SP.718 Special Topics at Edgerton Center: D-Lab Health: Medical Technologies for the Developing World
Spring 2009

CIMIT®
Center for Integration of Medicine & Innovative Technology

CIMIT GHI

User and Setting-Driven Innovations to Advance Global Healthcare

Aya Caldwell

March 2009

OUTLINE

- CIMIT/GHI Overview
- Background
- Neonatal Resuscitation Program
- “Car Part” Incubator

CIMIT's Core Business: Fund and facilitate the most innovative clinicians/technologists to impact patient care

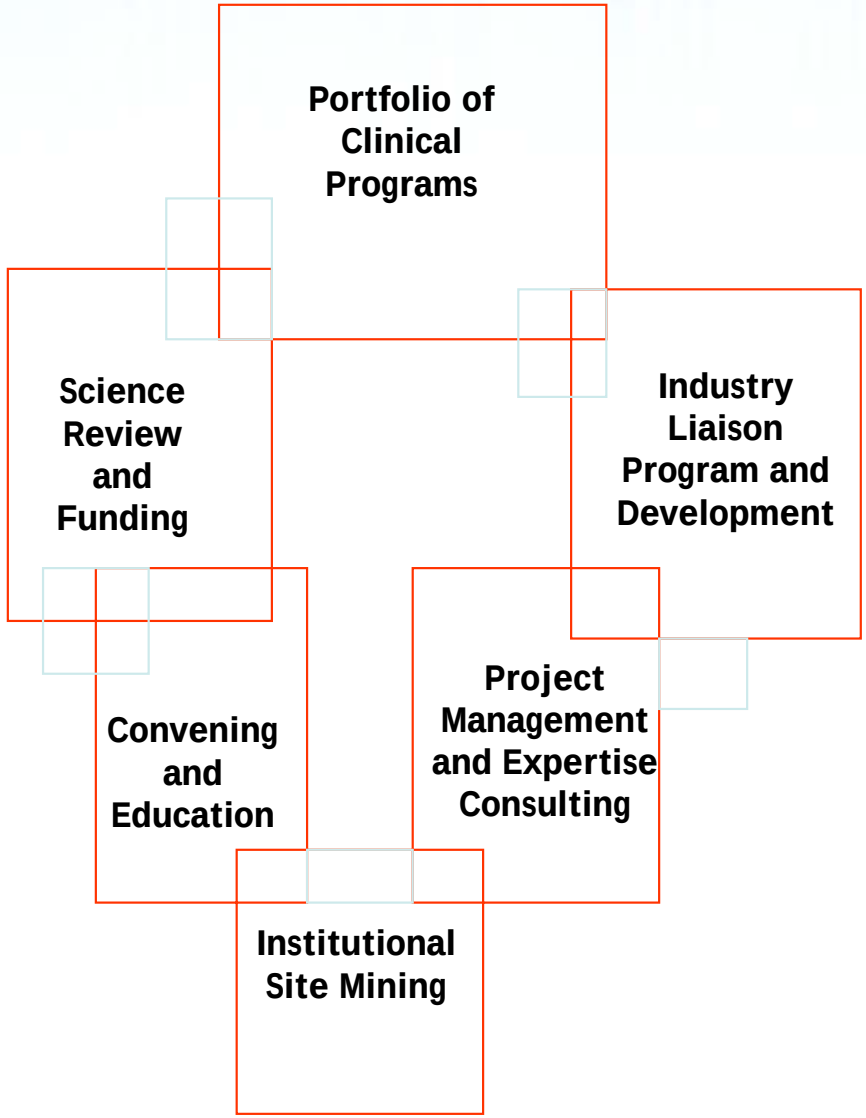
CIMIT Members: Sources for Clinical Needs and Innovation

Problem Rich Environments

- Massachusetts General Hospital
- Beth Israel Deaconess Medical Center
- Children's Hospital Boston
- Boston Medical Center
- Newton-Wellesley Hospital

Solution Rich Environments

- Massachusetts Institute of Technology
- Boston University
- Draper Laboratory



CIMIT PARTNERS: Pathway to Commercialization

Alliances

- Academia
- Government
- Foundations
- NGOs

Entrepreneurship

- Business Schools
- Angels/VCs
- Mentor Programs

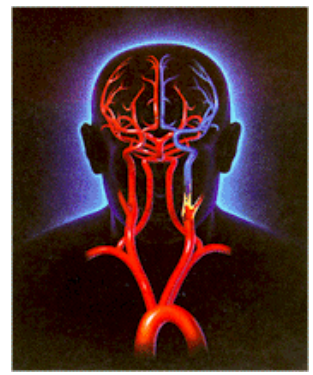
Industry Partnerships

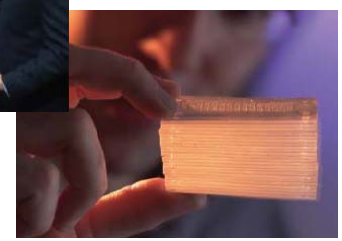
- Small start ups
- Large corporations
- Non Healthcare Businesses (Co-development and Licenses to Industry)

WHAT WE DO

Focus by clinical area….*to diagnose and treat illness*

- Bio-detection & Sepsis
- Biomaterials and Tissue Engineering
- Cardiovascular Disease
- Image-Guided Therapy
- Inhalation Technology
- Global Health Initiative
- Minimally Invasive Surgery (NOTES)
- NeuroTechnology
- Simulation
- Trauma and Casualty Care
- Optical Diagnostics





*Natural Orifice Transluminal Endoscopic Surgery

CIMIT 2010 Grants & Awards

- http://www.cimit.org/grants.html
- CIMIT Grants support early stage, collaborative research projects for improving patient care, with emphasis on devices, procedures, diagnosis, and peri-procedural systems.

