

More Money, More Science?

Understanding the impact of exogenous funding
on the Malaria research community

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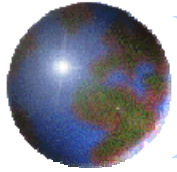
**Advisor: Professor Fiona Murray,
Sloan School of Management**



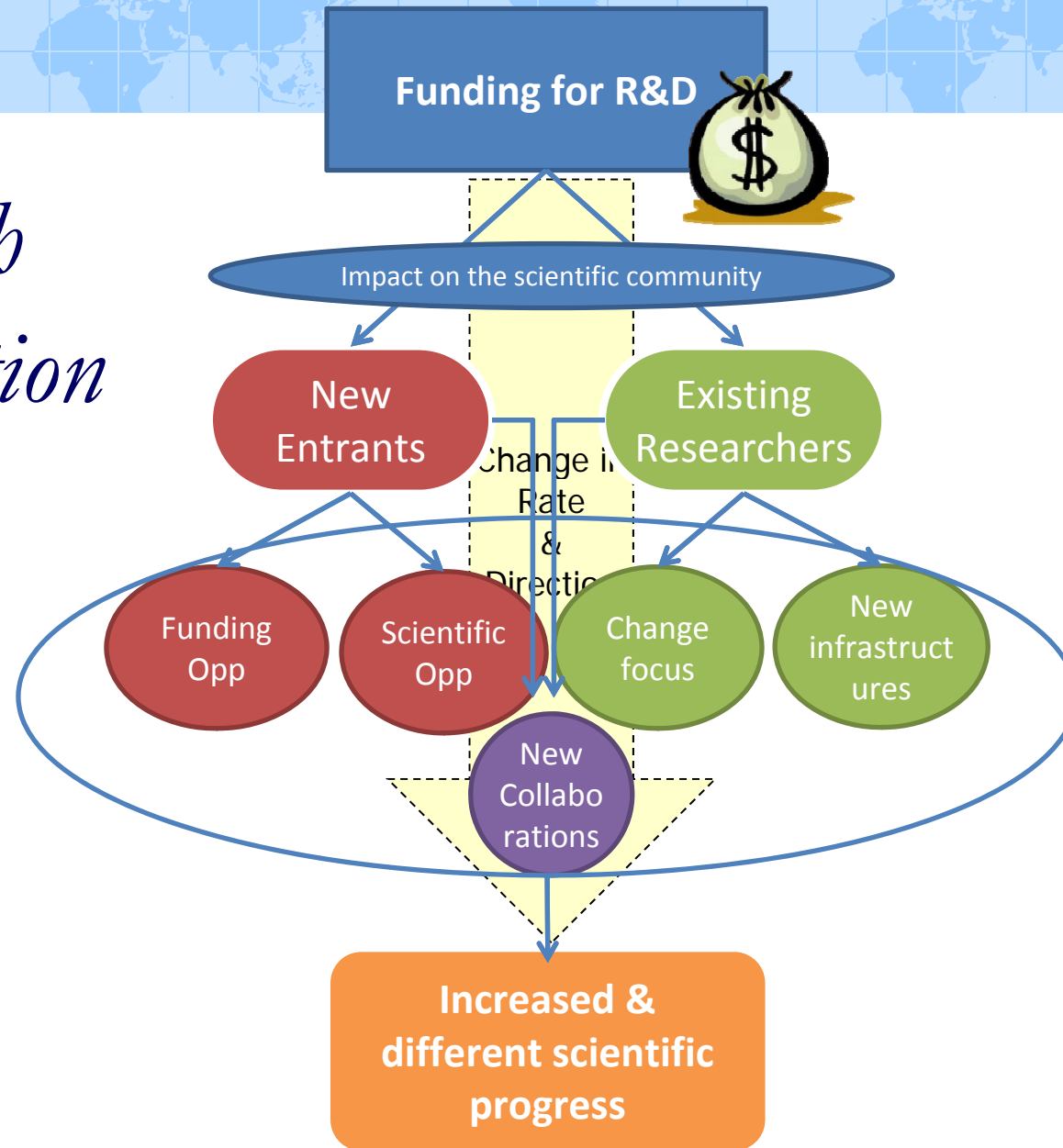
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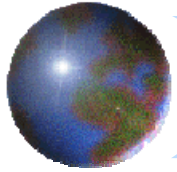


