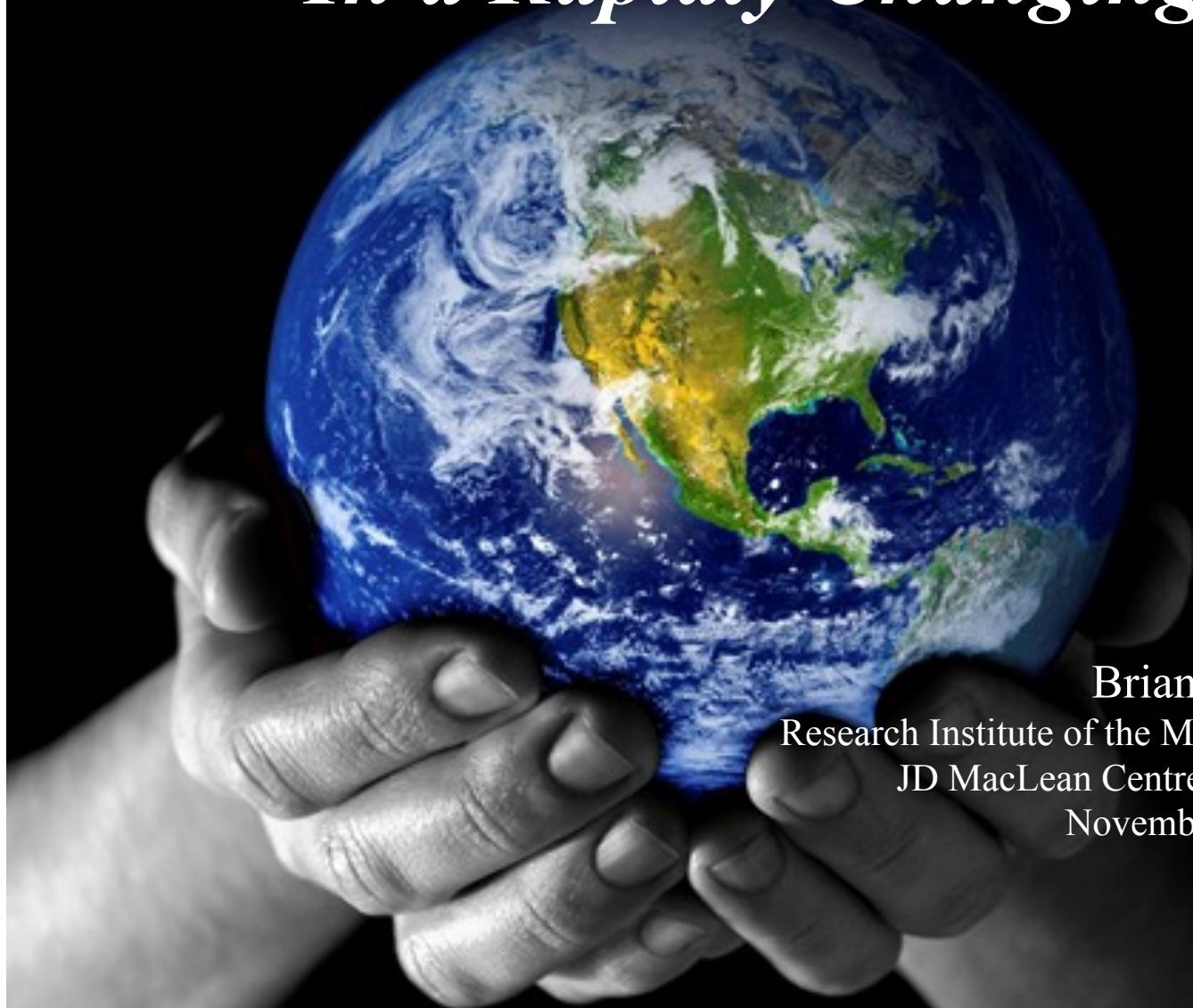


Research Challenges & Opportunities In a Rapidly Changing World



Brian J Ward

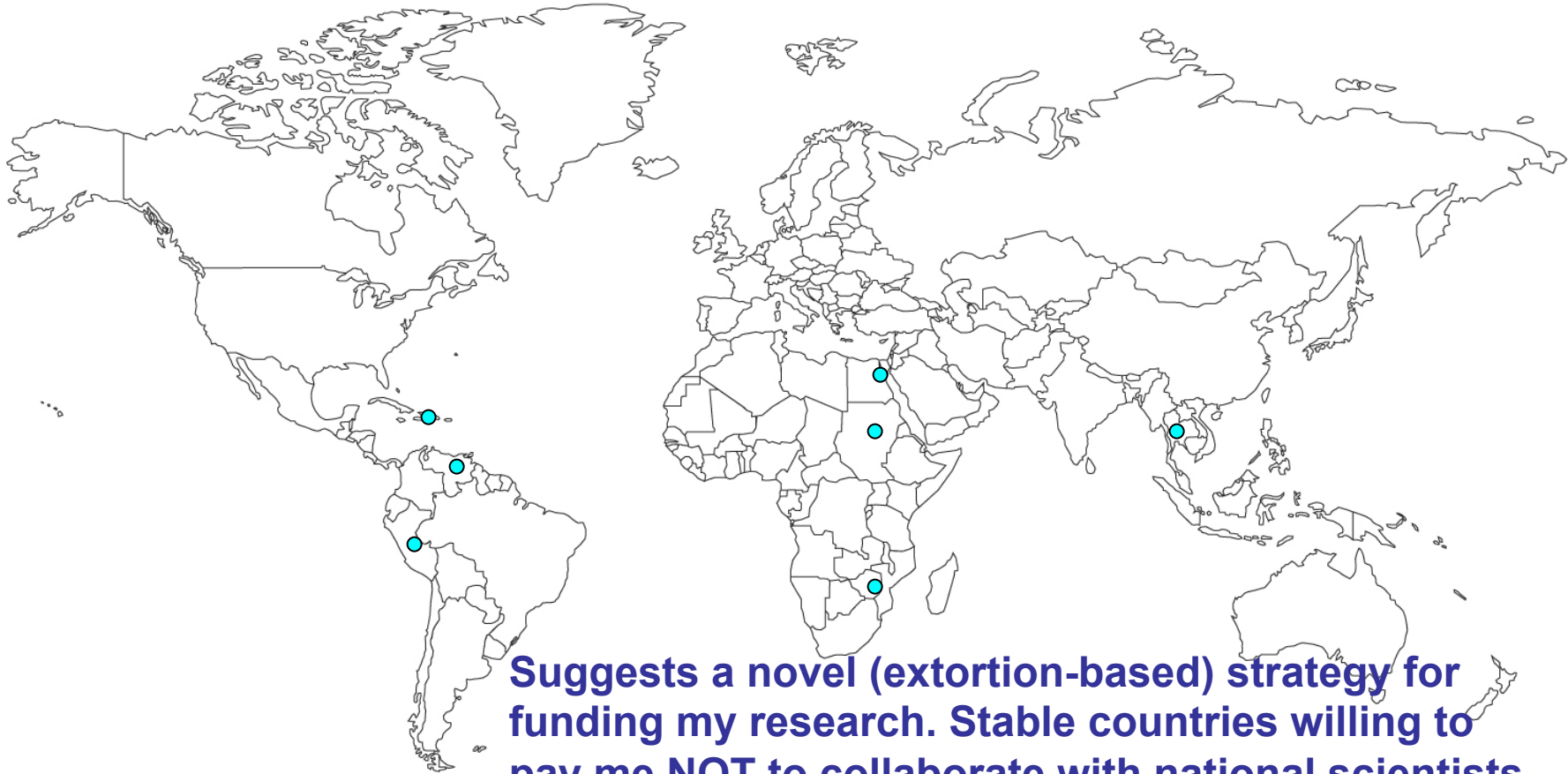
Research Institute of the McGill University health Centre

JD MacLean Centre for Tropical Diseases

November 21, 2012

My Wife's Theory

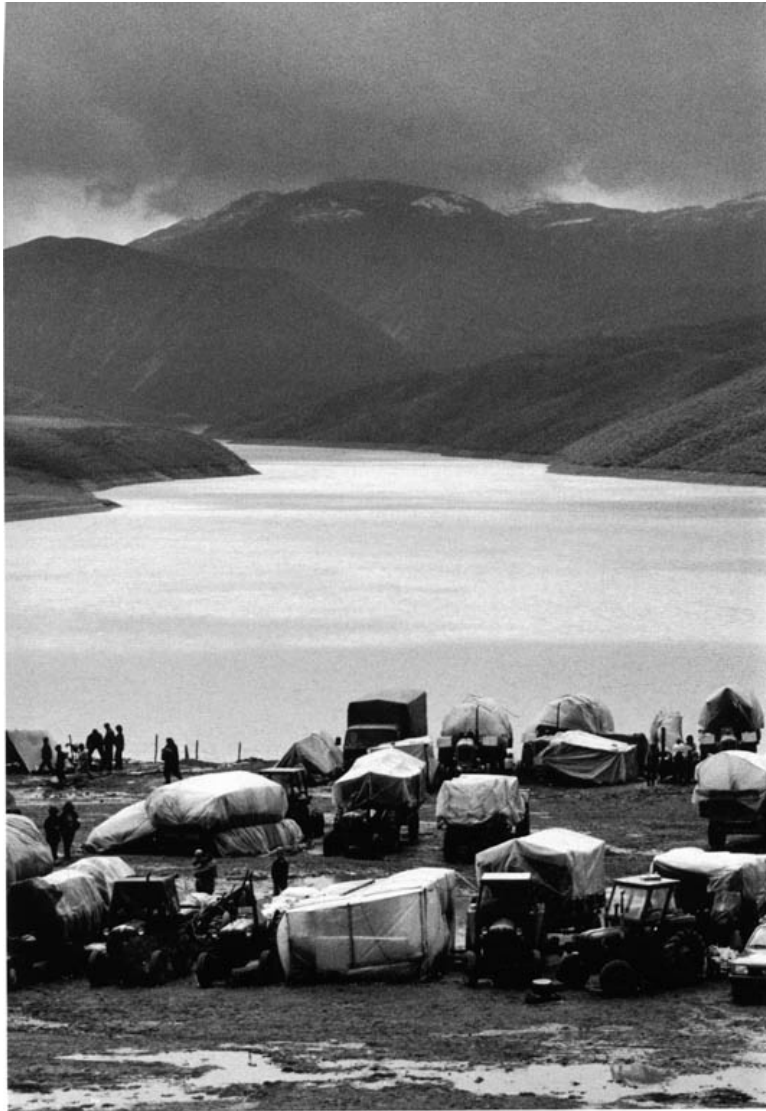
All countries where I work inevitably
collapse into civil chaos