TITLE	PRIZE	DEADLINE
Primary HeathCare Prize	10 finalists: $10k	1/15/2009
	Top 3 finalists: $150k; $100k; $50k	
Science Grants	Small Science: up to $40k	2/15/2009
	Medium Science: up to $100k	
Clinical Systems Innovation Grants	$100k	2/15/2009
Young Clinician Award	$50k	5/31/2009
Career Development	$50k	5/31/2009
Medical Engineering Fellowship	$55k for stipend and tuition	Oct-09
(graduate level)	$500 for travel	Oct-09
PIPELINE		**SOLICIT**
Working Group Grant	unknown	Jul-09
Fast Forward Grant	$25k	Jul-09
New Concept Grant	$25k	Jul-09

CIMIT's Global Health Initiative (GHI) Mission

To improve the effectiveness of health care providers in low-income settings by developing sustainable technologies and targeted training

GHI Vision: Clinical Focus and Training

Work with local resources to identify clinical needs, establish training and health outcome measures, and improve clinical processes

Clinical Priorities:

Maternal-Child Health

- Set as international priority in the Millennium Development Goals (MDGs) #4 and #5
- "Blind spot" field in global health, but gaining increasing interest and attention
- Appropriate medical technologies needed to augment lagging clinical care

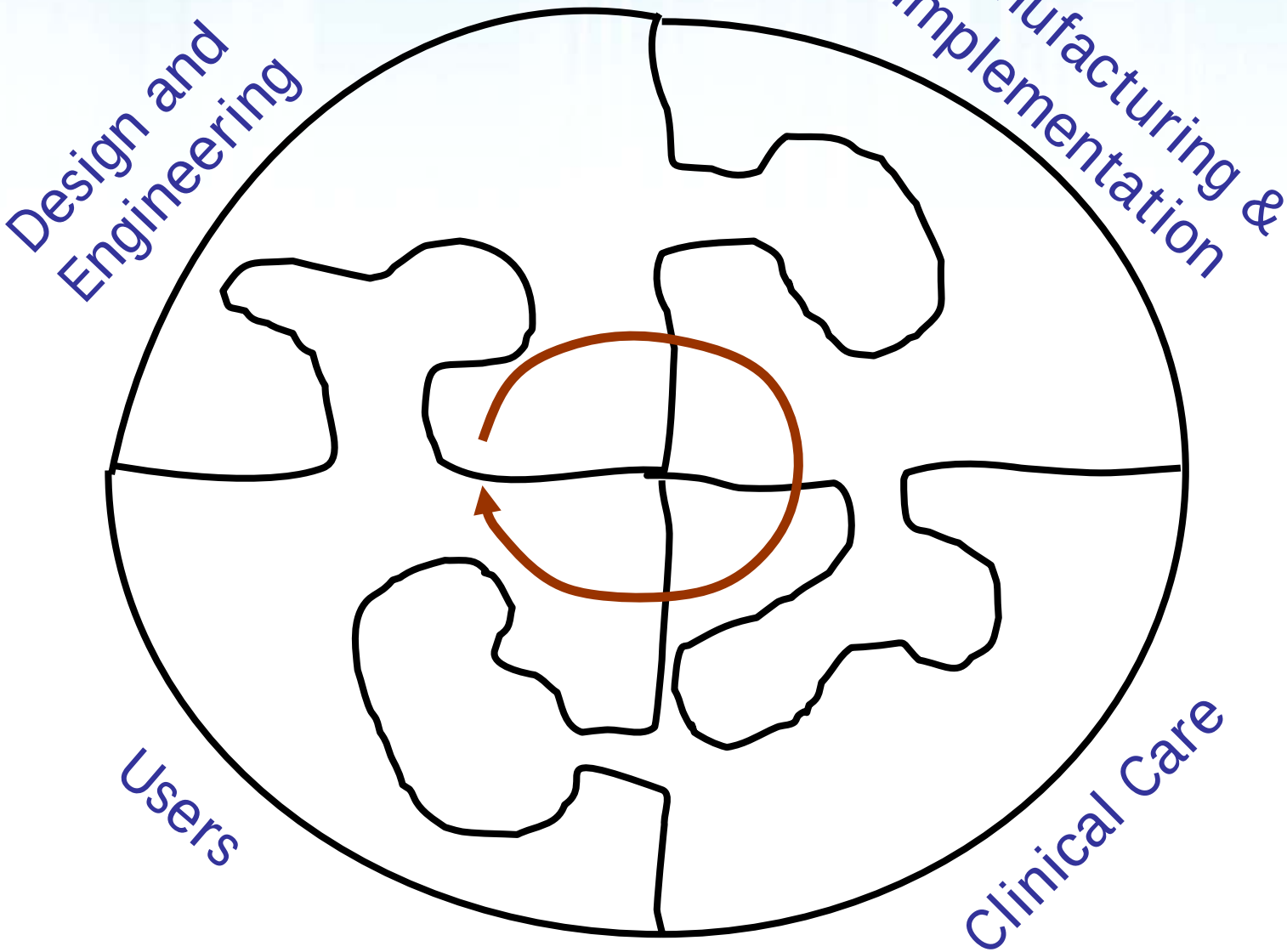
Diagnostics

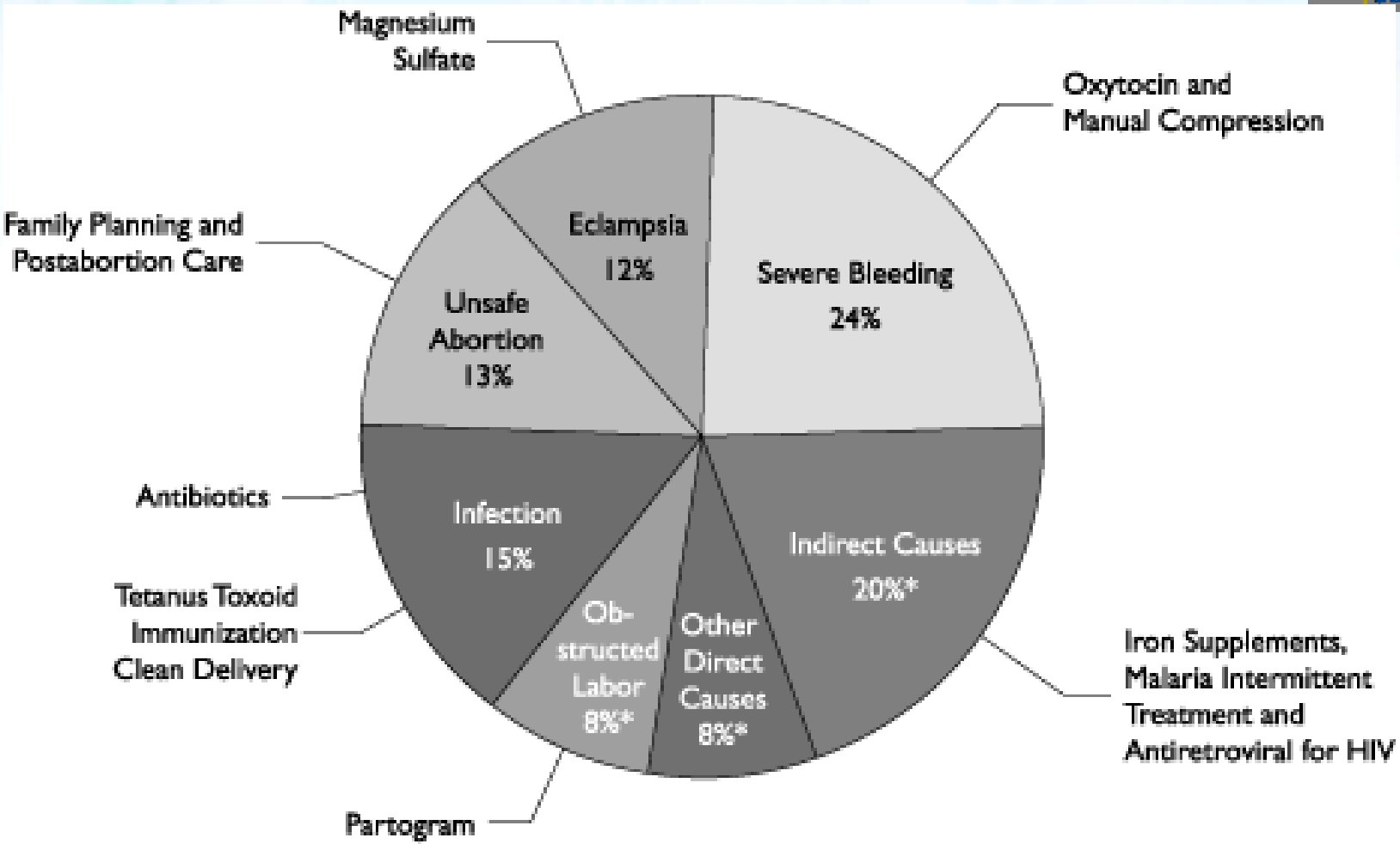
- Leverage already funded microfluidic, nanotechnology point-of-care diagnostic projects and capabilities
- Focus on key design features and attributes

Training

- Develop and implement curricula to augment the continuum of care and establish outcomes for health care providers

