Global Women's Health

LDE Thesis Lab 2025-2026

Universiteit Leiden

TU Delft

Erasmus University Rotterdam

Thesis Labs
Leiden-Delft-Erasmus Universities

The online version of this booklet and the student art works can be found via this QR code.

Contact:
LDE_ThesisLabs@cml.leidenuniv.nl

Foreword by Roos Oosting

Academic Coordinator

This booklet presents the collective work of our Thesis Lab, where we set out to explore how women's health can be improved across all stages of life, with a particular focus on global impact. Despite decades of medical progress, healthcare systems have historically been designed around the male body, resulting in critical gaps in knowledge about female biology.

Throughout this lab, we examined how women's health can be prioritized from maternal and child health to adult and elderly care. Central to our approach was an emphasis on digitalization, technological innovation, and sustainability, with the goal of translating insights into practical solutions for low-resource settings. The diversity of topics ,from postpartum hemorrhage and cervical cancer to femtech and safer surgical practices, reflects the urgency and breadth of challenges in this field.

It was a great pleasure to coordinate such a motivated group of students. Their work demonstrated a remarkable integration of social sciences, policy analysis, and engineering perspectives. Enrichment sessions encouraged critical reflection on positionality in global health research, health financing, and equitable access to care, while interactive activities with other labs broadened our collective understanding.

Beyond academic research, students also expressed their findings through artistic work, bringing creativity into dialogue with science,an inspiring combination that reflects the spirit of this lab!

I would like to thank the students, speakers, case holders, and all supervisors for their valuable contributions to this lab.

I have learned a great deal from all of you. I hope you enjoy reading and exploring the outcomes presented in this book.

Best regards,

Roos Oosting
Assistant Professor, Delft University of Technology
TU Delft Lab Biomedical Engineering for Global Health
www.bmeforglobalhealth.com

Meet the team!

From left to right:
Sahar Alsorawi, Miles Luxembourg, Nienke Loohuis, Roos Oosting (coordinator), Anneloor Memelink, Mina Brandt, Julia Sim, Keerthanapriyaa Kumaravel, Maureen van der Haar and Femke Paulis.

*"How can we **improve women's health** in low and high resource settings, with digitalization, (technical) innovation, and sustainability?"*

Did you know that?

Between 2000 and 2023, the maternal mortality ratio dropped by about 40% worldwide

Up to 80% of all Postpartum hemorrhage related maternal deaths occur in sub-Saharan Africa and South Asia.
The risk of death is 1 in 1,000 births in low- and middle-income countries, compared to 1 in 100,000 births in high-income regions.

Healths systems accross the world operate strikingly different, but the need for high quality care is universal

Follow-up adherence in oncology care is a major challenge, especially in low- and middle-income countries

Cervical cancer is preventable, yet it still kills more than 350,000 women each year.
~94% of its related deaths still happen in low- and middle-income countries.

Introduction

Women's health has historically been underrepresented in research, innovation, and healthcare design. As a result, significant knowledge gaps remain regarding the female body and the specific health challenges women face throughout their lives. These gaps affect not only the quality of life of women worldwide, but also have broader societal and economic consequences, particularly in low- and middle-income countries (LMICs).

The LDE Thesis Lab on Global Women's Health was established to explore how we can contribute to improving women's health across all stages of life. Special attention is given to the role of digitalisation, technological innovation, and sustainable healthcare solutions, with the ambition to create impact both locally and in low-resource settings around the world.

Over the past months, nine master's students from diverse academic backgrounds across Leiden University, Delft University of Technology, and Erasmus University Rotterdam have come together in this multidisciplinary lab. While each student pursued an individual thesis project within the broad field of global women's health, we simultaneously collaborated on a shared overarching challenge that united our different perspectives and areas of expertise.