TECHNOLOGY AND POLICY
PROGRAM

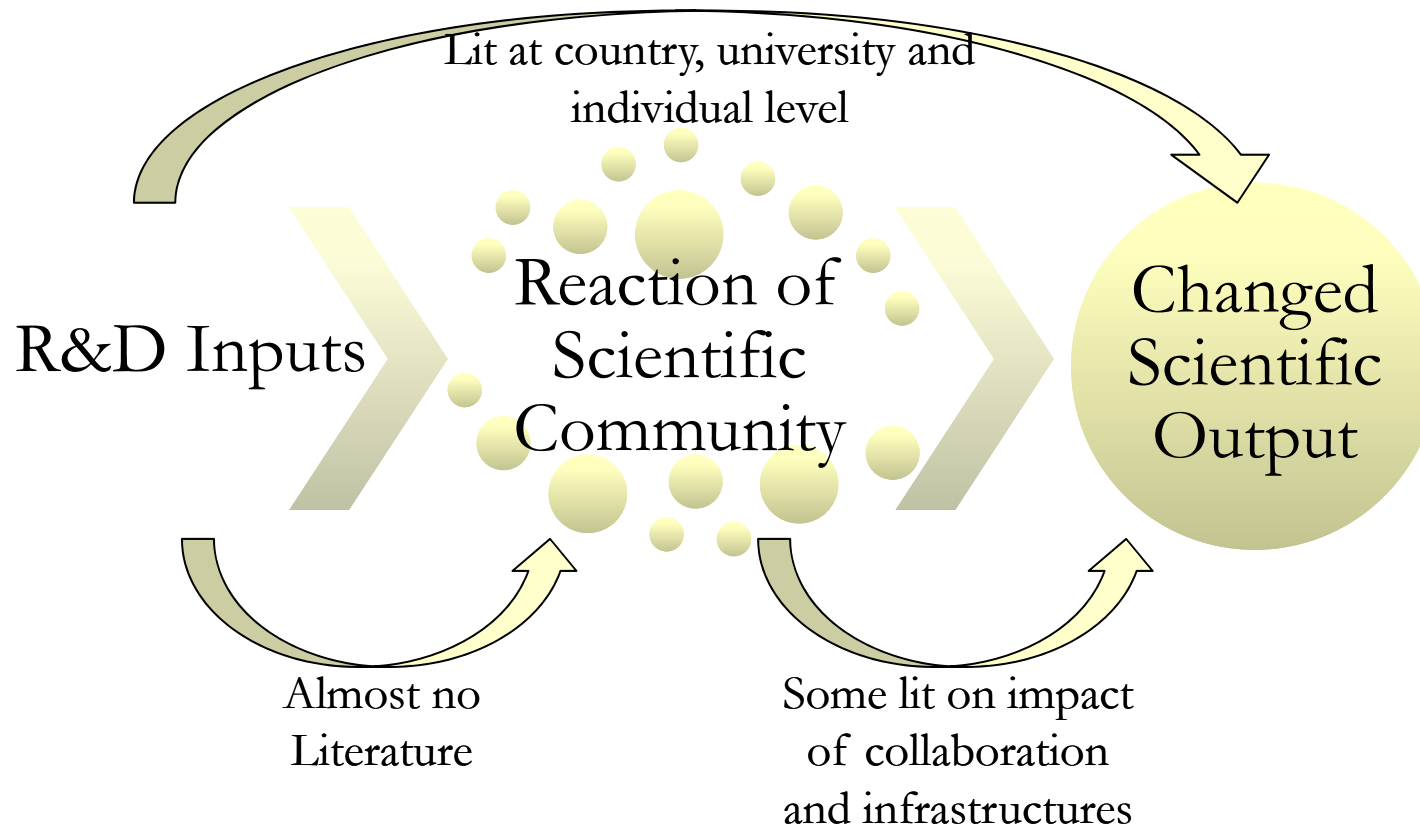


Research Motivation

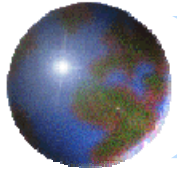




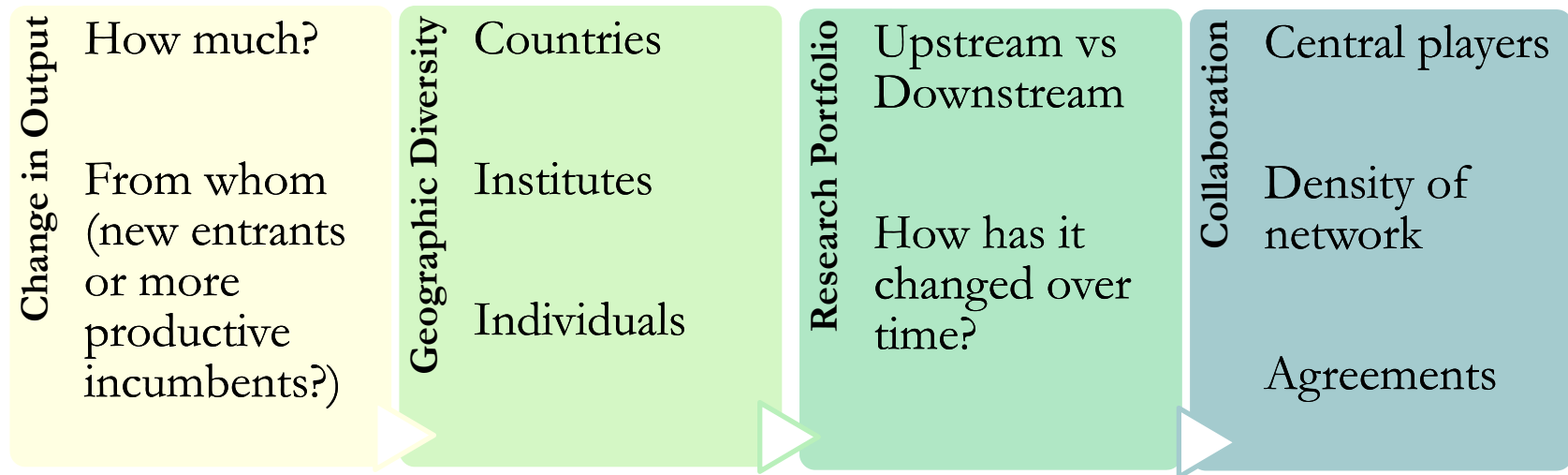
Existing Literature and Gaps

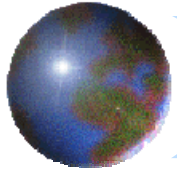


Research Motivation | Questions | Empirical Framework | Methods | Results | Policy



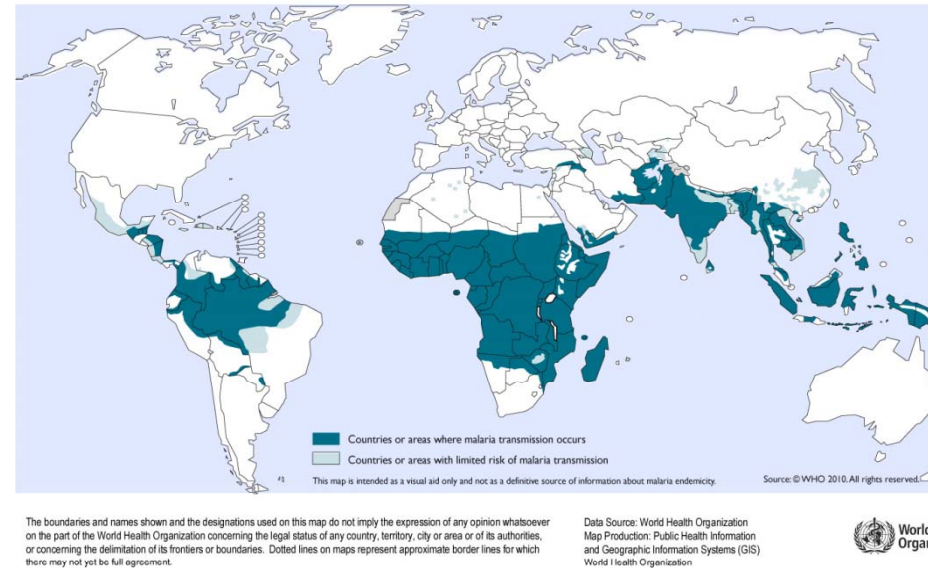
What we want to know

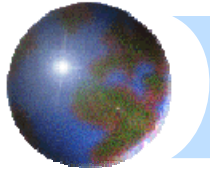




Why Malaria?

- Previously not a fashionable area of study
- Funding scaled up rapidly in late 1990s
 - Annual R&D Budget in 1993: ~\$130 million (in 2008 \$)
 - Annual R&D Budget in 2008: ~\$560 million
- **Increase by a factor of 4.3 in 15 years**
- Well defined research community

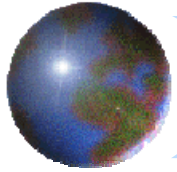




Why Malaria?

