



# **MAMASnet**

Mobile Assessment & Maternal Aid Solutions

Mano River Union Project: Liberia, Guinea and Sierra Leone

Converging Integrated Technologies, Partnerships & Best Practice Approaches to Address the  
“Three Delays” Leading to Maternal and Infant Mortality in Challenging Environments

A Program in Affiliation with World Health Organization’s “Making Pregnancy Safer” Department,  
the American Telemedicine Association and Global University System (GUS)

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*“We are all faced with a series of great opportunities brilliantly disguised as impossible situations”*

Chuck Swindoll

## I. Project Context: Roadblocks to Maternal Health

Across Africa the road to the only hospital is often a bumpy red streak, dusty in the dry season, and impassable during the rains. Families living in separate villages often spend weeks without seeing one another after the skies open in the rainy season. It is this road that pregnant women must take if they develop complications and need emergency treatment. Their choice of transport: the back of a bike, or as one of 20 passengers in a mini-van built for 12, facing a surly driver worried about getting blood on his seats. Even if she makes it to the hospital, there is no guarantee that the woman will find the emergency care she needs.



As one community member put it with stark simplicity, *"It is cheaper for our women to die at home. You make us send them to hospitals further and further away - sometimes all the way to the capital - and there they die. And then we have to pay to bring the body back"* (from Averting Maternal Death & Disability AMDD, Columbia University)

*"I stood in front of a small district hospital in rural Guinea that my daughter had helped build during her Peace Corp experience. A nurse emerged from her busy clinic to note that a few weeks earlier a mother had died in a wheelbarrow a half mile up the road as she was being pushed from her village toward the hospital, in labor."* (Linda Hawkin Israel, MAMASnet)

A woman dies every minute due to pregnancy-related complications with highest incidence in African countries mainly attributed to poor healthcare infrastructure. Leading medical causes of maternal mortality and injury could be prevented with more efficient triage, transfer and better clinician response to pre-eclampsia, hemorrhage, obstructed labor and infection. Contributing factors include poverty and lack of policy and practice which recognizes women's human rights.

### **Patients' lack of access to competent emergency health care: THREE DELAYS--**

- Delay on the part of the mother, family, and community in recognizing life-threatening conditions and delay in deciding to seek help;
- Delay in reaching a health facility, for example due to lack of transportation;
- Delay, after arriving at the health facility, in receiving appropriate care due to inadequate staffing or equipment.

### **Contributing factors to poor maternal health and to emergency obstetrical care (EMoC)**

- Health workers ill-prepared, with isolation and brain drain from rural communities to better opportunities and paying positions
- Inadequate education, health information management with lack of coordination and accountability
- Lack of resources, including funding for facilities, patient fees, and transport
- Poor public health, nutrition, sanitation, HIV/AIDS, malaria, other diseases

## II. Identifying Solutions

### **The Averting Maternal Death and Disability (AMDD) Program**

The Averting Maternal Death and Disability (AMDD) Program operates on the assumption that all pregnant women are at risk for serious complications and thus focuses on improving access, utilization and quality of emergency obstetric care. The program prioritizes the preparation and readiness of basic and comprehensive EmOC (emergency obstetric care) facilities, and reducing the "third delay" of the "3 delay model." The AMDD approach encompasses three facets.

- Technical component focuses on staff acquiring the necessary clinical skills.
- Managerial component embraces staffing and team building, maintaining a constant supply of drugs, blood, and equipment, an information system, IEC, facility maintenance and supervision. management

- Principles of human rights are integrated into clinical treatment and facility management. Discrimination, priority setting, information and communication or personal privacy are addressed in planning and implementation.

The AMDD approach, for phase one of its programs, includes five stages for improving emergency obstetric care: assessing needs for EmOC, planning the program, implementing the program, monitoring, evaluating, and disseminating information.

**IMPACT:**

Impact is a global research initiative whose ultimate goal is to improve maternal health and survival in developing countries. <http://www.impact-international.org/> Impact has developed a range of tools for safe motherhood programme evaluation. These include ways to measure maternal and perinatal mortality and morbidity, quality of maternal health care, economic outcomes and health systems factors.

### III. MAMASnet's Supportive Infrastructure Design

**A. Overview:**

MAMASnet represents a model maternal health infrastructure which builds on above existing investments, partial successes, and local existing capacity, with experience and an analysis for technologies and partnerships to expand use of IMMPACT assessment tools and gaps as identified by AMDD in the “Three Delay Framework.” MAMASnet will help coordinate, integrate and evaluate interventions to minimize each of the delays with information, remote diagnostic telemedicine, appropriate communications (including local talk radio) and local transport.