GHI


Design and Engineering
Manufacturing & Implementation
Users
Clinical Care



*Other direct causes include: ectopic pregnancy, embolism, anesthesia-related

*Indirect causes include: anemia, malaria, heart disease

- ¾ of Maternal death preventable
- Post Partum hemorrhage causes anemia – 1.6 million
- Pre eclampsia and eclampsia: high blood pressure and convulsions

Figure 1.2 Neonatal and maternal mortality are related to the absence of a skilled birth attendant

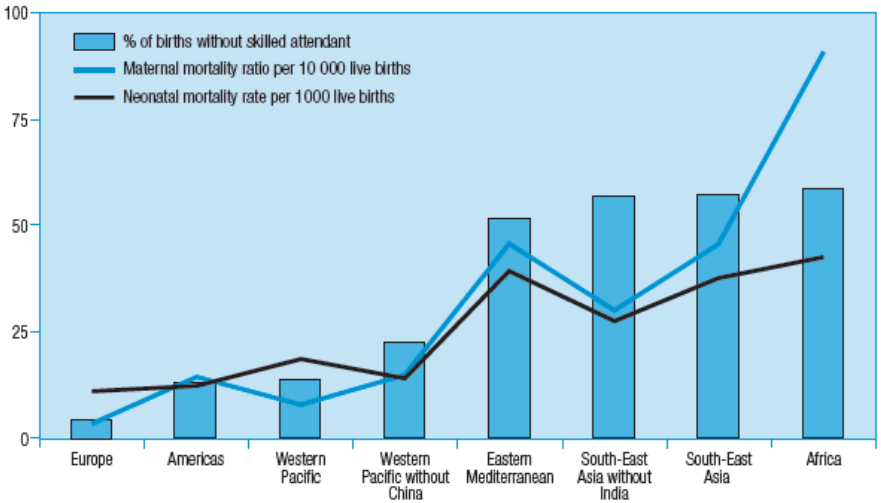


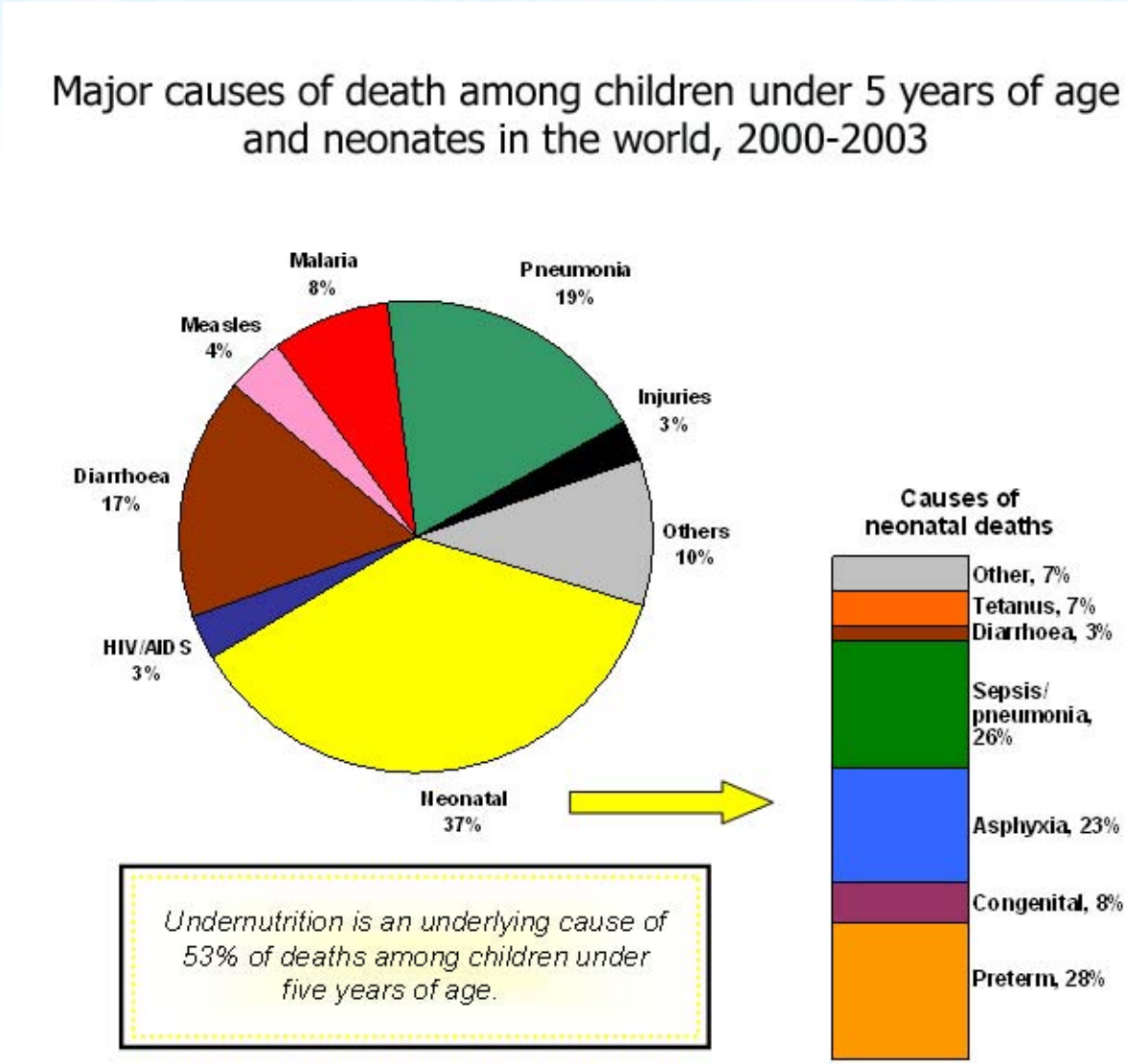
Table 4.1 Incidence of major complications of childbirth, worldwide

