thinking.pdf>
- [18] Badara, T. A. (2018). Community-Based Maternal and Neonatal Health Services in Kolda and Sedhiou Districts of Senegal. *Global Journal of Health Science*, 90. doi: 10.5539/gjhs.v10n3p90.
- [19] UN Women Africa, Senegal, <https://africa.unwomen.org/en/where-we-are/west-and-central-africa/senegal>
- [20] Fowler, M., & Highsmith, J. (2001). The agile manifesto. *Software Development*, 9 (8), 28-35. Retrieved from https://www.researchgate.net/publication/265620641_The_Agile_Manifesto
- [21] Eisenmann, T., Ries, E., & Dillard, S. (December 2011 (revised July 2013)). Hypothesis-driven entrepreneurship: The lean startup. Harvard Business School Entrepreneurial management Case, 812-095. Retrieved from <https://www.hbs.edu/faculty/Pages/item.aspx?num=41302>
- [22] Stevens, R., & Brownell, S. (2018). IEEE Global Humanitarian Technology Conference (GHTC). Collaborative Social Impact Design Course. San Jose, CA, USA: IEEE. doi: 10.1109/GHTC.2018.8601656.
- [23] Easterday, M., Gerber, E., & Rees Lewis, D. (2018). Social innovation networks: a new approach to social design education and impact. (M. I. Technology, Ed.) *Design*, 34 (2), 64-76. doi: 10.1162/DESI_a_00486.
- [24] Hillgren, P.-A., Seravalli, A., & Emilson, A. (2011). Prototyping and infrastructuring in design for social innovation. *CoDesign*, 7 (3-4), 169-183. doi: 10.1080/15710882.2011.630474.
- [25] Loudon, G. H., Santhosh Kumar, C., SreeKumar, K., Haritha, H., Kuruyachan, H., & George, K. (2019). Conference: 20th Anniversary People's Palace Projects: Indigeneous Research Methods Workshop. Empowering indigeneous communities in India through the use of design thinking methods. Retrieved from https://www.researchgate.net/publication/335465861_Empowering_indigenous_communities_in_India_through_the_use_of_design_thinking_methods
- [26] Thaddeus, S., & Maine, D. (1994, April). Too far to walk: Maternal mortality in context. *Social Science and Medecine*, 38 (8), 1091-1110. doi: 10.1016/0277-9536(94)90226-7.
- [27] Lassi, Z. S., Kumar, R., & Bhutta, Z. (2016). Community-Based Care to Improve Maternal, Newborn, and Child Health. In *Disease Control Priorities, Third Edition (Volume 2): Reproductive, Maternal, Newborn, and Child Health (3 ed., Vol. 2, pp. 1-397)*. Disease control priorities. doi: 10.1596/978-1-4648-0348-2_ch14.
- [28] Kruk, M. E., Gage, A. D., Arsenault, C., Jordan, K., Leslie, H. H., & Roder-Dewan, S. (2018). High-quality health systems in the Sustainable Development Goals era: time for a revolution. *The Lancet Global Health*, 6 (11), E11986-E1252. [https://doi.org/10.1016/S2214-109X\(18\)30386-3](https://doi.org/10.1016/S2214-109X(18)30386-3)
- [29] Mc Laughlin, J. E., Wolcott, M. D., & Rider, T. R. (2019). A qualitative review of the design thinking framework in health professions education. *BMC Medical Education*, 19 (98), 1-8. doi: <https://doi.org/10.1186/s12909-019-1528-8>
- [30] Design thinking and health communication: learning from failure. (2017, April 25). Retrieved from The Communication Initiative Network: <https://www.comminit.com/content/design-thinking-and-health-communication-learning-failure>
- [31] Chou, C. D. (2018). Applying design thinking method to social entrepreneurship project. *Computer Standards & Interfaces*, 55, 73-79. doi: <https://doi.org/10.1016/j.csi.2017.05.001>
- [32] Eesley, C., & Miller, W. (2018). Impact: Stanford University's Economic Impact via Innovation and Entrepreneurship. *Foundations and Trends® in Entrepreneurship*, 14 (2), 130-278. doi: <http://dx.doi.org/10.1561/03000000074>