Exogenous Funding Shock

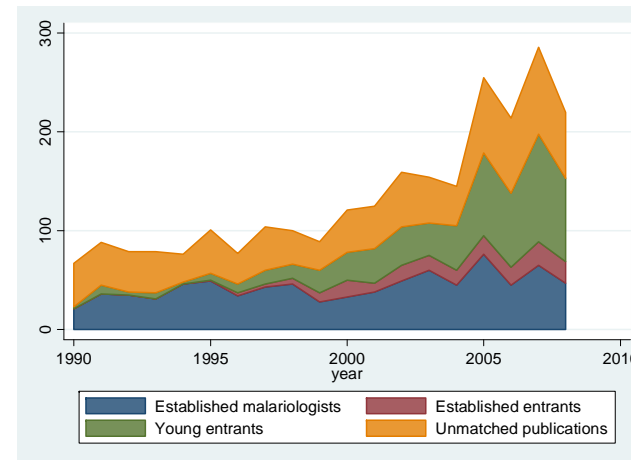
- 🌀 Funding scaled up in response to global awareness of HIV/AIDS crisis and other NTDs
 - Harold Varmus (former NIH director) emphasized malaria in 1997
 - Gates Foundation entered scene in 2001 with Global Health as a major objective



Methodology

Quantitative

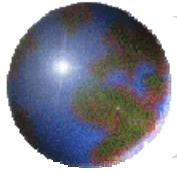
→ Bibliometric analysis of publication dataset



Qualitative

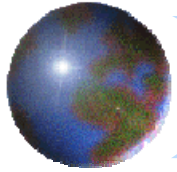
→ Interviews with Malaria researchers, global health experts and PPP directors



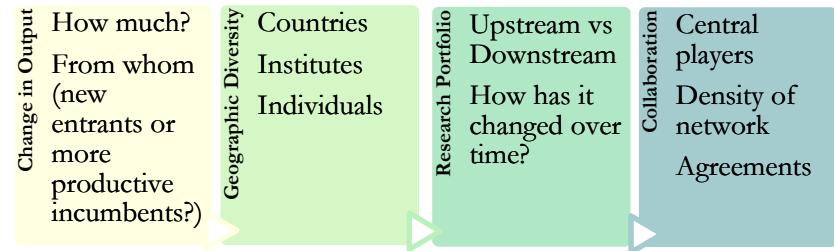


Data Sources

1. Funding data from largest donors (NIH, Wellcome, Gates and aggregated data from reports)
2. Literature on developments in malaria research & funding
3. Publication Dataset 1990-2008 from Scopus
 - Limited by search terms and IF of journal
4. Career histories of > 300 malaria scientists
 - Split by seniority
5. Interviews with researchers & health policy folks



Summary of results



Publication growth

- Diminishing returns to funding
- Growth in output is primarily accounted for by new entrants

Geographic Diversity

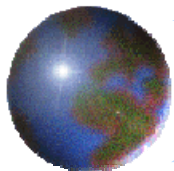
- More countries and institutes each have a smaller share of total the publication body.
- Established research countries such as the US and UK lost some

Research Diversity

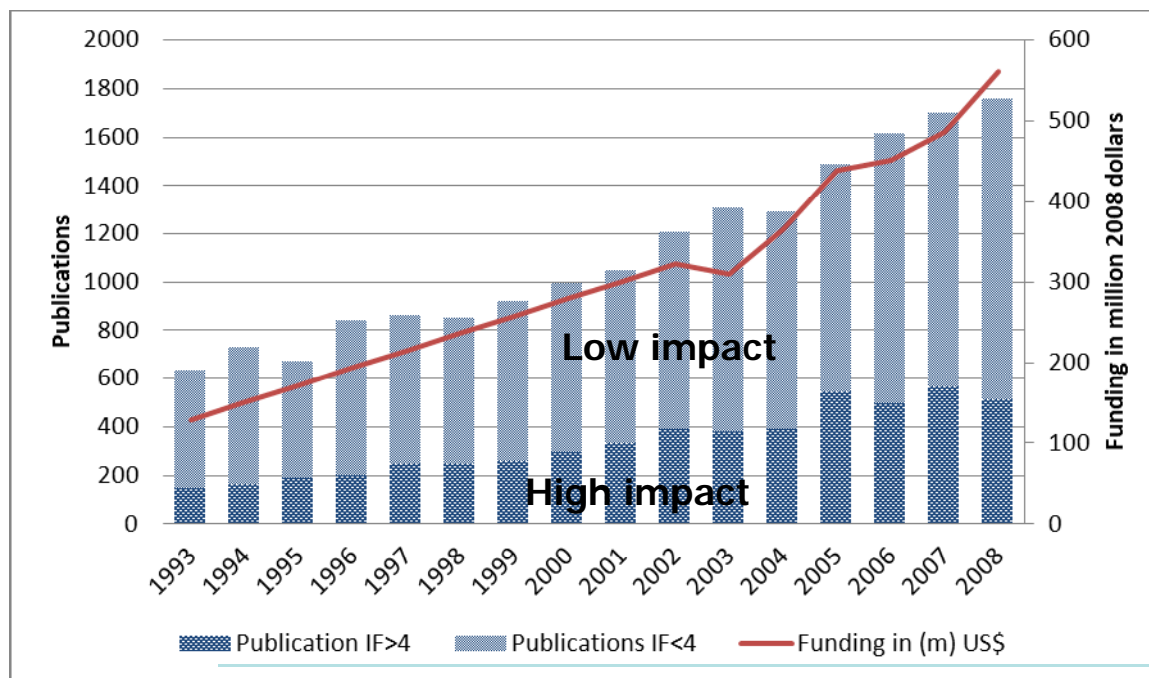
- Research emphasis shifted towards downstream research