Complication	Incidence (% of live births)	Number of cases per year	Case-fatality rate (%)	Maternal deaths in 2000	Main sequelae for survivors	DALYs lost (000)
Postpartum haemorrhage	10.5	13 795 000	1	132 000	Severe anaemia	4 418
Sepsis	4.4	5 768 000	1.3	79 000	Infertility	6 901
Pre-eclampsia and eclampsia	3.2	4 152 000	1.7	63 000	Not well evaluated	2 231
Obstructed labour	4.6	6 038 000	0.7	42 000	Fistula, incontinence	2 951

From http://www.who.int/whr/2005/en/, accessed October 2009. Courtesy of the World Health Organization. Used with permission.

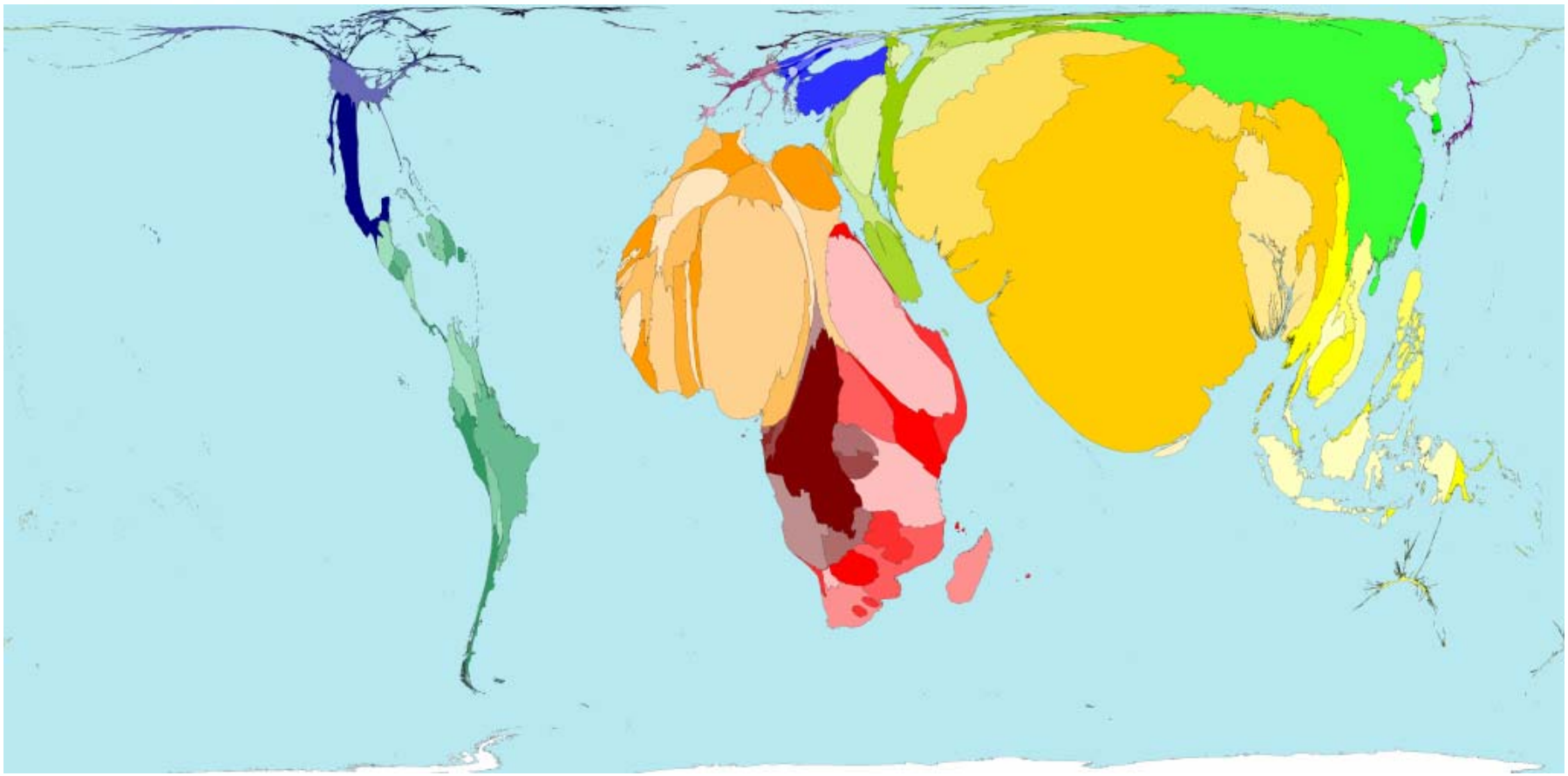
http://www.who.int/whr/2005/whr2005_en.pdf
- Every Child and Mother Count