Suggests a novel (extortion-based) strategy for
funding my research. Stable countries willing to
pay me NOT to collaborate with national scientists

***Globalization
of
Health Research***

The Global 'Village'



'it is not a matter of indifference if, in a city, the dwellings of the poor become infested with typhoid and cholera but it is a threat to the health of the richest people also'

1873 Reich Office Memo (Munich)
From Basch PF. Textbook of
International Health) OUP 1990

S Salgado: Albania - 1999

Mobile Populations - 'Us' vs. 'Them'

Immigrants

Illegal immigrants

Refugees

Asylum seekers

Internally displaced

Migrant workers

Guest workers

Tourists

- cruise ships
- 'eco' -tourists
- extreme (adventure) tourists
- sex tourists
- 'professional' travellers (WTs)
- VFR travellers

Missionaries

Humanitarian aid workers

Religious Pilgrims

International students

Diplomatic corps

Business travellers

Scientists

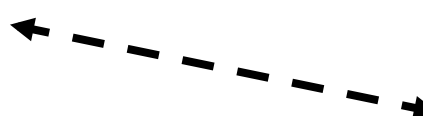
Expatriates

Sailors

Astronauts

Military personnel

- belligerents
- peace-keepers
- spies



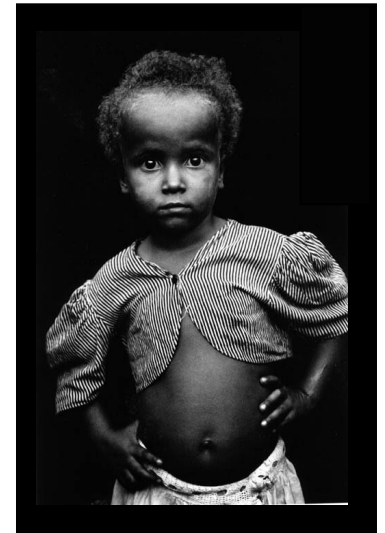
Canadian Hospital-Based Institutes Have a Responsibility to Lead in Global Health Research

- Canada (alone) accepts ~280,000 immigrants/yr
- June 2012 - >800,000 Canadians traveled overseas
- Same month - 26,000 Chinese visited Canada
- 2006 census - ~3.4 million foreign-born in Ontario alone
- >60% of residents in Dépt Santé Publique (Montréal Centre) foreign born

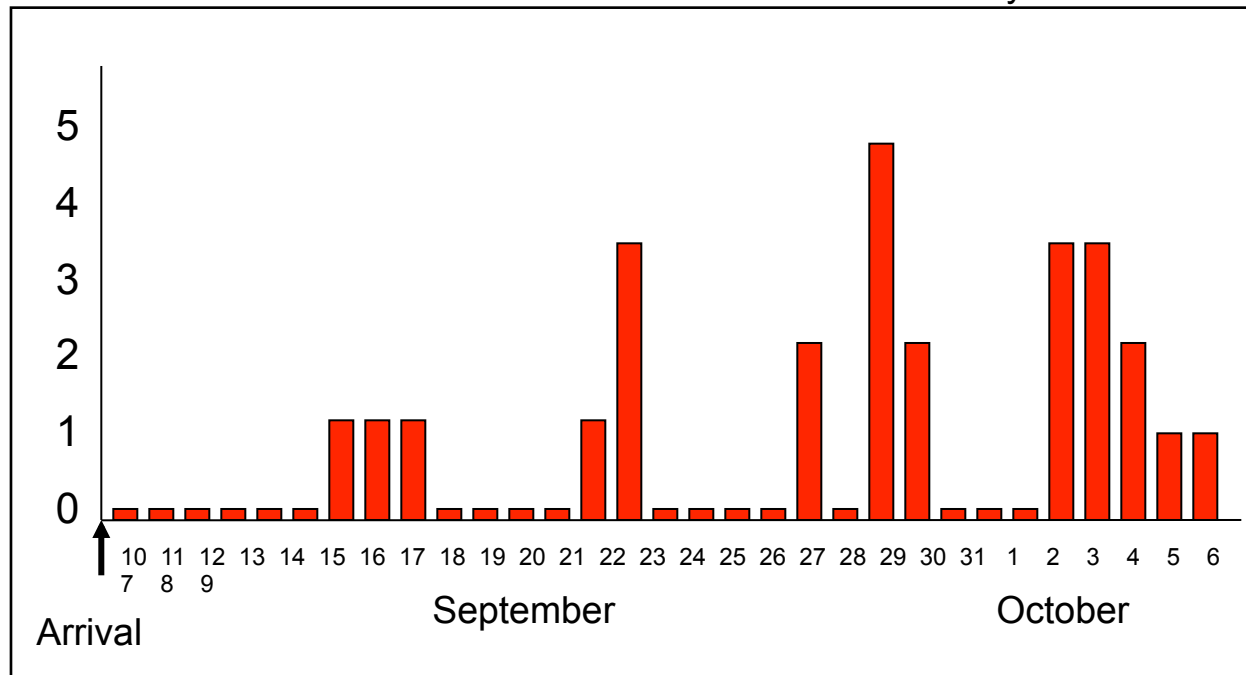


Example of the Global Village

Malaria in Quebec (2001)



Slides received at McGill Reference Laboratory

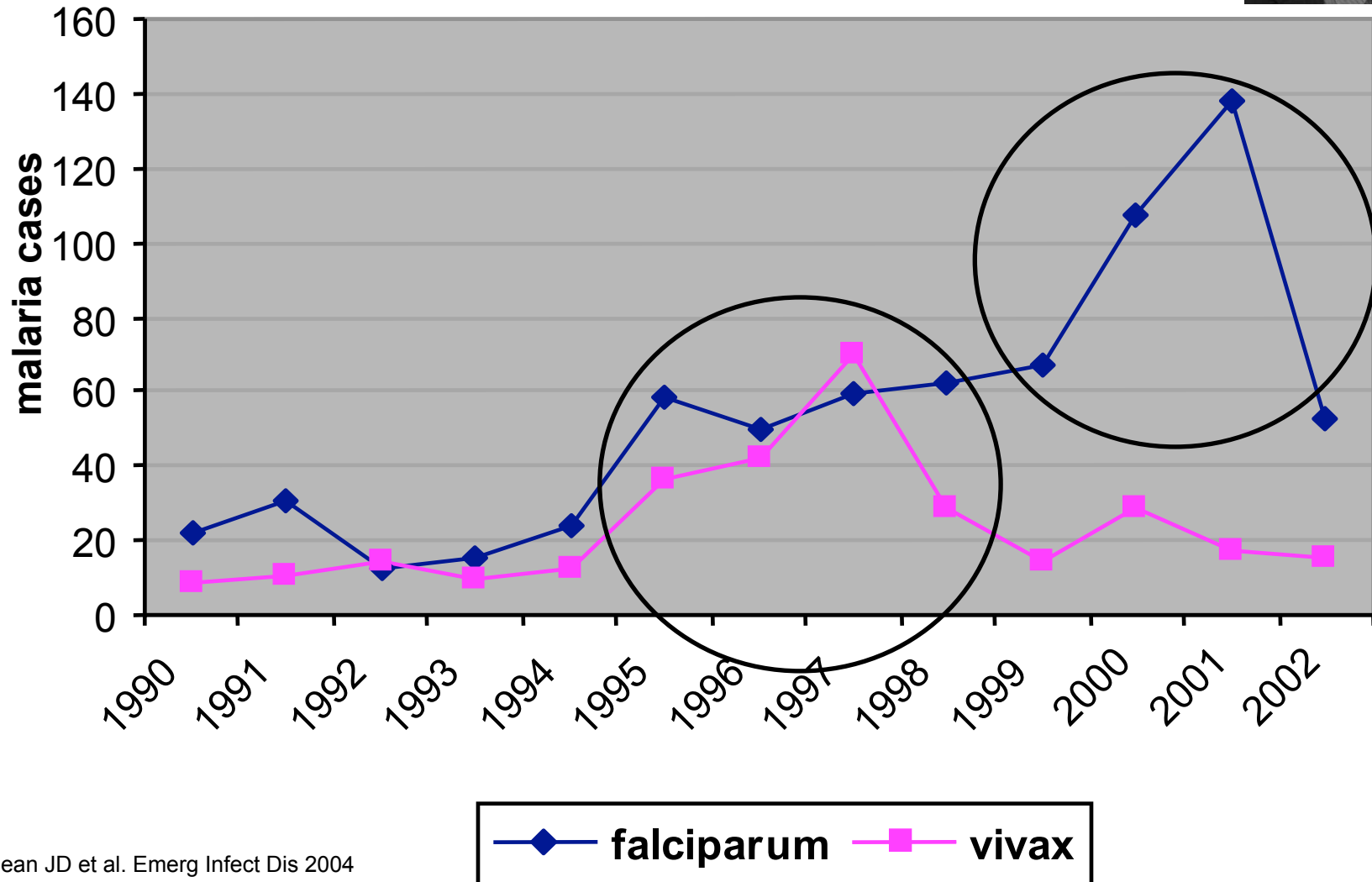


What?!?!