Every two weeks, the group met to engage with experts and stakeholders working in gloabl women's health, exchange knowledge, and discuss ongoing research. These sessions provided valuable opportunities for critical reflection, interdisciplinary learning, and collaboration. By bringing together students from fields ranging from engineering and technology to health, science and policy, the lab fostered an environment in which different persepcetives could complement and strengten one another.

This booklet presents the outcome of our collective journey. It provides an overview of the individual thesis projects, the collaborative activities and discussions that shaped our work, and the insights we gained through interdisciplinary cooperation. Together, these contributions reflect our shared commitment to advancing global women's health and demonstrate the value of bringing together diverse disciplines to address complex healthcare challenges.


What will we do today?
• Who will write the recap of today?
• Name + place you were born
• Session Julia
• Speed date - Get to know each others research
• Brainstorm about group deliverable of the Lab
• Next time: March 7th at Lenzo medical – Prepare a 3 min pitch

Creating Awareness Through Art

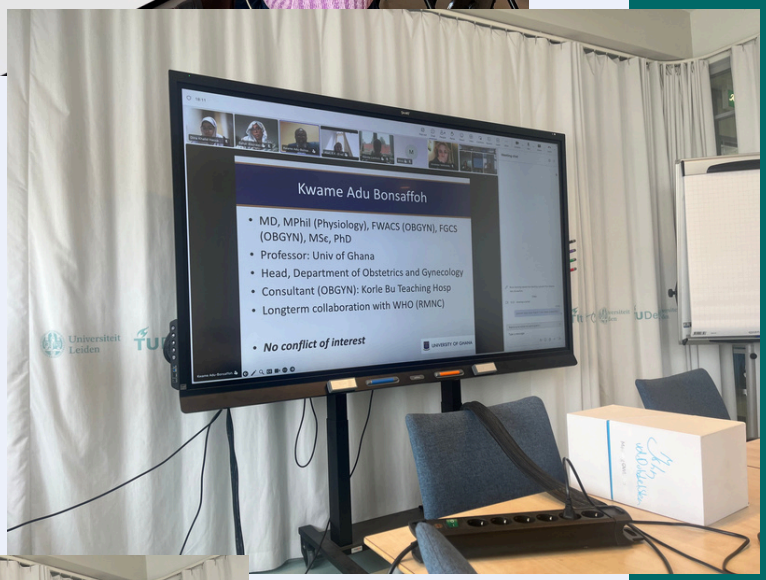
Alongside our individual thesis projects, we collaborated on a shared interdisciplinary initiative aimed at raising awareness about the challenges and inequalities that continue to shape women's health worldwide. While significant advances have been made in healthcare and medical research, many aspects of women's health remain underrepresented, underfunded, and insufficiently understood. These gaps affects millions of women across all stages of life and are often even more pronounced in low-resource settings.

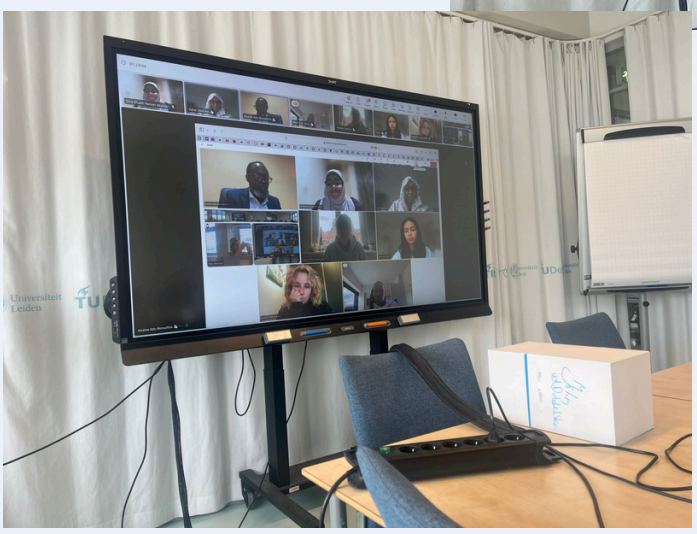
To explore these issues from different perspectives, we divided our lab into four groups, each focussing on a specific theme within global women's health. Drawing on scientific literature, expert insights, and our own research experiences, each group investigated the importance and societal relevance of its chosen topic:

1. The Expansion of the Global GAG rule
2. Closing the Cervical Cancer Care Gap
3. Comparing women's healthcare in the Netherlands and Curaçao
4. Data in Women's Health

Rather than communicating our findings through traditional academic formats alone, each group was challenged to translate its insights into an artistic expression. These artworks serve as a bridge between science and society, making complex and often overlooked issues more accessible, tangible, and engaging for a broader audience. We combine evidence-based information with creative storytelling to spark curiosity, encourage dialogue, and highlight the importance of prioritising women's health globally.

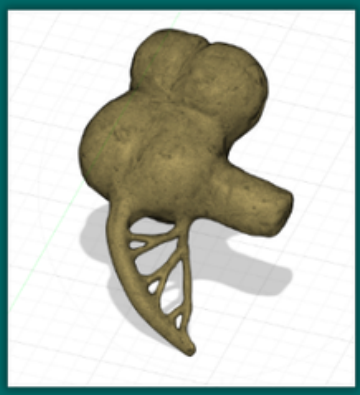
The artworks are accompanied by background information that explains the underlying challenges, their impact on women and society, and why greater attention is needed. Together, they form a collective effort to create awareness, stimulate reflection, and contribute to a broader conversation about achieving more equitable healthcare for women worldwide.


Kwame Adu Bonsaffoh
• MD, MPhil (Physiology), FWACS (OBGYN), FGCS (OBGYN), MSc, PhD
• Professor: Univ of Ghana
• Head, Department of Obstetrics and Gynecology
• Consultant (OBGYN): Korle Bu Teaching Hosp
• Longterm collaboration with WHO (RMNC)
• No conflict of interest



Surgical training model for LMIC: Laparoscopic Appendectomy

Nienke Loohuis
Biomedical Engineering
Questions? Contact me at naloohuis@gmail.com



Minimally invasive surgery, such as laparoscopic appendectomy, offers many benefits for patients, including faster recovery and fewer complications. However, access to laparoscopic traning remains limited in many low- and middle-income countries (LMICs). This project focused on developing an affordable surgical training model to support local capacity building and improve access to safe surgical care.

About the Project

In collaboration with the Kilimanjaro Christian Medical Care (KCMC) Hospital in Tanzania.

LMICs are in desperate need of surgical training models for laparoscopic procedures.

The model needs to identify the appendix, mesoappendix, and appendicular artery.

The model needs to allow basic surgical procedural steps of the laparoscopic appendectomy.

The model needs to be affordable and reproducible.

The model will be tested at Erasmuc MC, before being implemented in Tanzania.

The model is made through a hybrid design method: first made of clay, then digitalized and postprocessed to create a mould.

Model made from silicone.

TU Delft

K.C.M.C

Erasmus MC


Cervical
CANCER

Closing the Gap After HPV Positivity:

A Mixed-Methods, Population Health Management-Informed Study and Follow-Up Prioritization Prototype for Cervical Cancer Screening Completion

Sahar Alsorawi
MSc Population Health Management
Leiden University
Questions? Contact me at [s.m.asahar@hotmail.com]

Why it matters

Cervical cancer is preventable, yet it still kills more than 350,000 women each year, mostly in low- and middle-income countries. In Uganda, where the burden is among the highest worldwide, HPV self-sampling has successfully brought screening closer to women. But screening is only the first step. Many women are still lost after receiving a positive HPV result, before follow-up care can happen.

What I did

Using a mixed methods design combining routine data from 6,974 women in the PRESCRIP-TEC Uganda program with health workers & program staff ; this study identified where the cervical screening pathway breaks after HPV self-sampling. The findings were used to design a Population Health Management traffic-light prototype that prioritises follow-up using three layers: clinical safety flags, pathway gaps, and support-to-attend barriers.