Collaboration

- Research community became more connected, international collaboration increased.
- The policy community became more tight knit



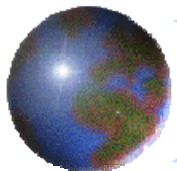
Publication Growth



Change in Output
How much?
From whom
(new entrants
or more
productive
incumbents?)

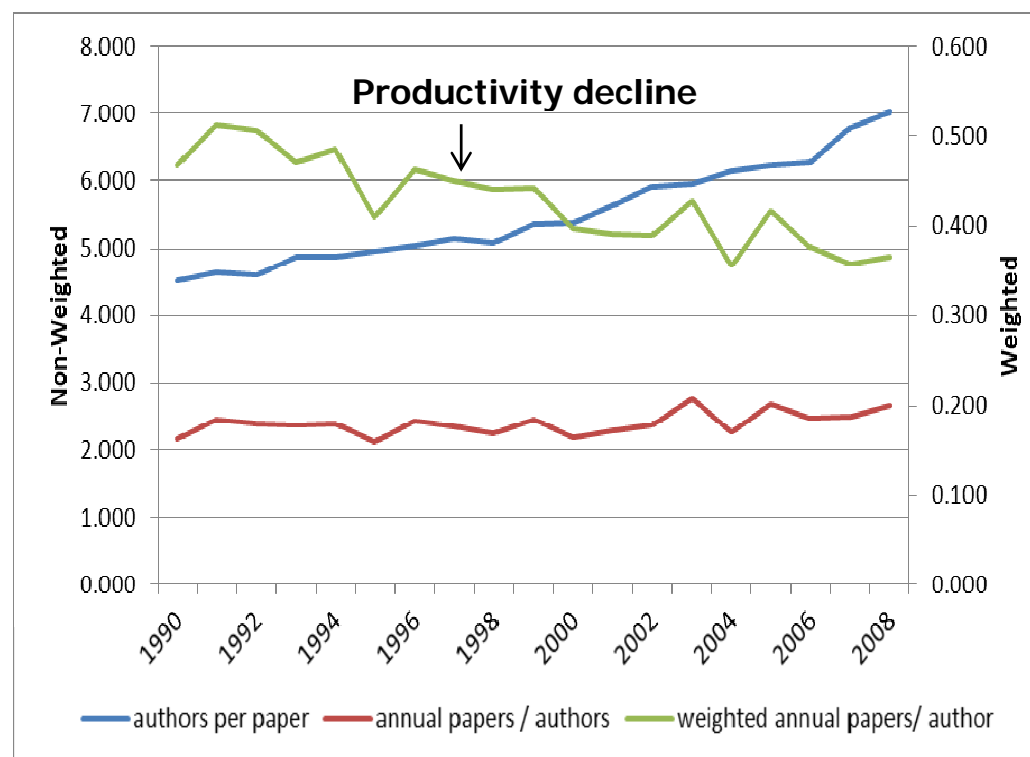
**Diminishing
Returns!!**

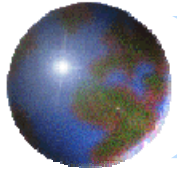
Year	R&D Investment	All Publications	Publications, IF>4	Authors
1993	129m	632	145	2183
2008	562m	1758	508	8103
Change	435%	278%	350%	370%
Elasticity to funding		0.64	0.8	0.85



Who accounts for Output?