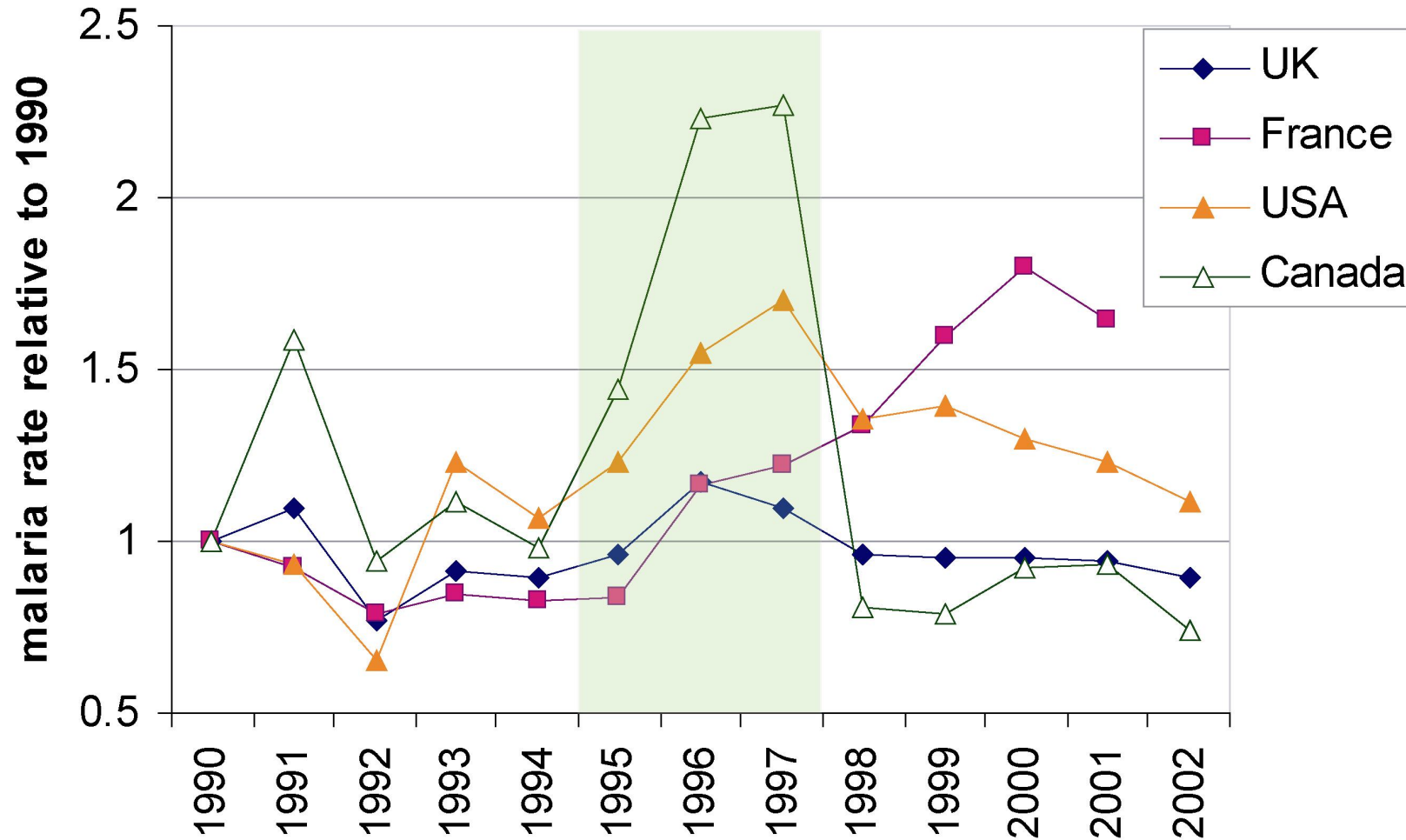


aaaheatingac.com

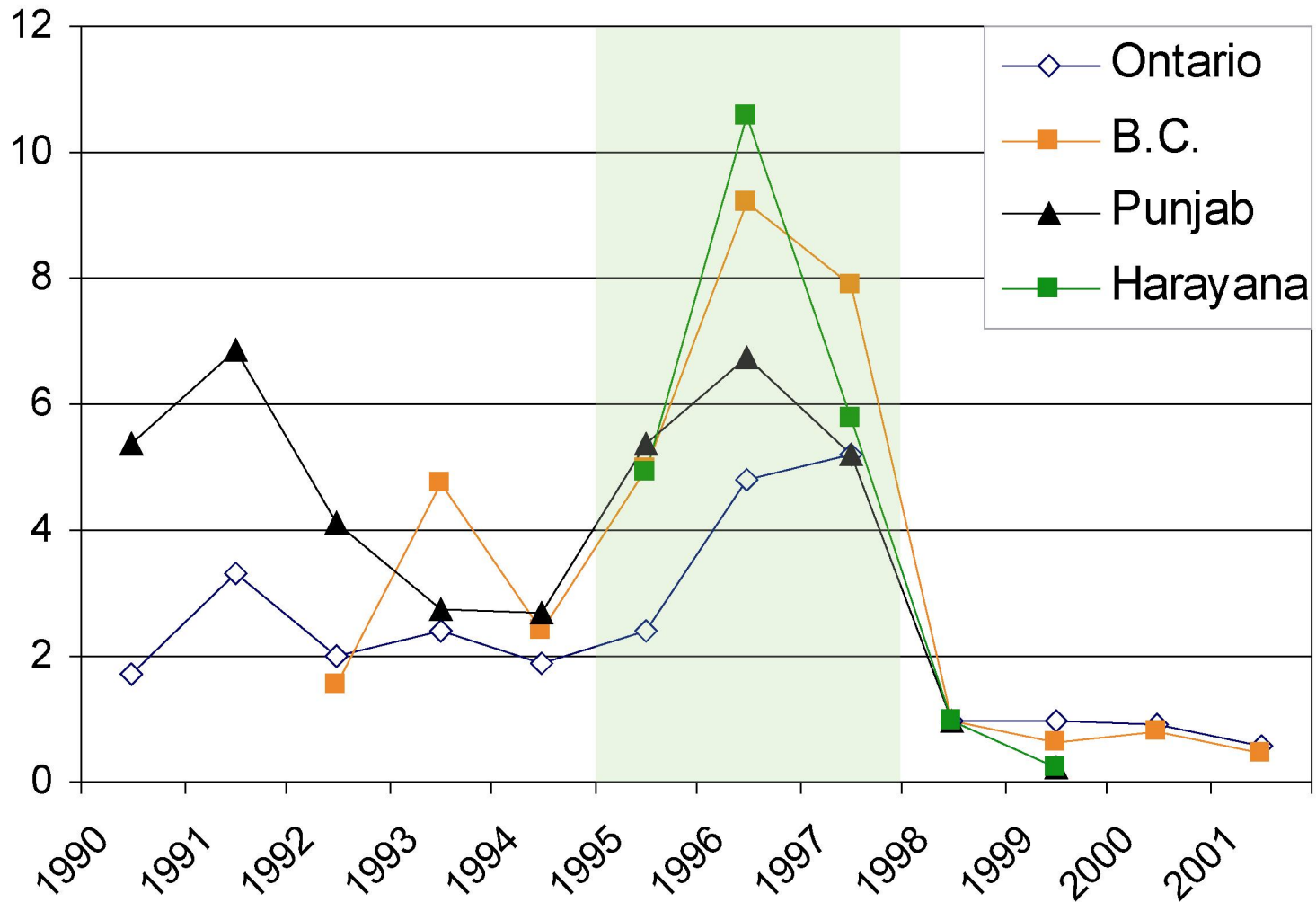
QC Malaria Dynamics



Malaria Rates Relative to 1990



Vivax incidence relative to 1998



Hans Rosling's World



Massive Inequalities Exist

- Many countries experiencing epidemiologic transitions
- Dramatic impact on exposure to infectious diseases
- Equally dramatic impact on chronic conditions



San Cristobal, Lima, Peru



img177.imageshack.us/img177/7531/54147499ea9.jp

Mathur P, Arora NK. Epidemiological transition of hepatitis A in India: issues for vaccination in developing countries. Indian J Med Res. 2008 Dec;128(6):699-704.