MAMASnet team has identified resources to implement a network of communication, information and rural transport, conceptually tailored for Africa in direct response to needs and UN MDG-2015 targets for maternal and infant mortality reduction in relation to UN Process Indicators..

**B. Mission:**

- To localize women’s access to competent obstetrical care—both routine and emergency—by innovative rural talk radio from markets and schools, health workforce communication and transport, support for midwives’ competency and logistics and remote health team coordination resulting in more rapid and competent response.
- To then demonstrate reduced mortality in Mano River Union countries (as worst case scenarios) in advance of the [UN Millennium Development Goals](#) (MDG) for 2015.
- To increase the capacity of complementary partners for research and use of advanced telemedicine and health informatics appropriate to reducing maternal mortality
- To bridge international and national resources with community- based organizations for clinical healthcare and public health in rural and crisis environments.

**C. Values:**

- Women must be central to design and use of telemedicine and related health networks,
- Systems will be designed to be eventually self-sustaining, and costs shared between sectors, with net impact increased as each sector is strengthened
- Capacity to share information—real time--- will be organized for rapid analyses
- Ongoing research and analyses will be central to each aspect of testbed projects

**D. Background and Strategy:**

MAMASnet builds on nearly eight years of field analysis and relationship-building in West Africa and US, with focus on maternal and infant mortality prevention and development of related practical communications and transport in typical rural communities.

MAMASnet proposes cooperation with Engineers Without Borders and University of Washington WWAMI (Washington, Wyoming, Alaska, Montana, Idaho) for all testbeds to explore best rural innovations which add to both remote medical trainings and to parallel programs for sustainability.

All testbeds will be reviewed by existing maternal mortality prevention leadership (see Appendix I) AMDD, PATH, RPMM, IMMPACT, ACNM, Bill and Melinda Gates Foundation) with MAMASnet pilots building information, communication and transport systems at the regional level which best demonstrate “filling the gaps” as identified by AMDD research.

The Project will support customization and management of the following to demonstrate the impact on maternal and newborn health if these *key components* are in place:

- **Trainings:** with support from the Mercy Ship’s organization in Africa, will demonstrate and evaluate uses of distance learning, remote diagnostics, surgical guidance and performance measurement in relation to operating staff in testbed sites and will include:
  1. telesurgery, for education to international standards, pre and post surgical case review, from onboard the Mercy Ship docking in Freetown and Monrovia ports,
  2. telemedicine (telemidwifery) to support remote diagnostics with focus on identification of high risk pregnancies for early transport from rural areas.
  3. medical libraries and remote mentoring (via internet, cell phone, email) to second opinions (peers, reference materials)
  4. medical informatics with common platform for administrative management, supply chain, cold chain, blood management, billing
- **Tracking:** design of software and mobile phone infrastructure for data upload, mapping, monitoring, appropriate packaging and delivery of content to stakeholders for health infrastructure planning and policy;
- **Triage:** support for dispatch network linking hospitals, field midwives, district hospitals Peripheral Health Units (PHUs) and patients’ villages to a model center that enables rapid information flow and coordination among actors.
- **Transport:** use of alternative vehicles such as motorcycles and mobile vans with partnership program and local maintenance (proposed “Riders for Health), designed to overcome poor roads and costs considerations.
- **Talk Radio:** incorporates youth and women’s media production for community engagement, MAMAS will build on a decade of experimental media from rural and refugee settings, now partnering with *WINGS* (Women’s NewsGathering Service) and *Talking Drums Studios* to produce “Let’s Talk MAMAS!” call-in radio utilizing mobile phones (schools, hospitals, markets) for local radio and international distribution.

#### E. Partnerships:

MAMASnet will include an administrative structure to support collaboration among key academic, industry, NGO and governmental partners, proposed in lead cooperation with Global University System (linking local to global universities), American Telemedicine Association (ATA), WHO “Making Pregnancy Safer” Department and University of Washington Department of Global Health with School of Medicine Obstetrics and Gynecology..



MAMASnet consortium will cooperate with lead field partner, Mercy Ships, for development of a “virtual medical school” to support fast-tracking of health workforce development. Mercy Ships has priority program for VVF repair and will play a role with MAMASnet in both VVF surgical trainings and C-section standardization for rural clinicians.