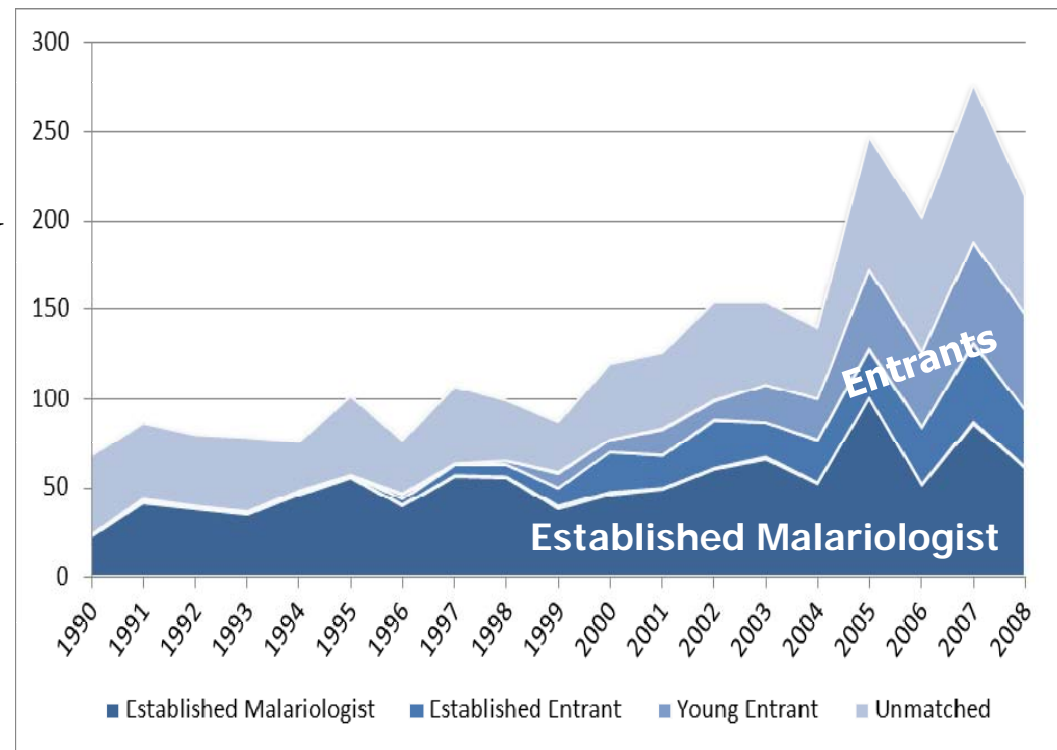
- Authors do not increase productivity at an actual count and decrease their productivity when taking into account co-authorship

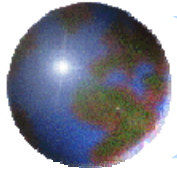




Who accounts for Output?

- ⚙️ Growth in publications is accounted for by new entrants (young and established)





Research Diversity

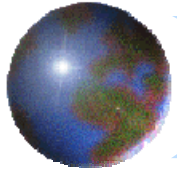
Research Portfolio

Upstream vs
Downstream

How has it
changed
over time?

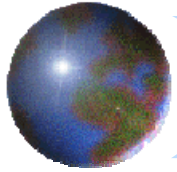
Changes in Research Emphasis					
Category	1990-1994		2004-2008		Change
Genetics	445	14%	1656	21%	↑7.3%
Drug discovery and review articles	630	20%	1772	23%	↑3.1%
Mosquito vector studies	324	10%	980	13%	↑2.5%
Clinical Trials - Drugs	80	2%	319	4%	↑1.6%
Pathology - Transmission Stage	13	0%	18	0%	→0.2%
Epidemiology & prevalence	144	4%	329	4%	→0.3%
Intervention trials and health service research	426	13%	1011	13%	→0.3%
Diagnostics/ diagnostic tests	225	7%	512	7%	→0.4%
Pathology - Sporozoites/Hepatocytic stage	50	2%	70	1%	→0.7%
Clinical Trials - Vaccines	182	6%	355	5%	↓1.1%
Unclassified	267	8%	226	3%	↓5.4%
Pathology - Merozoites/Erythrocytic stage	440	14%	591	8%	↓6.1%
Grand Total	3226	100%	7839	100%	

Research Motivation | Questions | Empirical Framework | Methods | **Results** | Policy



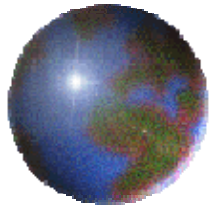
Research Diversity

- ⊕ Emphasis shifted downstream
- ⊕ Mostly due to funding oversight of the Gates Foundation
 - ⊞ *“NIH funding is much more akin to what you need to do basic science, and the Gates funding is of the sort that delivers a particular solution that was agreed on at the outset.”*
- ⊕ US dominates almost all research areas in terms of publication share but has lost some share in post-shock period