Findings & Recommendations

Screening reached women:
97.8% completed HPV self-sampling.

Bring follow-up closer through outreach or mobile clinics where feasible.

The main gap came after a +ve result:
41.1% of HPV+ women had no documented follow-up

Use a red/amber/green feasible action sheet to prioritise follow-up before digitization

Care worked when women arrived:
98.8% of attenders had management recorded.

Act fast for clinical safety flags and unresolved HPV+ cases.

Women were not simply "refusing":
transport, fear, stigma, household support gaps all mattered.

Support health workers with counselling scripts, reminders, transport planning, and weekly review.

A positive HPV test should start action , not become a missed opportunity for prevention.

PRESCRIP TEC

Female Cancer Foundation

LUMC

Universiteit Leiden

Designing for Continuity in Cervical Cancer Screening

A Mixed-Methods Socio-Technical Study of Screening Pathways in LMICs

Keerthanapriyaa Kumaravel
MSc Management of Technology, TU Delft
Questions? Contact me at kpkeerthanapriyaa@gmail.com

The Challenge

Cervical cancer remains one of the most preventable causes of cancer-related mortality among women in low- and middle-income countries. While HPV self-sampling has improved access to screening, many women do not continue through follow-up, diagnosis, and treatment after receiving a positive result

Methods

A mixed-methods approach combined quantitative pathway analysis with qualitative interviews involving women, healthcare workers, programme managers, and experts. Findings were integrated to understand behavioural, organisational, and socio-technical factors influencing continuity of cervical cancer screening and follow-up care.

Key Findings

- Uganda: 61.9% follow-up, 10.6% management documented
- Bangladesh: 99.4% follow-up, 81.1% management documented
- Most continuity loss occurred after HPV-positive identification
- Fear, low HPV understanding, family influence and access barriers reduced follow-up
- CHWs, trusted communication and repeated follow-up improved continuity

Research Question

Why do women discontinue cervical cancer screening pathways after HPV-positive results, and how can continuity be strengthened?

Recommendations for CCE

- Train local women as Community Continuity Champions to support awareness, reminders, household engagement and follow-up navigation.
- Use CHWs and trusted healthcare workers for counselling, result explanation and emotional support after HPV-positive results.
- Pilot local-language voice support and anonymous question services, with escalation to healthcare workers when needed.
- Maintain HPV-positive follow-up registers or dashboards so women remain visible across pathway stages.

Continuity is not an individual behaviour, it is a socio-technical capability shaped by people, programmes, and technologies.

Screen, Prevent, Protect.

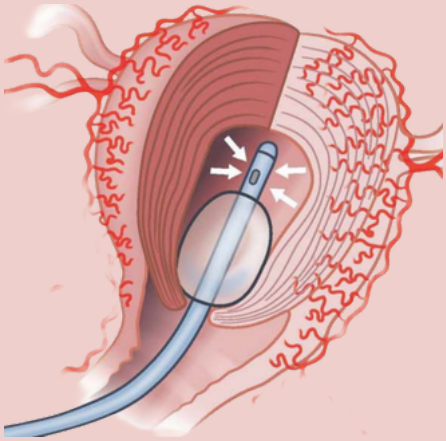
A healthier future for every woman

TU Delft Female Cancer Foundation

Repurposing vela™ vacuum pump -
a manual vacuum pump for postpartum hemorrhage management

Miles Luxembourg
MSc Biomechanical Design TU Delft
Questions? Contact me at milesikes@gmail.com

Postpartum hemorrhage (PPH) is excessive bleeding after childbirth and remains to be the leading cause maternal deaths worldwide, with the majority occuring in low- and middle-income settings. Most cases are caused by uterine atony, where the uterus fails to contract and compress the bleeding vessels. In the last 10 to 15 years research into a new method to manage bleeding was done where negative pressure to promote the uterus's contraction is applied. This research investigates whether LAYCO Medical's reusable, manual vela™ vacuum pump can be repurposed as the vacuum source for this type of PPH management.