Image removed due to copyright restrictions.
Source: UNICEF. "World map of Maternal mortality ratios (MMR) per 100,000 live births (2005).”
From "Progress for Children: A World Fit for Children Statistical Review." Number 6, December 2007.



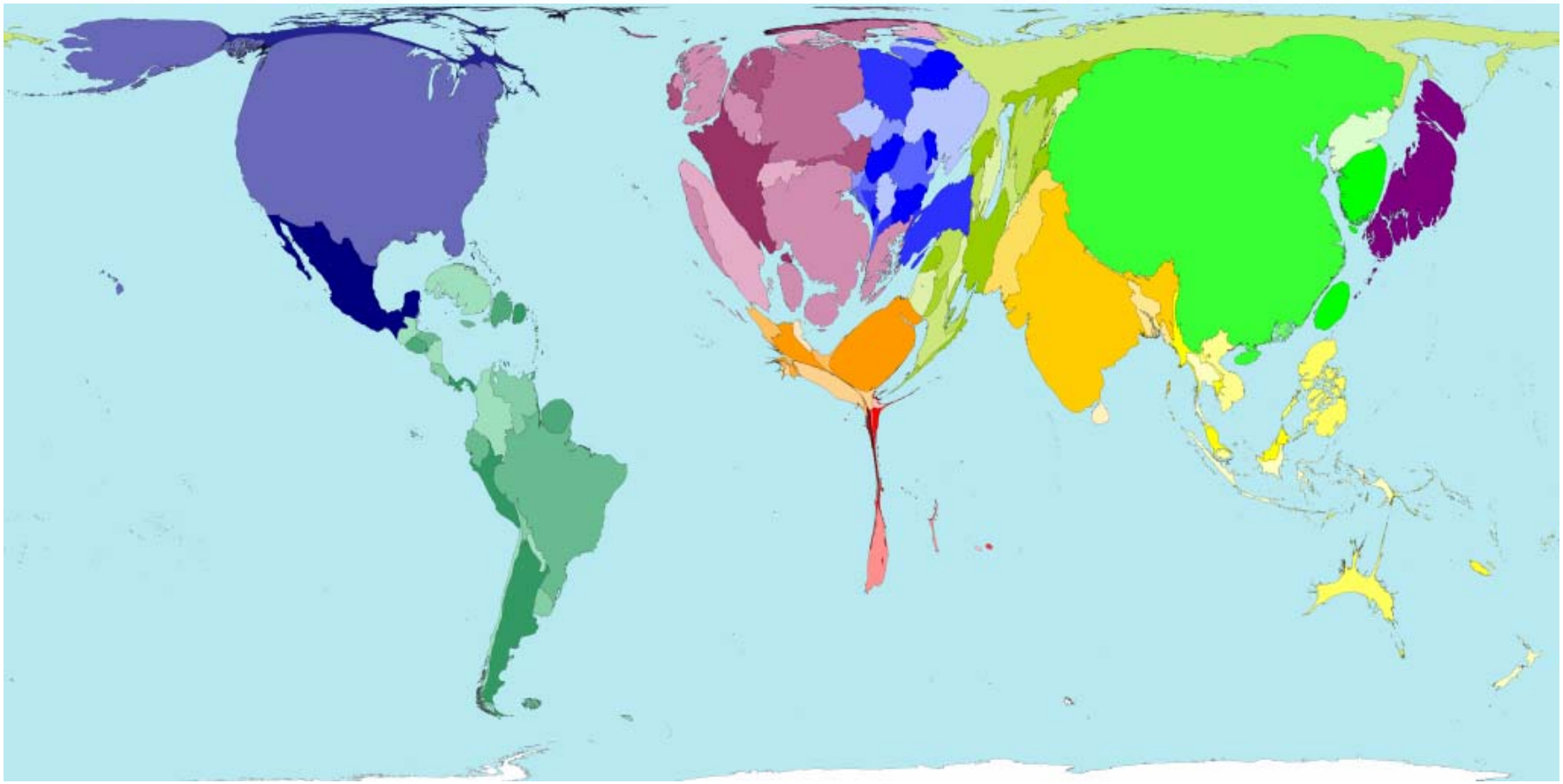
From "Fighting the 'Silent Epidemic.'" *Bulletin of the World Health Organization* 83, no. 4 (April 2005); 241-320. Courtesy of the World Health Organization. Used with permission.