Emphatically NOT a ‘Developing World’ Problem

- Income gaps rising rapidly in many wealthy countries
- The disadvantaged claim a disproportionate amount of health care dollars



trice.ca

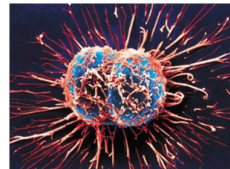
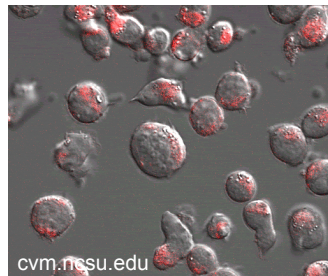
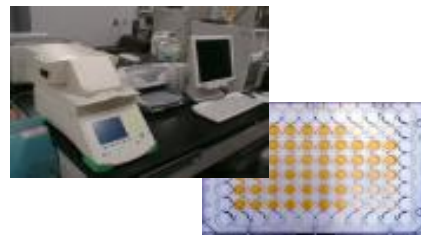


uglychinesecanadian.com

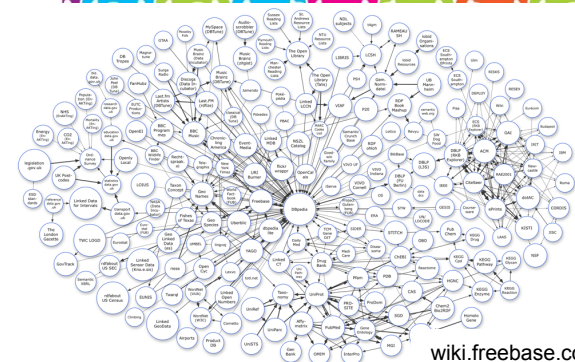
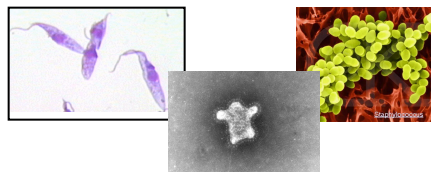


**‘Health Research’ Cuts
Across Entire Spectrum
of Science**

Hospital-Based Institutes at the Centre of Global Health Research?



(Cancerous cells splitting apart)



Research is a Continuum of Ideas

- **Discovery is only the beginning of a long process leading to application and evaluation**
- **Pure vs. Applied Science**
- **This is a false dichotomy since discoveries are of little value to societies if they are not applied**



I HATE the Word 'Innovative'



To Paraphrase One of My Heroes (Gary Larson)

Research Starts with an Idea

(cementum)



Roman aqueduct (Nerja, Spain)

history.com

Idea has Impact when Translated

Same 'Discovery' Different Applications



Enriched by Both



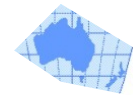
(and parenthetically)

***The Nobel Prize Would
Have be Given To the Person
Who Invented Cement***



Research is Fundamentally about Ideas

- **Societies that don't offer girls an education miss out on 50% of the best brains**
- **Same for societies that systematically under-educate large segments of their population (almost 30% drop-out rate in QC)**
- **Silly to look to 20% of the globe's population to solve the world's problems**



canamkitchen.com

McGill GLOBAL HEALTH PROGRAMS

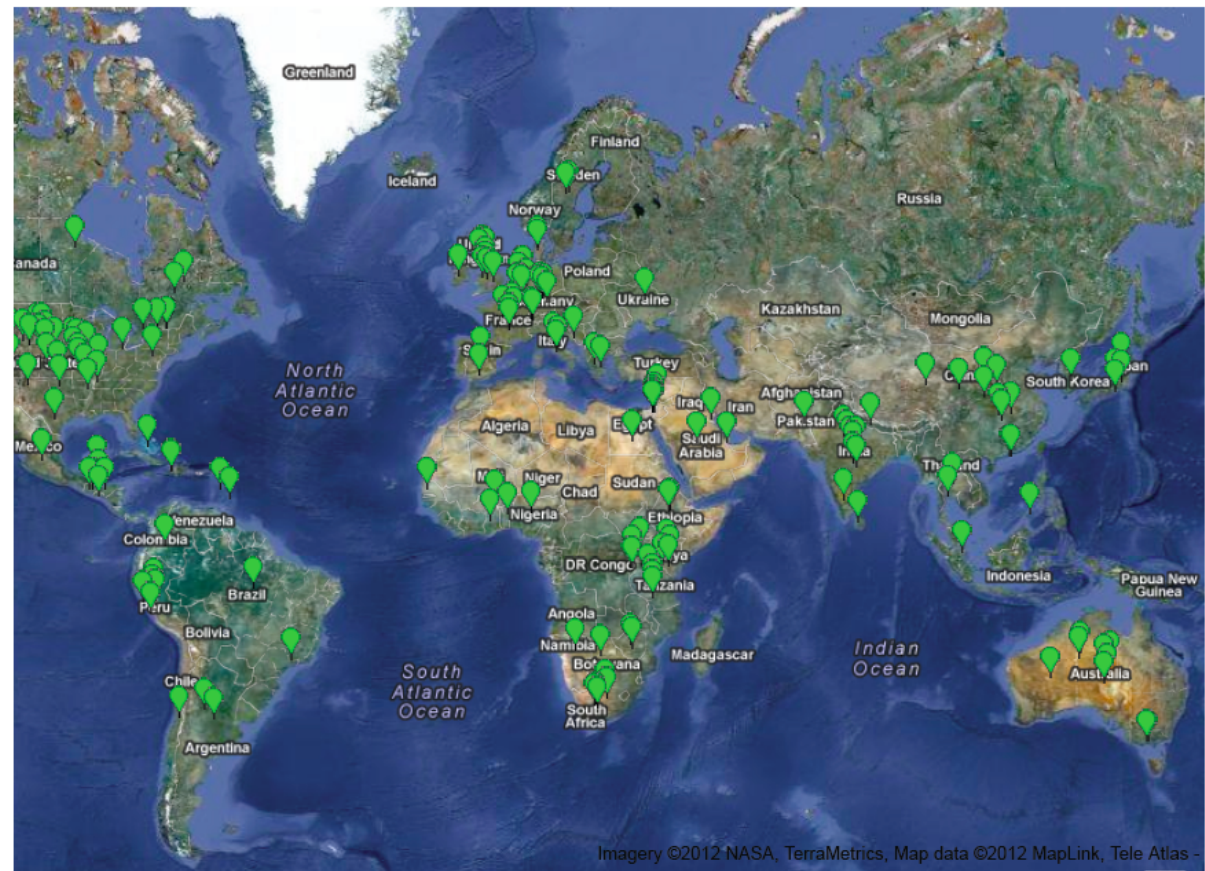
Projects Current As Of

2012-11-20

Search

Format: 2012-11-20

New interactive map that let's one track all of McGill's overseas projects & collaborations



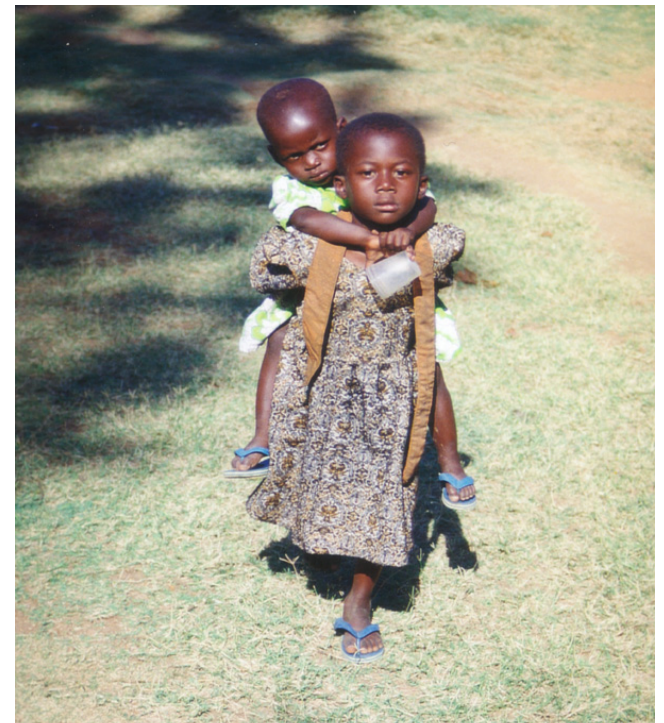
http://www.mcgill.ca/globalhealth/project/map_view

The Opportunities?