Incentive

The WHO has explicitly called for additional research into tamponade devices for PPH management. This is particularly relevant in low- and middle-income settings, where a stable power supply cannot always be guaranteed.

Requirements

A set of 11 requirements for vacuum-induced PPH management for a manual vacuum source was identified and validated with three OB/GYN experts.

Method & Design

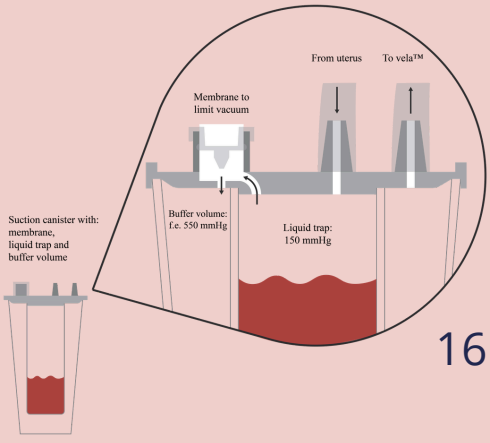
Benchmark testing with the vela™ vacuum pump revealed gaps that formed the basis for design recommendations. A silicone membrane was added to the suction canister to limit maximum vacuum and stabilise applied vacuum during treatment. Additionally, a silicone uterine model was developed for realistic simulated testing.

Findings

- Membrane limits maximum vacuum toward 150 mmHg, where thickness determines maximum.
- Buffer volume behind the membrane increases vacuum stability and reduces re-pump frequency.
- Simple and fully reusable design

Recommendations

- Further research into realistic validation can be done
- More work into making the design plug-and-play while ensuring air tightness
- The influence of design parameters of the membrane can be further clarified



LAYCO TU Delft

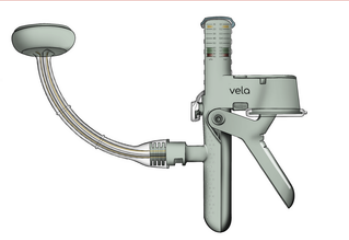
Implementation of reusable devices: vela™ vacuum pump

A manual reusable vacuum pump: cost efficacy and sustainability

Anneloor Memelink
MSc Technical Medicine
Questions? Contact me at Anneloor.memelink@home.nl

The successful introduction of a new reusable medical device, such as vela™ vacuum extractor, relies on more than just technical compliance. Clinical outcomes depend on a continuous lifecycle involving both medical experts and logistical staff.

Furthermore, reusable devices offer immense global potential. In resource-limited settings like Suriname, disposable vacuums are often financially and logistically unattainable. The current vacuum extractor (VE) used during my clinical rotation at the Academic Hospital in Suriname is shown in the figure.



The reusable vela™ provides a cost-effective and sustainable alternative, reducing environmental waste while improving global obstetric care. Before introducing vela™ in a multi-center Post-Market Clinical Follow-up (PMCF) study, a comprehensive baseline and implementation strategy was developed.

This research aimed to show the current clinical standard of care, quantify the mechanical risks of traction forces, and validate the usability of the device for both clinical users (gynecologists) and logistical users (CSSD staff)

Findings & Recommendations

The Clinical Baseline:

Retrospective data (N=211) established the current standard of care using disposable cups in 2025 at the LUMC. Documenting these specific success and complication rates provides a clear, localized benchmark to evaluate future clinical performance and safety in the upcoming PMCF study.

The need of training

Validating the training material with the two user groups (clinical and logistical) indicated that simply handing over a new device to professionals is insufficient; both user groups require targeted instruction to ensure safe procedural and logistical outcomes.