Early Neonatal Mortality



*www.worldmapper.org Poster 260

Doctors working

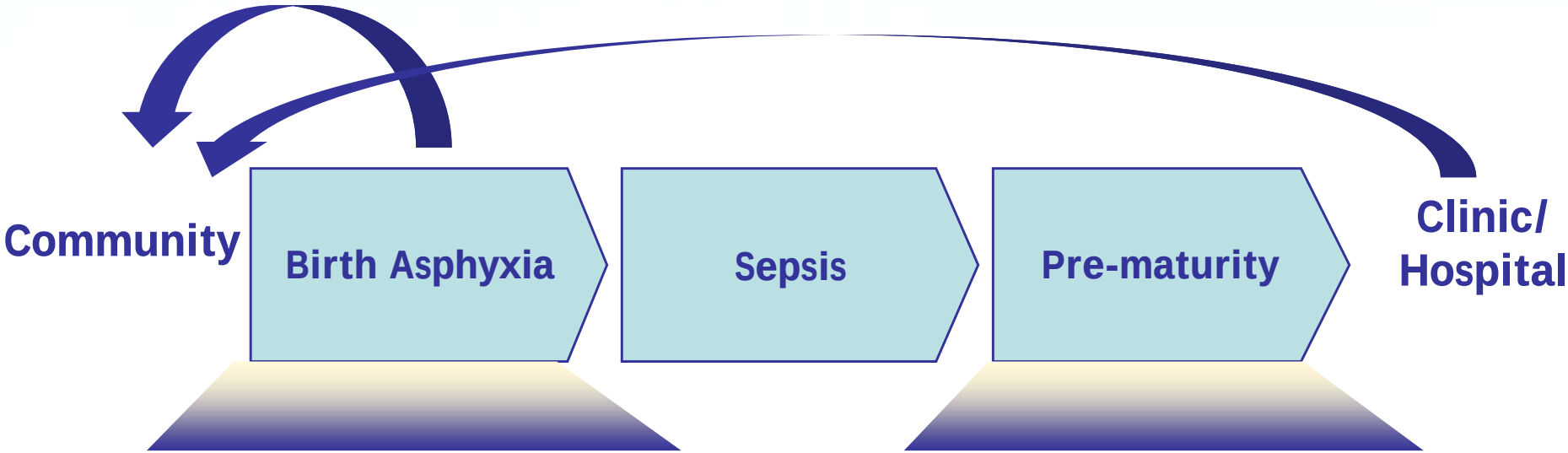


*www.worldmapper.org Poster 260

Thirty-three week premature newborn in Burmese refugee camp.

GHI Vision: Clinical Focus and Training

Improving clinical care is required to realize a greater than 50% reduction in 4 million annual neonatal deaths.*



CATALYST
TECHNOLOGIES &
TRAINING

Darmstadt, GL et al. Evidence-based, cost-effective interventions: how many newborn babies can we save? Lancet 2005; 365: 977-88.

Resuscitation Device

Tekno tube & mask

Laerdal® paediatric pocket mask

Topster® bag & mask

Ambu® bag & mask

FROM: PATH/SNL/Indonesian MOH Unpublished Study

Midwife Training in Indonesia

Healthy 57 Day Baby After Resuscitation

Technology as a symbol of medical sophistication

GHI

Broken Incubators in Katmandu:

95% of medical equipment in public hospitals in developing world is donated and more than 80% of these are non-functional within 5 years

Donated incubator from France in Aceh, Indonesia. 6 of 10 these donated devices were non-functional within 3 years

Challenge:

To potentially improve health care for 4 million babies who may need a source of thermoregulation often lacking in resource limited settings. Is it possible to leverage the existing parts supply and technical understanding of local car mechanics in poor countries to create an incubator?

Broken Incubators in Katmandu, Nepal

Photo courtesy of Design that Matters, Inc. Used with permission.

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Auto repair yard in rural Benin – often the most skilled labor resource

Process:

In 2007 CIMIT's Global Health Initiative (GHI) partnered with Design that Matters (DtM) and along with volunteers from IDEO and Rhode Island School of Design deconstructed a Toyota 4 Runner along with off the shelf parts to explore the feasibility of building a low cost incubator from locally available parts.