From the “Africa Mercy” ship, now anchored in Monrovia harbor, MAMASnet testbed projects will increase efficiency of the local partners for planning, harmonization of health team and cooperation with land-based institutions to increase capacity of rural surgeons and other clinicians. Key partnership will also be with American College of Nurse Midwives (ACHM) for expansion of its existing midwifery and Home Based Lifesaving Skills (HBLSS) and midwifery trainings in Phebe Hospital, Bong District, Liberia.

MAMASnet proposes cooperation with International Federation of Red Cross, Averting Maternal Death and Disability (AMDD) Columbia University, PATH and Regional Prevention of Maternal Morality (RPMM) for advisement at each stage of baseline assessment, testbed design, project implementation and analyses to ensure compliance with UN Process Indicators.

Other key US collaborators are proposed to include:

- University of Washington SOM, Department of Obstetrics and Gynecology, ISIS (Institute for Surgical and Interventional Simulation) WWAMI (Washington, Wyoming, Alaska, Montana, Idaho), UW Biomedical Informatics and Education (Nursing)
- University of Alaska for connectivity strategies and Community Health Aide Program
- University of New Mexico, Center for Telehealth and Cybermedicine Research
- US Army Telemedicine and Advanced Technologies Research Center (TATRC)
- US NASA Mars Institute, (telehealth in severe, remote and other challenging environments).

**F. Technologies:**

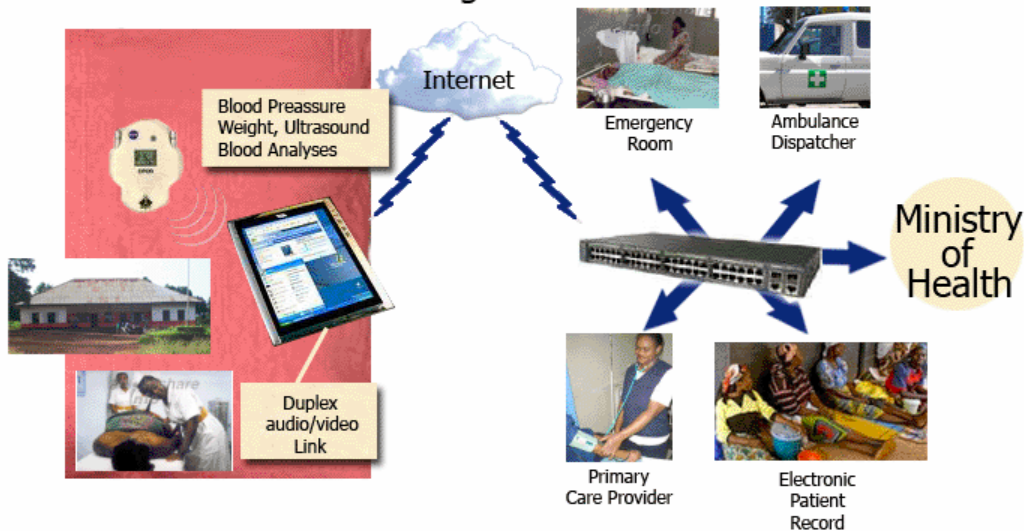
MAMASnet has identified the need to:

- adapt the e-medicine platform, enabling managing and sharing of personal health data.
- develop communication networking tools and interfaces with input by local population.

MAMASnet has developed a series of schematics to illustrate our systems which include:

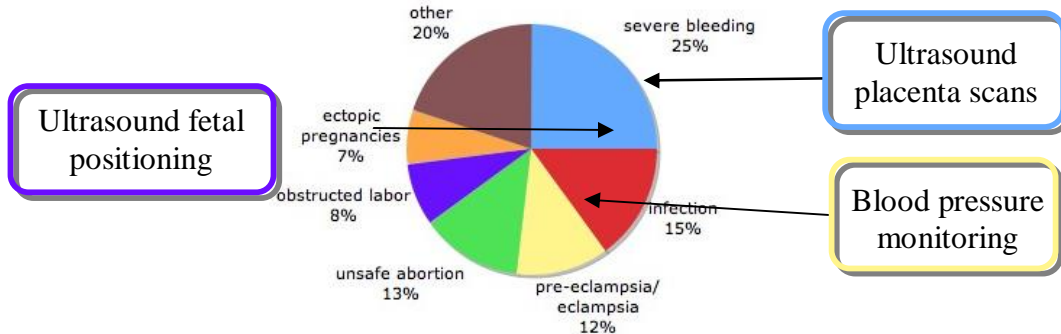
- remote diagnostics and other uses of telemedicine
- efficient connectivity in low resource, low bandwidth environments
- information flow between relevant stakeholders

**MAMASnet: Tools for Decentralized Diagnostics and Medical Logistics**



**Examples of screening protocols on major causes of maternal death:**

Multiple uses (across specialties) for stationary and portable ultrasound have potential for cost-effective use in district and provincial hospitals.