The Technical Baseline:

Simulated traction testing suggested that suboptimal cup placement and incorrect pulling angles could substantially reduce effective pulling power. This might increase the risk of mechanical failure and neonatal trauma.

Global impact

This validated implementation blueprint could support the introduction of vela™ device worldwide striving to combine high-quality maternal care with cost efficacy and sustainability.

LAYCO

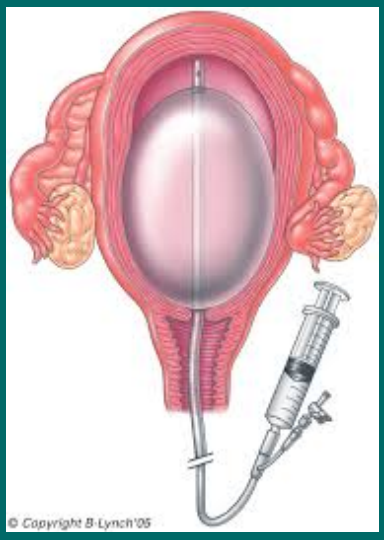
LUMC Leids Universitair Medisch Centrum

TU Delft

Redesign of Intrauterine Balloon Tamponade for Low-Resource Settings

Femke Paulis
MSc Biomedical Engineering TU Delft
Questions? Contact me at femkepaulis@gmail.com

Postpartum hemorrhage (PPH), defined as excessive blood loss after childbirth, is one of the leading causes of maternal mortality, especially in low- and middle-income countries. Intrauterine balloon tamponade (UBT) is an intervention to manage PPH. The balloon is inserted into the uterus and inflated to apply pressure compressing the blood vessels and supporting uterine contraction. UBT can be an effective and simple intervention, but current devices are not always well suited for low-resource settings. This project explores how the design of a balloon tamponade device can be improved for low-resource use, with a focus on simplicity, affordability, anatomical fit, and ease of use.



Clinical need

PPH causes up to 25%-43% of maternal deaths, resulting in roughly 70,000 maternal deaths every year. More than 80% of all PPH-related maternal deaths occur in sub-Saharan Africa and South Asia, where access to timely obstetric care, blood transfusion, medical devices, and trained personnel is often limited. UBT can provide a simple mechanical method to control bleeding, especially where rapid access to surgery is limited. However, existing devices are expensive, unavailable, difficult to assemble, or poorly adapted to low-resource contexts. This creates a strong clinical need for a low-cost, accessible, and easy-to-use UBT device that can provide reliable tamponade in emergency PPH management.

Findings

Accessibility and affordibility

Current UBT devices cost upwards of $200–300 per unit, placing them out of reach for many facilities in low- and middle-income countries where PPH is most prevalent.

Assembly complexity

Multi-step assembly under emergency conditions is a failure cause, especially where operator experience varies.

Design directions

Low-cost design

The redesign focuses on widely available materials and simple manufacturing methods, enabling local production without specialized equipment.

Simplicity and easy of use

The redesign focuses on assembly simplicity and easy of use, so that the device can be deployed quickly, correctly and intuitively under stressful conditions.

This project took a design-driven approach combining anatomical analysis, silicone casting from 3D-printed molds, and low-cost component selection. A prototype was developed and tested for initial verification and validation of the design concept. Future research should focus on more realistic testing models, optimized balloon geometries, and implementation in low-resource settings.

Framing data justice in digital maternal care in Kenya

Julia Sim
Digitalisation in Work and Society
Questions? Contact me at 706985js@eur.nl

MomCare, a digital health programme in Kenya, aims to improve maternal health outcomes through behavioural data collected via mobile platforms. As it prepares to scale, a key question emerges: how do we ensure these data practices are fair and trusted by the women they serve? Drawing on 13 in-depth interviews with programme implementers, clinicians, and policymakers, this thesis explores what responsible data use looks like in the Kenyan context, and how getting it right is essential to the quality of care MomCare promises to deliver.