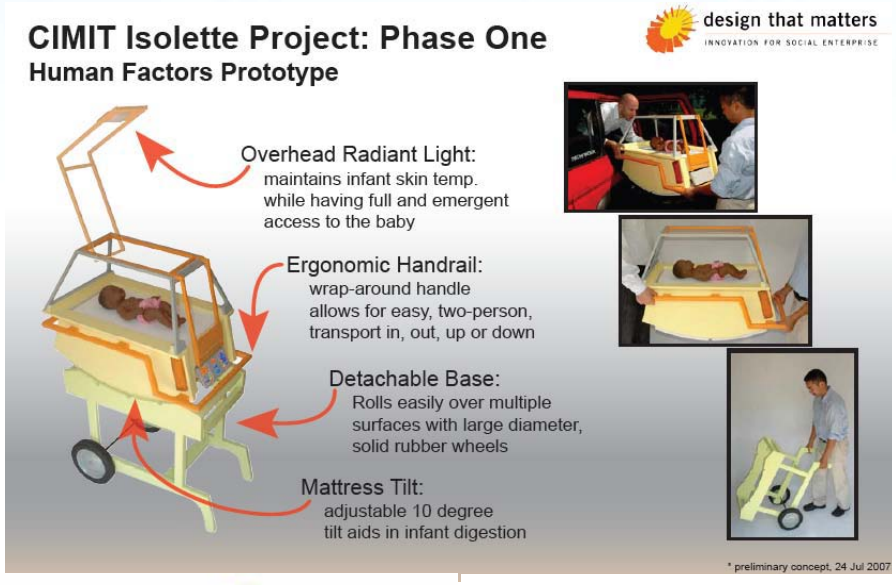
Operational Toyota 4 Runner

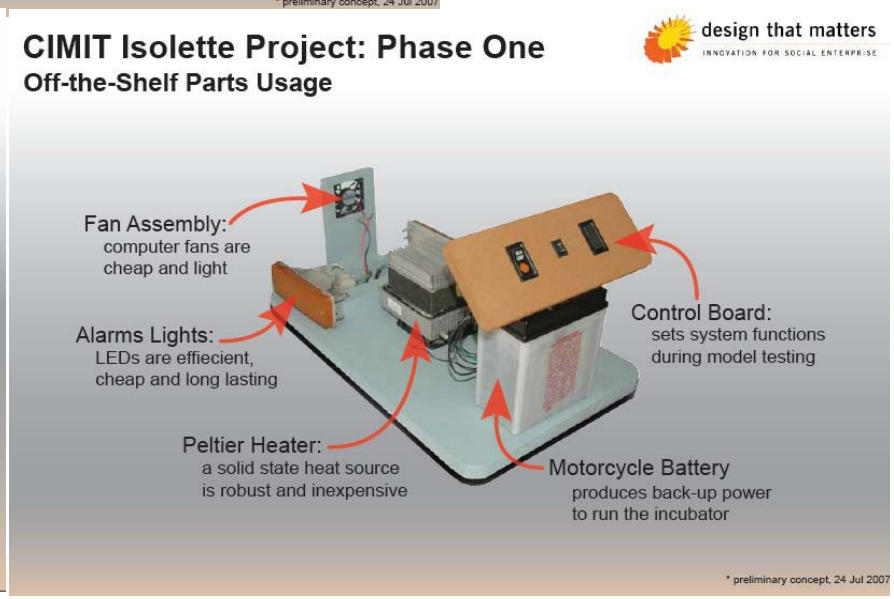
Assembled team – Dr. Kris Olson (bottom left) and Timothy Prestero (second from the bottom left)

Photos courtesy of Design that Matters, Inc. Used with permission.

Results:

Incorporated human design factors for user-friendliness. Automotive parts are capable of being repurposed to produce heat, light, air, convection, a power reservoir, as well as auditory and visual alarms.





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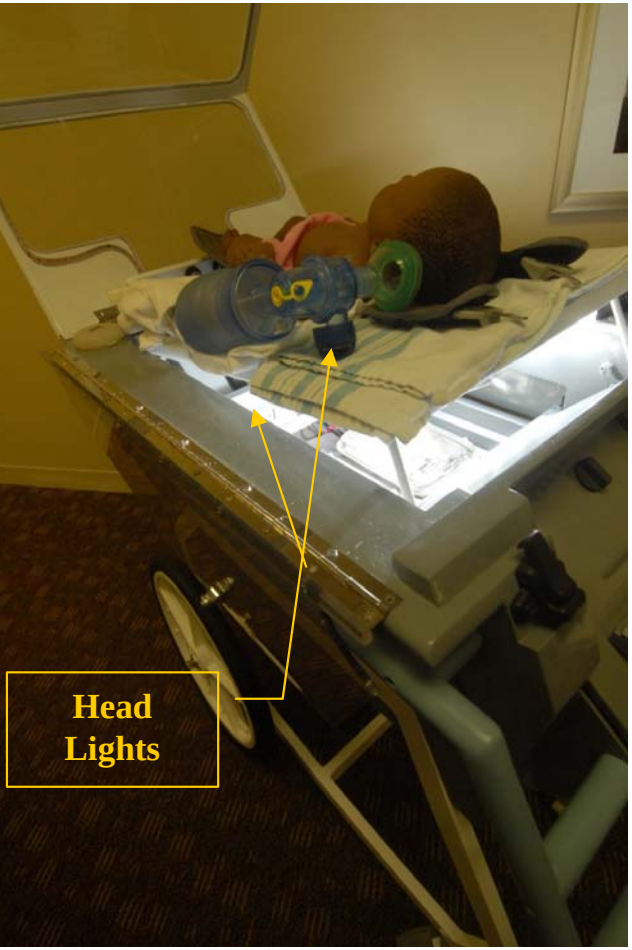
Results Continued:

User Stimulated Maintenance: Air filter – visible to users; Headlights – intuitive to fix if broken

Uses: Incubator, Warming Table, and Blanket Warmer Drawer



Photography by Joshua Touster

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