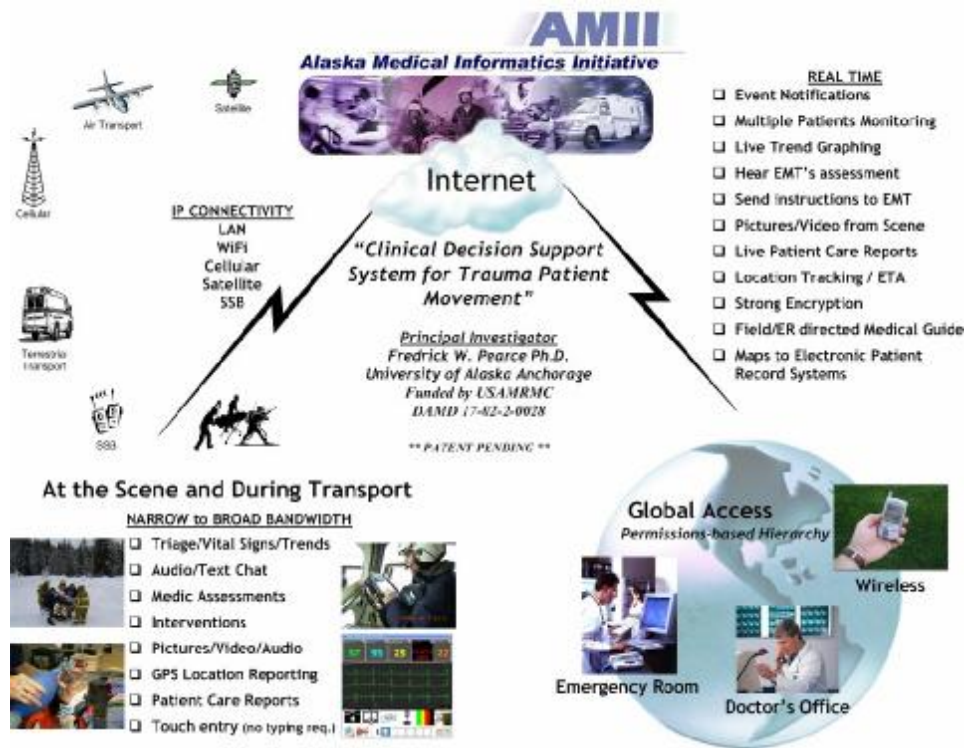


### G. Strategies for Connectivity

Infrastructure should allow for current medical metrics including images to be securely transmitted and received. In addition, we will also adapt the existing e-medicine platform for supporting the network and human interfaces for both the local and the global clinician support. Mobile telephony infrastructure has exploded in its use, even in rural Africa. Based on our experience and partners' capacity, we will utilize cell phone and/or other communications infrastructure to develop a flexible and scalable network for MAMASnet.

MAMASnet test beds will provide opportunities for further analyses and development of system technologies like Alaska's AMII (Alaska Medical Informatics Initiative) with the unique capability to transmit in narrow bandwidth environments.

Central to these considerations will be assessment best and most economical uses of broadband with mid and long range planning as to how 1) these assets can be shared across sectors and nationalities; 2) costs can be contained with innovative uses of each system, given challenges and limited resources in rural communities; 3) target countries can demonstrate technology and programmatic accountability and measurable progress against MDG 2015 targets, enabling them to access further resources for broadband and other supportive, critical resources.



### University of Alaska Anchorage

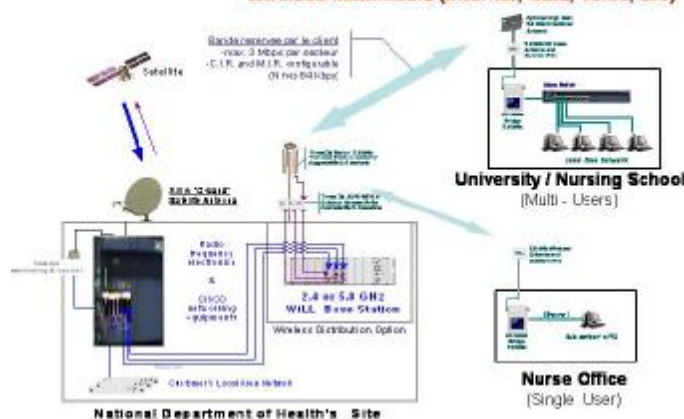
The AMII communications module will seek and find the “best” available IP connection from a satellite modem (default communications protocol for air evacuation), cell phone modem, 802.xx wireless IP, and/or Ethernet. The database structure records every aspect of each event for trend analysis and utilization review with up to six simultaneous interventions per field-unit.