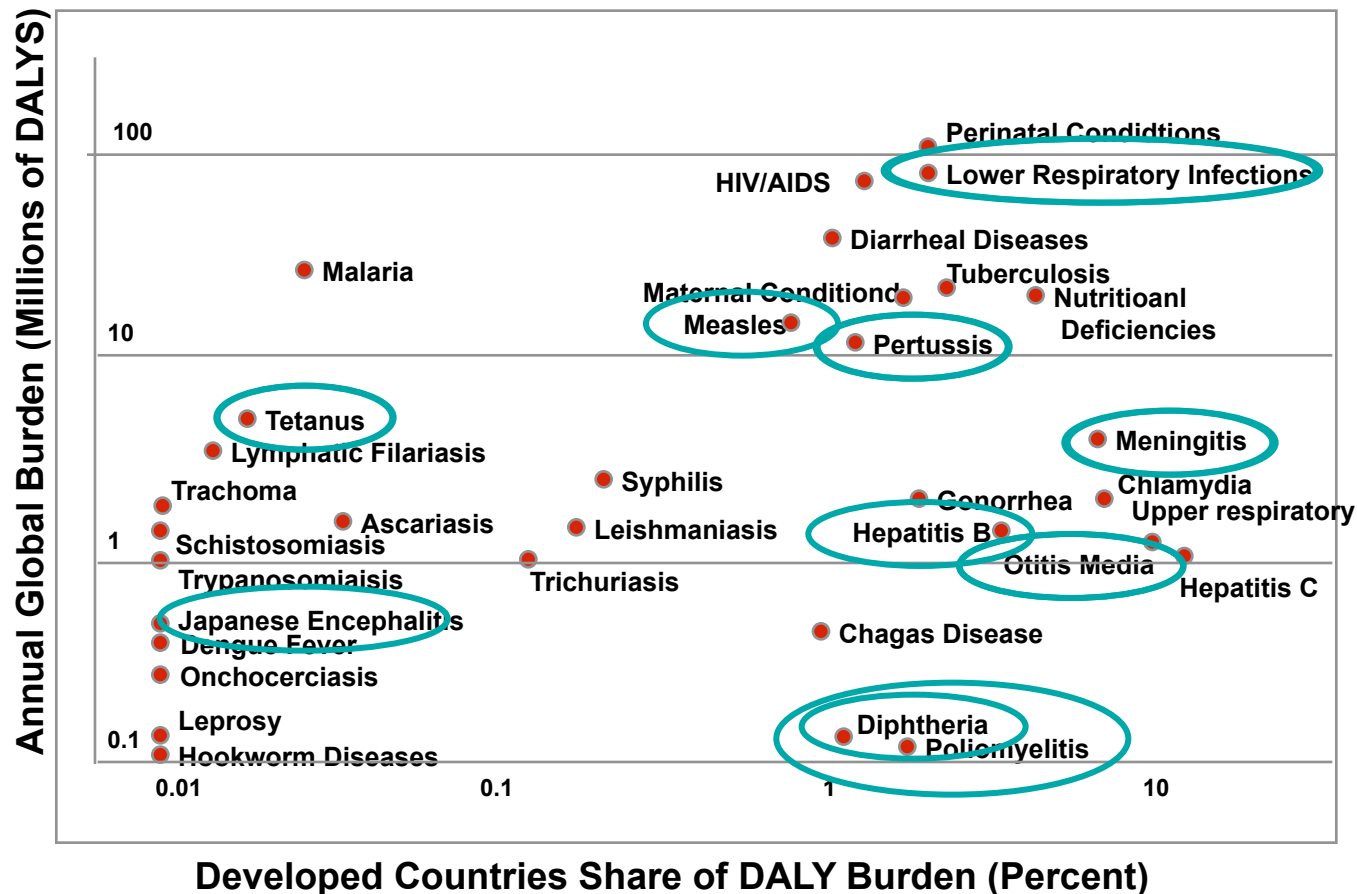
Opportunities in Global Health

1) There is a Huge Backlog of 'Stuff' We Know How to Fix

- Clean water & enough food
 - Sanitation
 - Mother-Child Health
 - Maternal Education
 - Vaccines
 - Bednets & simple antibiotics
 - Vitamin A
-
- **Need research to find ways to meet needs with resources (Application & Evaluation)**



Distribution of Global Infectious Disease Burden (2004)



>50% of low-income country DALYs lost are lost due to infectious diseases (vs <4% in the wealthy countries)



**No
Trivialization
... Some of
These Are
Big
Problems**

Johns Hopkins (1980s)

- Pre Anti-Retroviral Drugs
- 10-15% of hospitalized HIV⁺
- 30-40% of trauma HIV⁺
- Infection across mucosa
- Immune deviation/destruction

My fellowship

- immunosuppressive viruses
 - measles
 - HIV



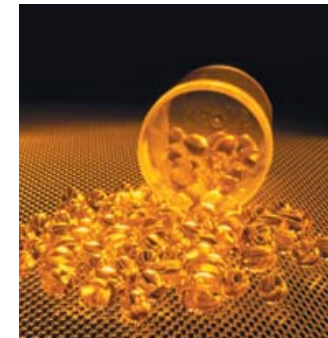
ZVITAMBO

Zimbabwe Vitamin A for Mothers & Babies Project

14,110 women & their babies
Recruited at birth
Randomized to receive

Mother	Baby
400,000 iu	50,000 iu
400,000 iu	placebo
placebo	50,000 iu
placebo	placebo

Followed for up to 24 months (q 3 months)



Findings for Initial ZVITAMBO

- 31% HIV-positive at enrollment
- additional 9% seroconverted during 2 yr follow-up
- ANY supplemental feeding major risk for MTCT
- Infant mortality (12 months of life)

M ⁺ B ⁺	400/1000
M ⁺ B ⁻	40/1000
M ⁻ B ⁻	4/1000
- Infant vitamin A had no impact on survival



Sixteen Years Later



Zimbabwe

- 18+ digit deflation
- massive social disruption
- malnutrition/stunting
- basic needs not met



ZVITAMBO

- >\$43 million in grants
- Employ/train 100s
- Access to safe water
- RCT of sanitation
- HIV testing/counseling
- microbiome studies
- breastmilk proteomics



Opportunities in Global Health

2) Tsunami of 'Stuff' We Know is Wrong

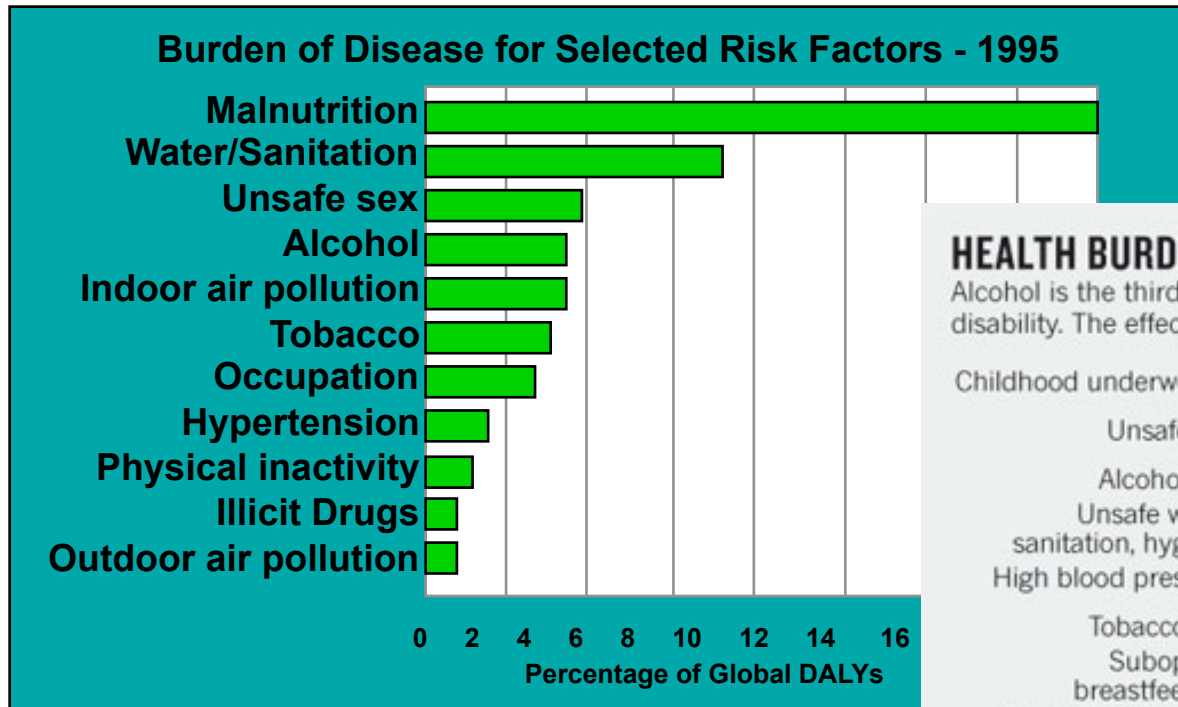
- **Smoking**
- **Pollution** (indoor & outside)
- **Cheap calories**
- **Obesity**
- **Diabetes**
- **Hypertension**
- **Aging**



- **Need research at all levels to figure out how to deal with these problems for everyone (eg: nicotine vaccine, prevention & treatment of Alzheimers, how to effectively address obesity)**

Global Health Burden

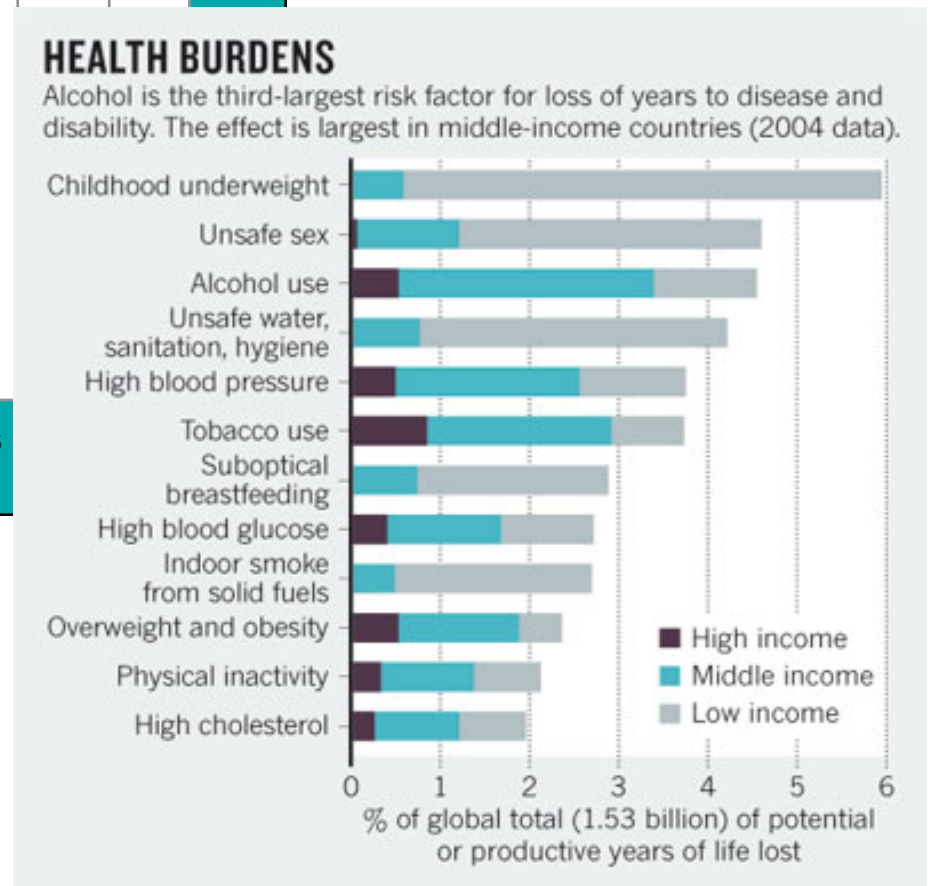
Non-Infectious



O' Neale Roach J, BMJ 2000

Health burdens

- nutritional
- behavioural
- age-related



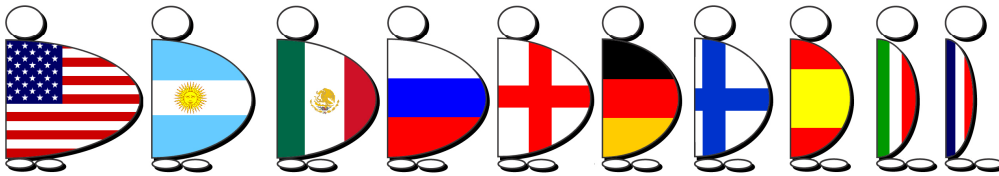
nature.com (2008)