AI Image by PharmAccess

Findings

Consent is relation, not transactional.

Formal consent forms are not enough. Trust built through community health workers, not paperwork, is what actually determines whether data sharing happens.

Household instead of individual unit of data legibility.

Phone ownership in Kenya is gendered and shared. Data collected from a device often represents a household, not the individual woman the programme intends to track.

Purpose drift is structural: not accidental.

Data collected for one purpose consistently risks drifting into others, without anyone intending it. The cost falls hardest on the most vulnerable.

Recommendations

Redesiging consent.

Build in visible benefit return, ongoing withdrawal rights, and community input into what gets collected, before collection begins, not after.

Aligning data architecture with local social structures.

Design data collection methods (like timing, device-sharing patterns) around how households and communities actually use technology, not around individual-user assumptions.

Operationalise purpose limitation to programme level

Make explicit, documented boundaries on what each data stream can and cannot be used for, before integration, not as a fix afterward.

Evaluation of the HOPE Programme on Follow-up among Breast Cancer Patients at Peace and Love Hospital, Ghana

Maureen van der Haar
MSc Medicine
Questions? Contact me at maureenvanderhaar@gmail.com

Follow-up adherence in oncology care is a major challenge, especially in low- and middle-income countries (LMICs), where interruptions in care negatively impact patient survival. Peer support has proven effective in improving retention and health outcomes globally. The **HOPE (Helping Others through Personal Experience)** programme at a the Peace & Love Hospital in Kumasi, Ghana, deploys breast cancer survivors to support newly diagnosed patients throughout their care trajectory. This study describes the follow-up patterns and experiences of breast cancer patients enrolled in the HOPE programme.

Picture: © Breast Care International taken during the Walk for the Cure organized by BCI to create awareness for breast cancer in Ghana

Methods

Methods used in this study were **record review** for data on early and late follow-up and **questionnaires** for data on patient experiences

Recommendations

A notable proportion of patients that filled in the questionnaire experienced gaps in care, with financial and logistical barriers most commonly cited as reasons for missed visits.

These findings highlight that peer support alone may be insufficient to ensure long-term retention, and that a **broader, structural approach to healthcare** is needed to improve continuity of care.

Results

Descriptive analyses showed that early follow-up completion was high (77%), while long-term retention proved more challenging, with 60.1% of patients classified as lost to follow-up, consistent with patterns reported in comparable settings.

Subgroup analyses revealed one significant finding: patients with a partner had significantly higher early follow-up completion than those without, suggesting that social support may facilitate early return to care.

Experiences with the HOPE programme were largely positive, with all questionnaire respondents reporting feeling encouraged to attend appointments.

Our wishes for Global Women's Health...

Sahar: *"May no woman be called 'lost to follow-up' when the system has not yet found a way to reach her."*

KP: *"I wish that healthcare innovation begins with understanding people and systems, not only developing technologies."*

Julia: *"In global women's health, data should serve women, not the other way around"*

Miles: *"I hope affordable and reusable medical devices become the norm rather than the exception."*

Femke: *"Better care for women is not only about innovation. It is about making sure that innovation is simple, accessible, and useful in real clinical settings."*

Anneloor: *"Where a mother gives birth shouldn't determine the safety of her delivery. Let's try to make global women's health as equal as possible"*

On March 14th we held a Round Table to discuss health system challenges in Sudan, Uganda, Malawi, Ethiopia and The Netherlands. We learned how strikingly different healths systems operate accross the world, but that the need for high quality care is universal.


What will we do today?
• Who will write the recap of today?
• Name + place you were born
• Session Julia
• Speed date - Get to know each others research
• Brainstorm about group deliverable of the Lab
• Next time: March 3rd at Lavoie medical - Prepare a 2 minute

Universiteit Leiden

TU Delft

Erasmus University Rotterdam

Thesis Labs
Leiden-Delft-Erasmus Universities