### H. Data Management:

Integrated data systems for both clinical support and development of informed policy and planning are central to sustainability. MAMASnet related systems are described in “Technical Description” document, separate cover. MAMAS will cooperate with GES (Global Education Systems) for selection of software, design of systems and university-industry collaboration.

## Local Network Plan for National Hub

Wireless Multimedia (internet, data, voice, etc)



### I. Transport:

MAMAS International proposes cooperation with “Riders for Health” for inclusion of Riders’ Transport and Vehicle Management System with MAMASnet Rural Dispatch. Washington State *Engineers Without Borders* and partners in Washington State will participate in assessment of needs, application of “Riders” programs for transport and maintenance in testbeds and outreach to establish a MAMAS-Riders model with US rider and industry support,



Riders for Health is an international non-governmental organization born out of the world of motorcycle racing. Its mission is to ensure that health workers in Africa have uninterrupted access to reliable transport. Without such transport, all health care projects fail. Using an innovative social enterprise model, Riders has developed a practical, dynamic approach that is helping to achieve real and sustainable development. They have put in place reliable maintenance systems for two- and four-wheeled vehicles used in health care delivery allowing health workers to reach rural villages time and time again.

### IV. Proposed Testbeds:

MAMASnet will be based onboard the Africa Mercy. MAMAS will focus on existing midwifery programs with assessment of communication, information and transport needs in pilot districts. Testbeds will demonstrate uses of telemedicine and health informatics which increase local capacity to train and manage rural obstetrical care (both routine and emergency) and, at the same time, provide opportunities for applied research by university and industry partners.

Availability of funding and other strategic considerations will determine the selection and sequencing of testbeds. The following districts are under consideration:

- Liberia: Bong
- Guinea: Labe
- Sierra Leone: Koinadugu
- Natal, South Africa: Kwazulu-Ingwavuma

Testbeds will include workshops, district demonstrations and planning for programs which address the “Three Delay Framework”, establishing governmental, university relationships and

technical capacity. Target populations can then be offered specialized trainings and professional development through partner universities, school-based networks and international agencies.

## V. Key Benefits of MAMASnet Strategy

MAMASnet addresses the essential elements for successful maternal mortality reduction:

- Collection of data in remote locations, its transmission to central processing facilities, the processing of data to extract desired information, and dissemination of raw data and post-processed information to stakeholders including research and evaluation.
- Efficient rural clinical health care delivery through the broadcast of training programs and performance review, remote diagnostics and consultation, faster triage and transport.
  - accessible electronic medical records database for each deployed system based on geographic region, with priority to maternal and child health records
  - supply chain management to include equipment, medicine and food through tracking, inventory and mapping applications.
- Community mobilization—locally produced radio tailored for education, public policy and planning within a human rights framework
- Outreach to international resources, relationships, extended education within a Global University System (GUS) international university network.

## VI. Next Steps:

**Phase I (months 1-3):** Design of long-term leadership structure to be based at University of Washington, Seattle, to include key partners (currently in process). Collaboration with Global University System (GUS) will frame strategy for regional university partnerships in Mano River Union countries identified during assessment missions. Submission of proposal for Phase I to include assessment trip (s) to Liberia by expert team to evaluate possible testbed site and to meet with MRU Secretariat, Ministries of Health in Liberia and Sierra Leone and local stakeholders about testbed design and university partners. Development of funding proposals will be created to support initial field cooperative design and preliminary demonstration testbed.

**Phase II (months 4-8):** Based on the trip (s) analyses, we will finalize agreements both for regional and international partnerships, and for bioengineering support in US, and install and test the technical system in a U.S. lab as a permanent counterpart to the systems installed in testbeds. We will design workforce and community trainings and set up monitoring and evaluation systems;

**Phase III (months 9-16):** We will install and run identical testbed technical systems in the two testbed districts. These will include development of clinical applications with appropriate connectivity. We will troubleshoot as needed.

**Phase IV (months 17-18):** Following review of testbed results (as per UN indicators) we will develop a plan for scaled systems, trainings, and operations in months 19-36.

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