Obesity

Not Just North America

Comparison of percentages of population classified as obese

Female



Male



Percentage of people classified as obese		
	female	male
USA (1999-2000)	34	27.7
Argentina (1997)	25.4	28.4
Mexico	25.1	14.9
Russia	25	10
England (2001)	23.5	21.0
Germany (1991)	19.3	17.2
Finland	19	20
Spain (1997)	15.2	11.5
Italy (1999)	9.9	9.5
France (1995-1996)	7.0	8.0

How Should We Set Priorities?



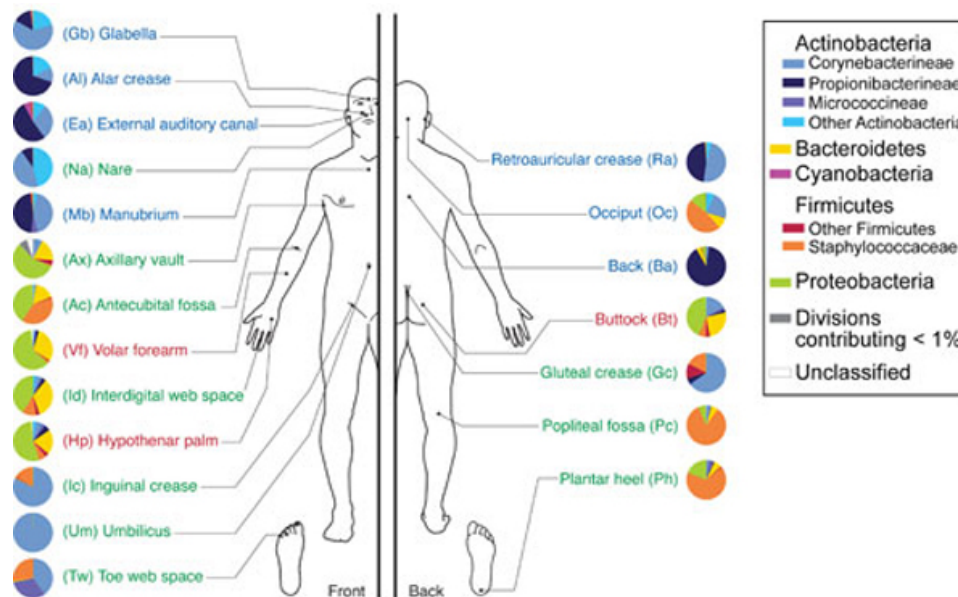
bextruthfinder.blogs.com/.../2005/09/



www.smh.com.au/.../2005/06/30/1119724757442.html

It is Ironic (and Should be Instructive) That BASIC Microbiome Research May Provide Novels Approaches for Both

- gut flora participates actively in extracting calories from available food
- Can increase calories by as much as 30%



- gut flora alone can cause and/or prevent weight loss on fixed caloric intake
- First human trials of stool ‘transplant’ for weight loss underway

Opportunities in Global Health

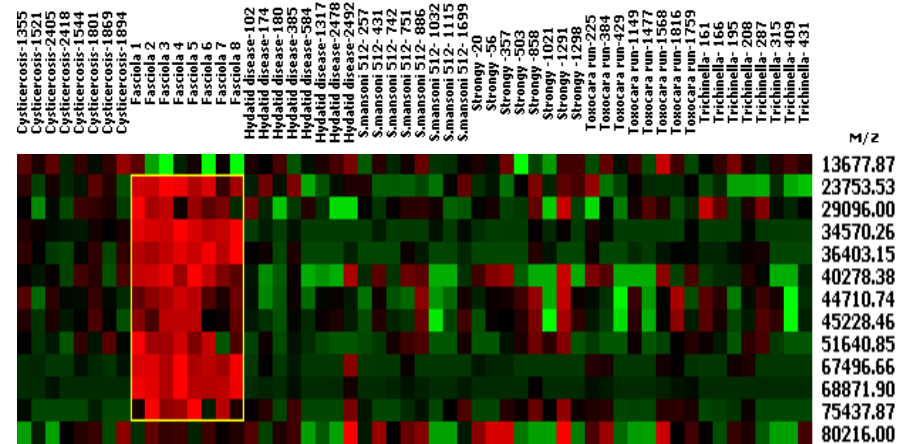
3) Plenty of New ‘Stuff’ to Think About

- **Pesky Remnants**

(TB, influenza, malaria, HIV)

- **Genomics & Proteomics**
- **Metabolomics**
- **Microbiome**
- **Personalized Medicine**
- **Nanomedicine**
- **Stem cells**

- **Need research at all levels and global partnerships to fully understand these new ideas and exploit them optimally**



Both Good and Bad Examples

Good

Preliminary AIDS Vaccine Evaluation (PAVE) Sites

Pasteur Institutes

Wellcome Trust facilities

Walter Reed Institute

The Bad

Hepatitis B vaccine trials in Haiti (early 1980s)

yet HBV vaccine program in Haiti only in (±) 2010

Indonesia's refusal to permit the use 'Indonesian'

H5N1 virus strains to make candidate vaccines

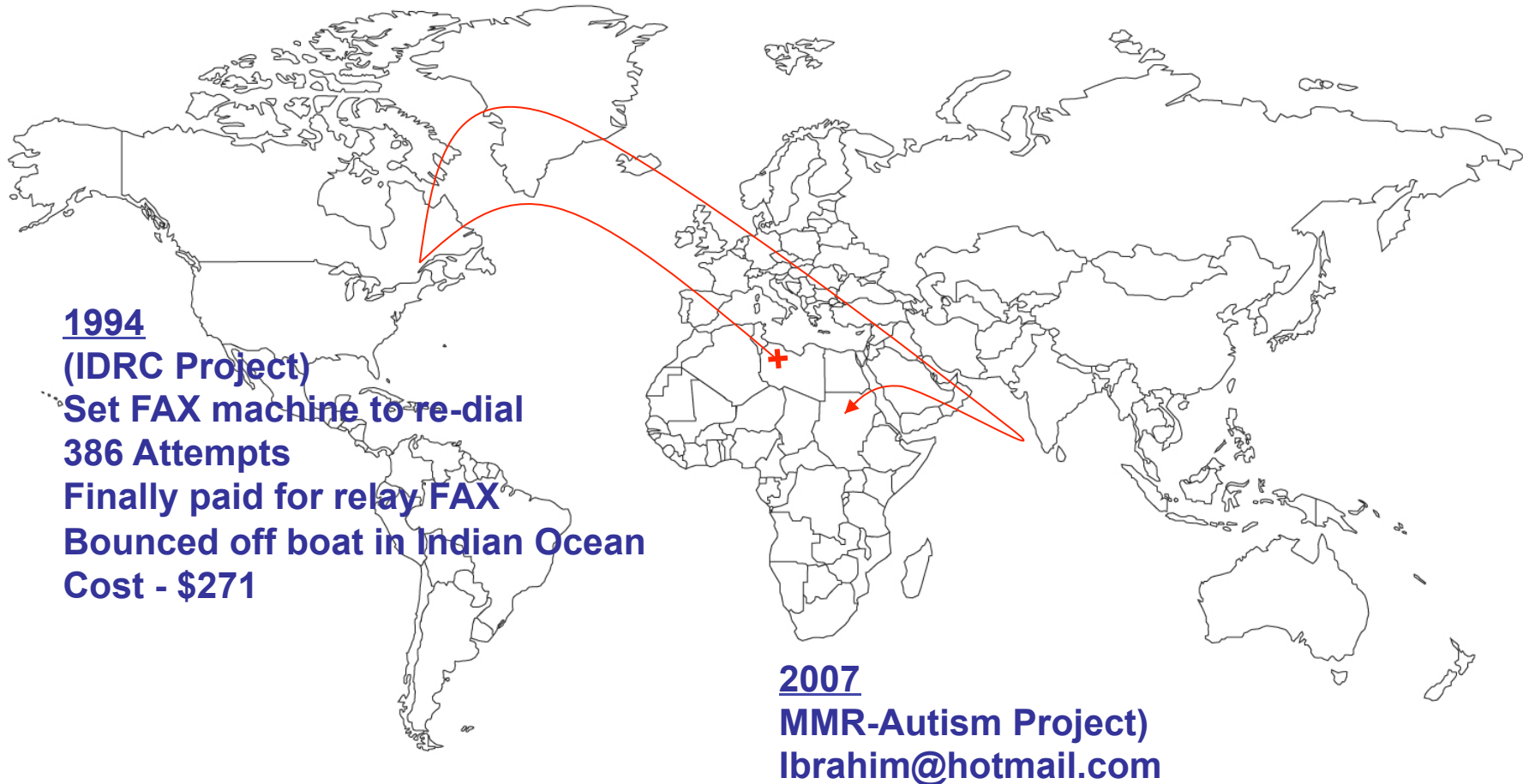
Zimbabwean policy (and others) of refusal to permit human materials to leave country

The Challenges?

Challenges in Global Health

From the Simple to the Philosophical

Sending a Document to Sudan



Challenges in Global Health

From the Simple to the Philosophical

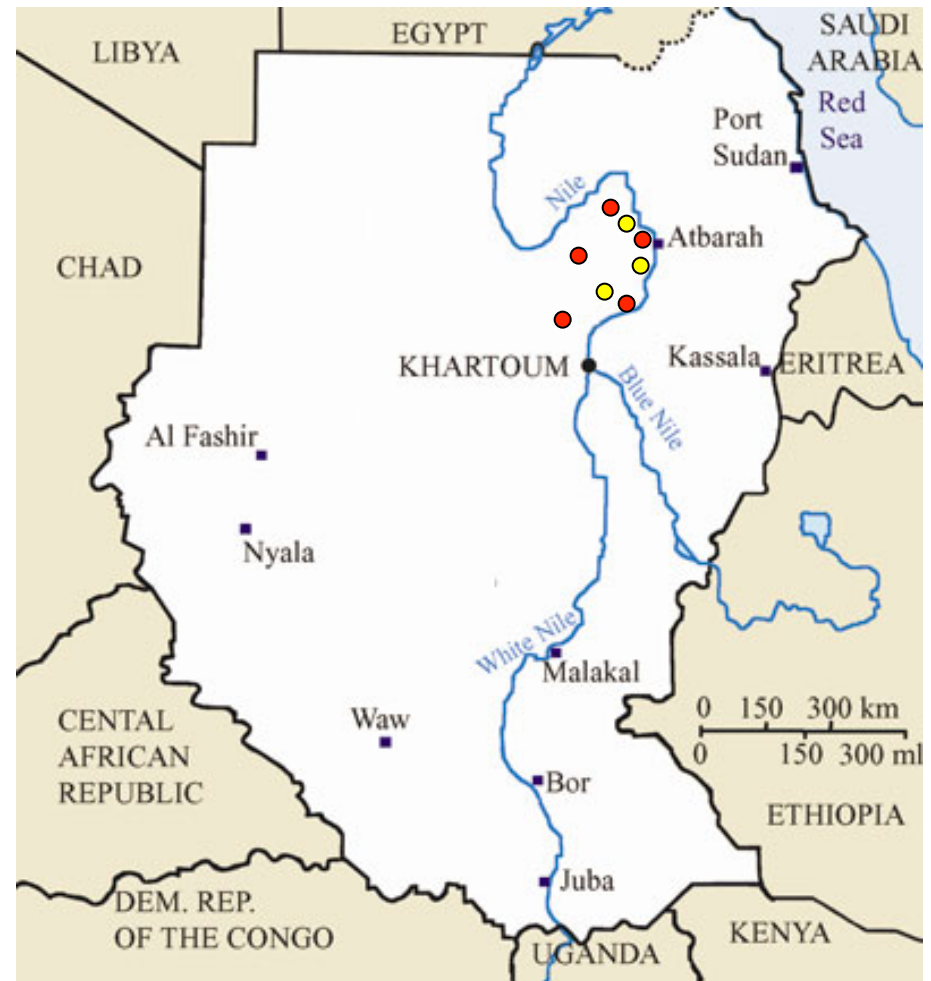
How To Assess Informed Consent in Rural Sudan

1994-2000

Study of High-Titre Measles Vaccines
Vaccines protected against measles
but associated with increased deaths
in infant girls

**Protocol: approach religious leader
then local health worker then families**

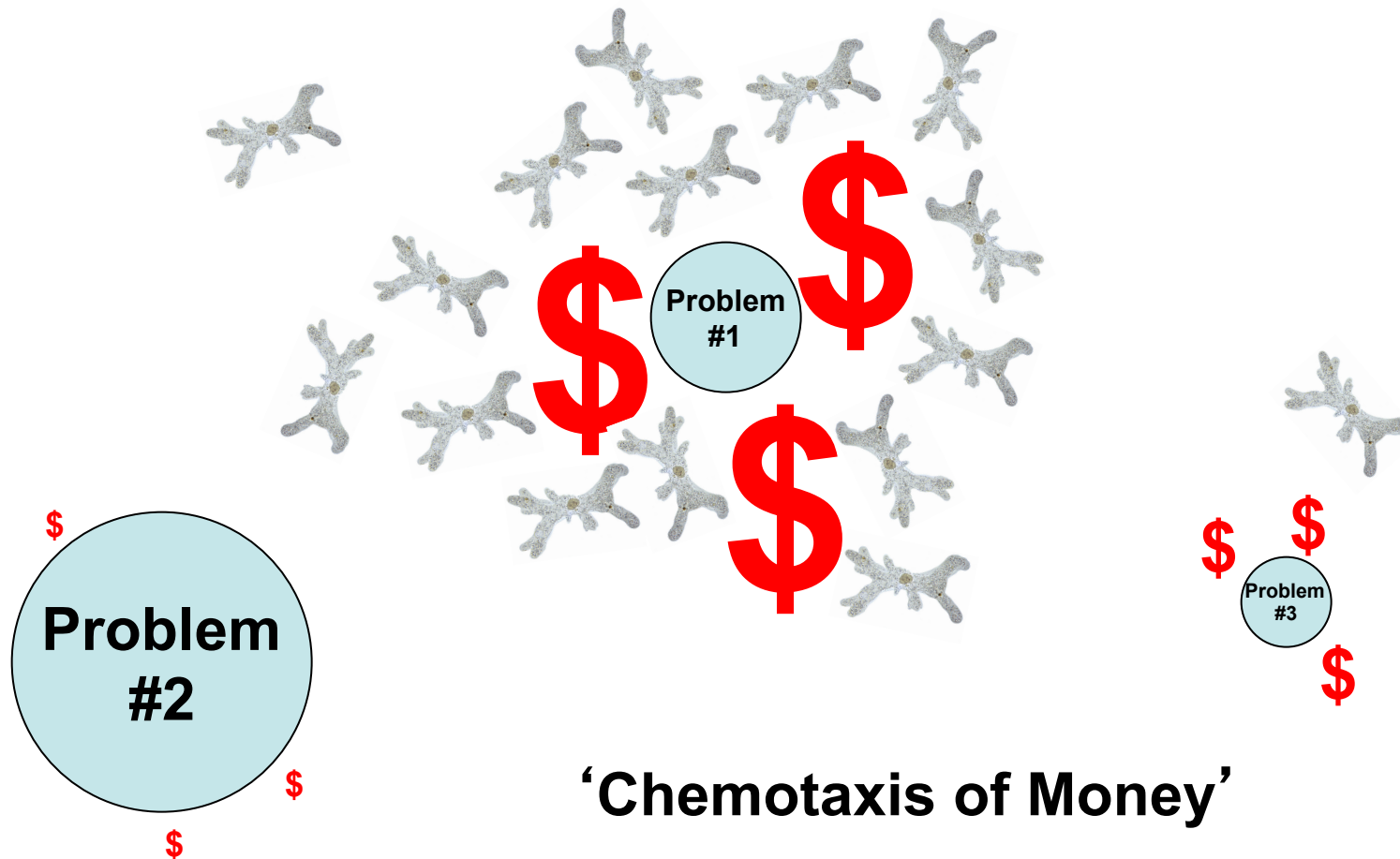
- **Local religious leader agreed
All health workers agreed
100% enrollment**
- **Local religious leader disagreed
All health workers said 'no'
Enrollment <5%**



Resources Drive Research from Discovery to Application



Resources Drive Research from Discovery to Application



'Chemotaxis of Money'

Gates Foundation



Total Assets (2012)	\$36 billion
Total Grants to date	\$25 billion
2010 grants	\$2.6 billion
2011 grants	\$3.4 billion

***Realistically ...
What Can We Do?***

Global McGill

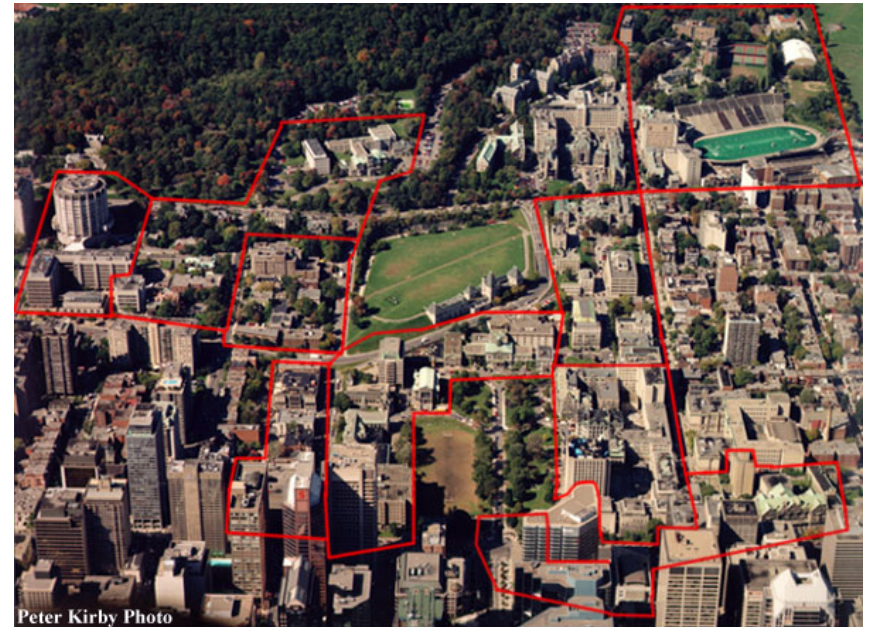
Graduate students from 150+ countries

Non-Canadian Citizen Trainees

38% of graduate students

49% of doctoral students

>45% of post-docs
(clinical fellows)



RI MUHC Today

- 3rd Research Hospital in Canada & 1st in Quebec for 2011
- \$175M annual budget in 2012 (\$17M operating)
- 620 researchers (370 FTEs)
- 300 labs devoted to fundamental and clinical research
- 1,150 students (MSc, PhD, Post-Doc, Clinical Fellows)
- ~1,700 peer-reviewed publications per year
- 306 principal investigators



Personal Networks Through Trainees And Collaborations



Not Enough

- **Canadian universities need to attract foreign students & trainees at all levels**
 - **NOT for their fees (the current strategy)**
 - **for their brains**
 - **for their energy**
 - **for their passion**
- **Need to offer scholarship assistance or (at the very least) level the tuition for international students. Consider taking some funds from our development assistance 'pot' .**

Canada?



fourfourtwo.com



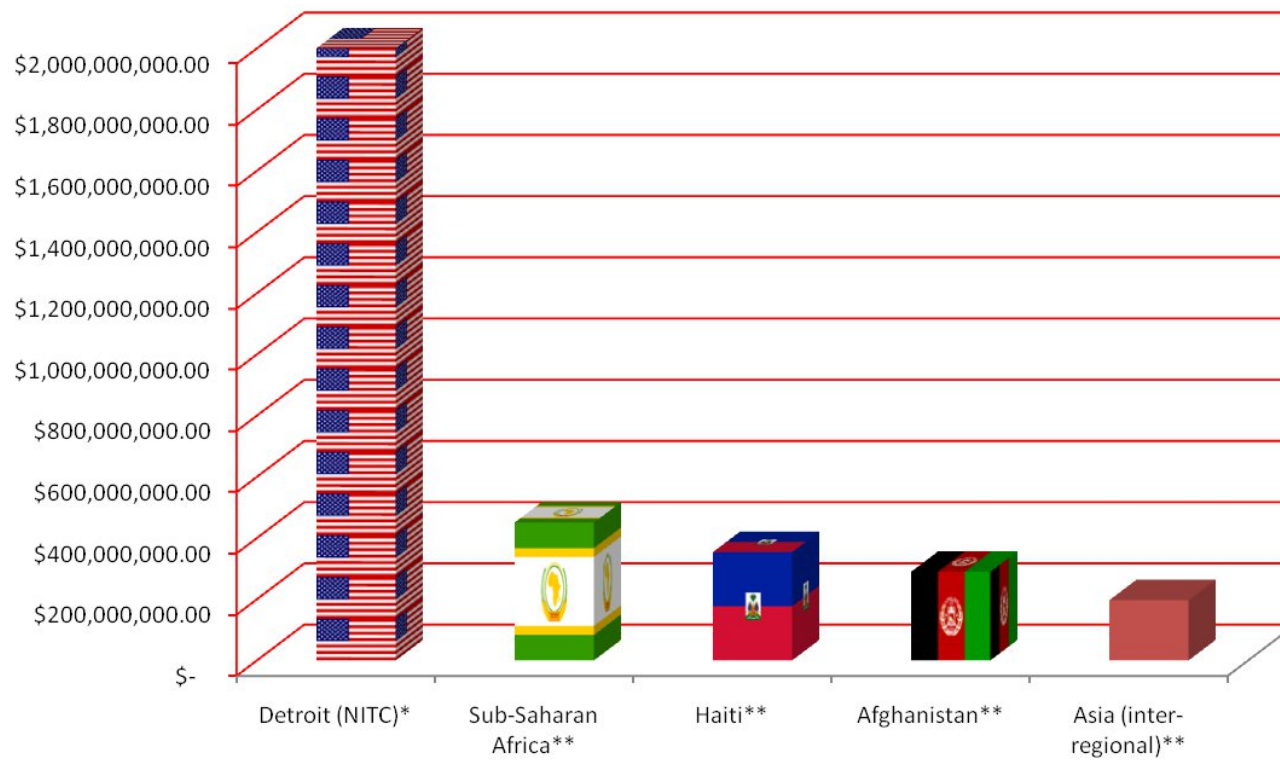
Assets **\$36 billion**
2010 awards **\$2.6 billion**
2011 grants **\$3.4 billion**

GNI **\$1.74 trillion**
CIHR **~\$1 billion**
CIDA **\$4.8 billion**
IDRC **\$180 million**
Total aid **0.29% GNI**

Norway GNI 485 billion
Norway, Sweden & Denmark >1%

Priorities Sometimes Seem Odd

Canadian Foreign Aid: Detroit NITC vs CIDA Top 4



Sources:

* "over \$2 billion for green space development, replacement costs and other related impacts" - State Representative Rashida Tlaib (D-Detroit), June 15/2012
<http://012.housedems.com/news/article/statement-from-state-representative-rashida-tlaib-d-detroit-on-the-announcement-of-an-agreement-between-michigan-and-canada-to-build-the-new-international-trade-crossing>

** Canadian International Development Agency - Statistical Report on International Assistance — Country Spending, 2010-2011

Make Research A Basic Principle Of Canadian Development Assistance

- **Currently an after-thought**
- **Personal Opinion**
 - **this is (not as clever as it could be)**
 - **why would we NOT want to know how to do things better**
- **Our new ‘focused’ immigration policy targets highly trained students (‘brain drain’)**
- **Needs to be paired with program to support international trainees who want to return to their countries of origin**
- **Each returning trainee is a potential ‘small business’**

ATIU AIRPORT Voluntary Security Check

**Would passengers please hand
their **AK47s** Bazookas, grenades,
explosives and nukes to the pilot
on boarding the aircraft.**

**Airport Management thanks you for your
cooperation.**

Canadians Are Not Risk Takers

- ‘No guts - no glory’ foreign to Canadian psyche
- Our approach to life relatively conservative
- Increasingly focused on predictable ‘outcomes’
- Not the best environment for research
- Extends to translation of ideas (eg: VC community)



vickicarwana.blogspot.com

**If we knew the
answers, we
wouldn't have
to do research**

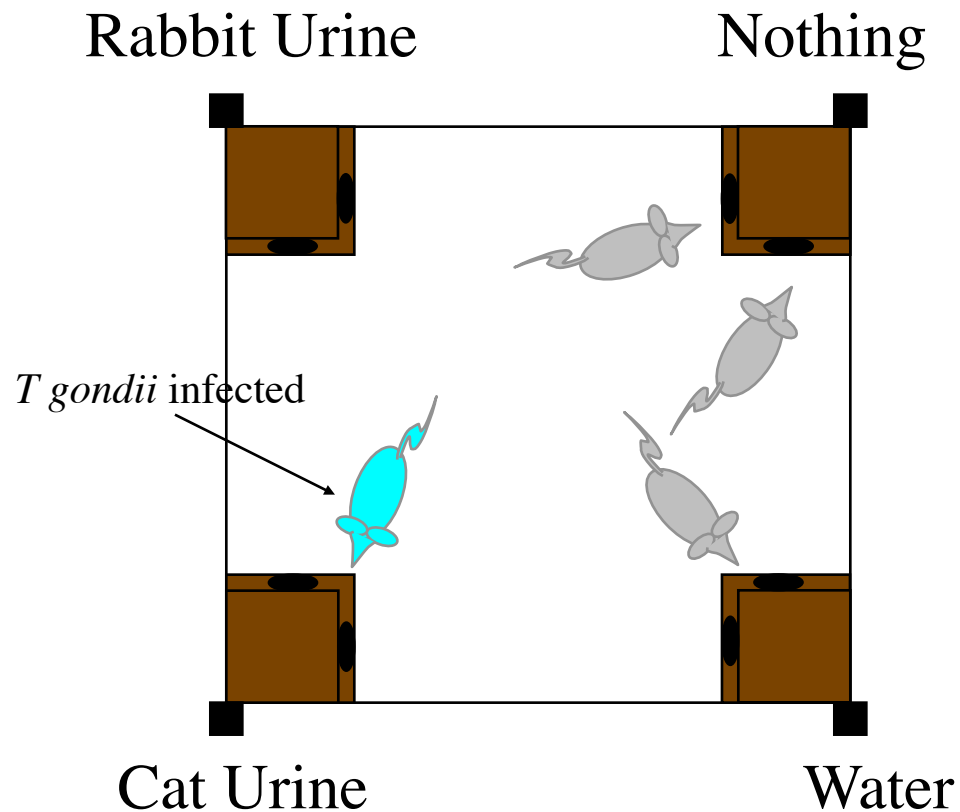
If we knew what it was we
were doing, it would not be
called research, would it?
(A Einstein)



drmillis.wiki-site.com

A Modest Proposal

Infect all Canadians with *T. gondii*



If you were a parasite and wanted to make your victims hyperactive and take risks ... what part of the brain would you target?

Right ... the sexual arousal centres



zoo-logic.tumblr.com

'Globalize' the Next Generation

Develop
Promote
Fund
and STUDY
overseas experiences & work



Much of what is done now
amounts to poverty 'tourism'

Thanks for your attention