Policy Implications

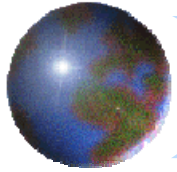
- ✚ Rapid scale up of funding cannot be fully absorbed by the scientific community and so we get diminishing returns → support gradual rather than sharp budget increases
- ✚ When scaling up the budget we should concurrently invest in young researchers
- ✚ New funding sources and sudden increases in budget can drastically change the research portfolio



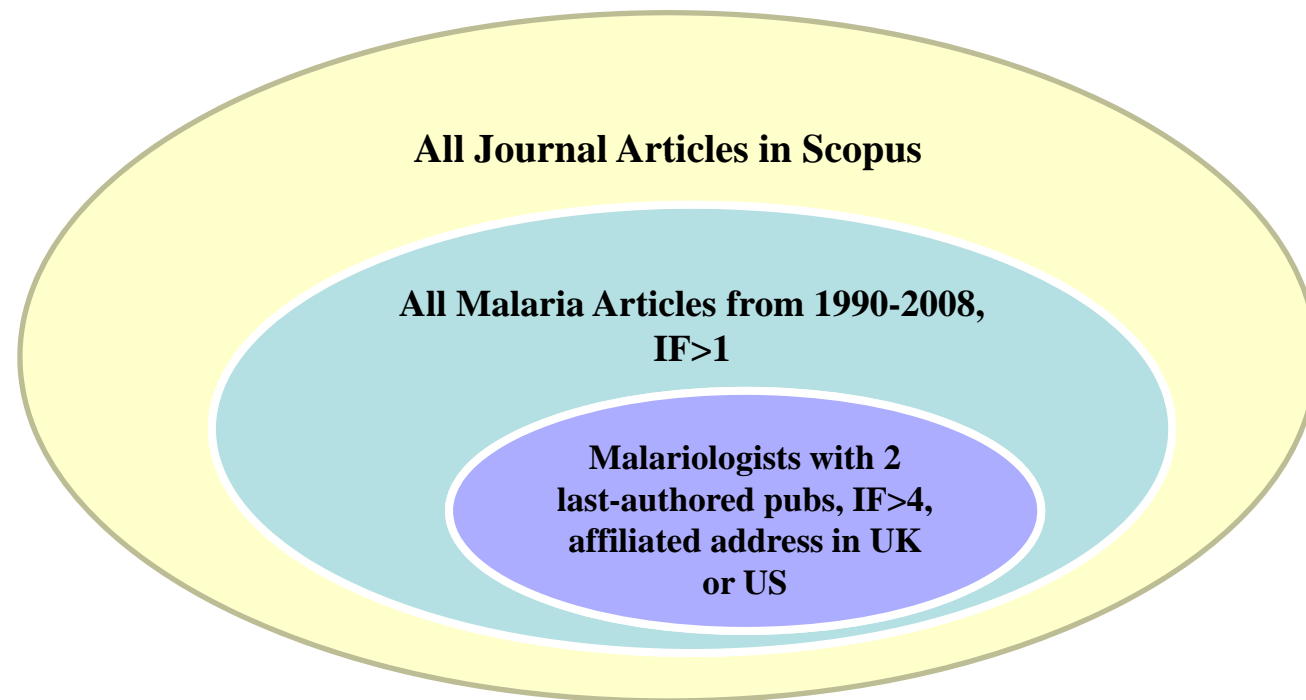
Thanks!

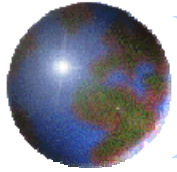
Contact:

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Publication Data



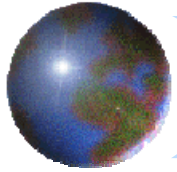


Geographic Diversity

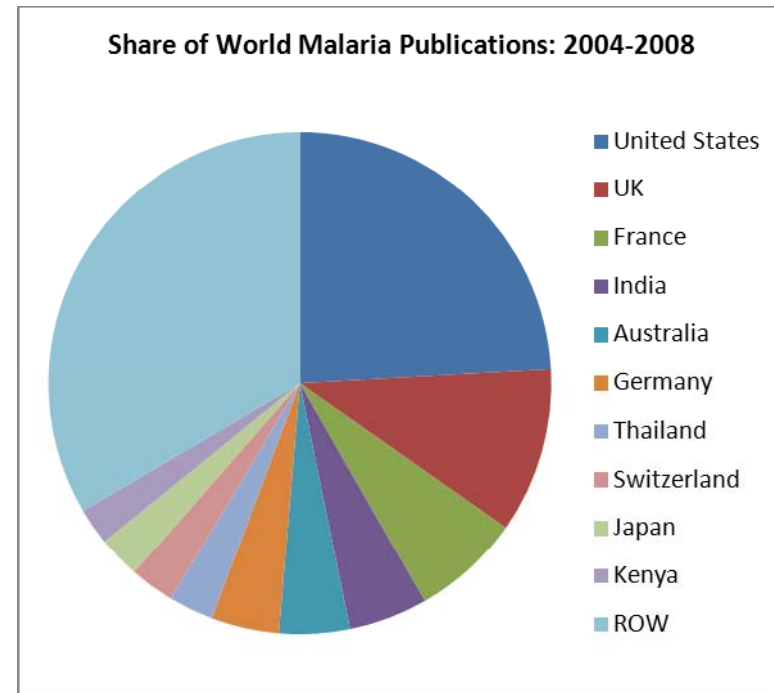
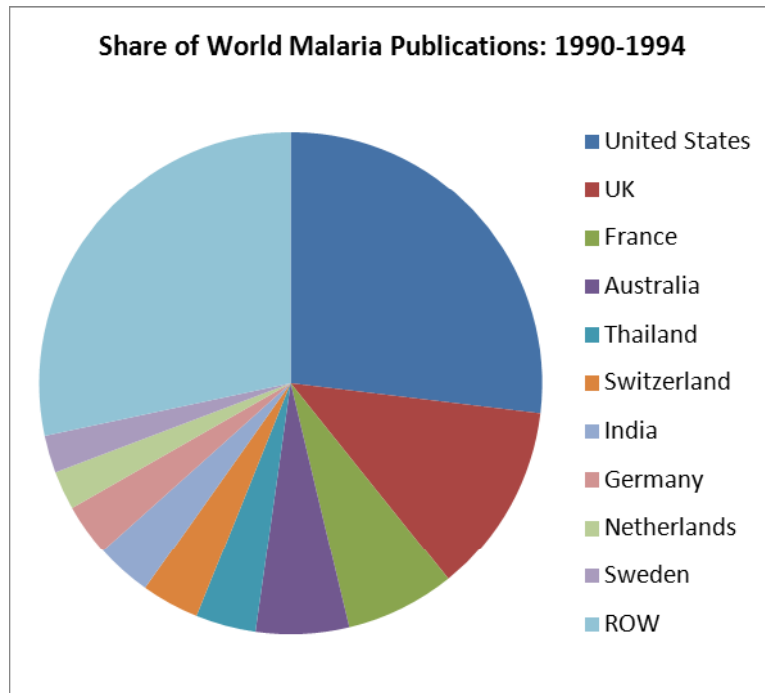
- More countries, more institutes
- But big fish stay big fish

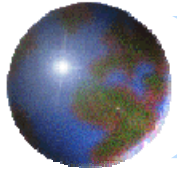
Geographic Diversity
Countries
Institutes
Individuals

Time Period	Total Countries	Top 10 Countries produce	Top 5 Countries Produce	US Share	UK Share	Herfindahl index for countries	Top 10 Institutes produce
Pre-Shock (1990-1994)	128	71.7%	43.9%	27%	12%	0.105	18%
Post Shock (2004-2008)	157	66.6%	48.7%	24%	11%	0.087	15%



Geographic Diversity

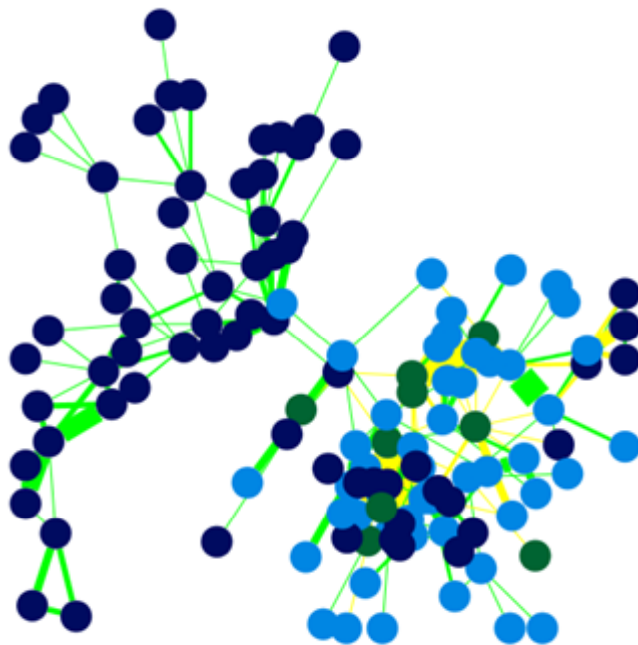




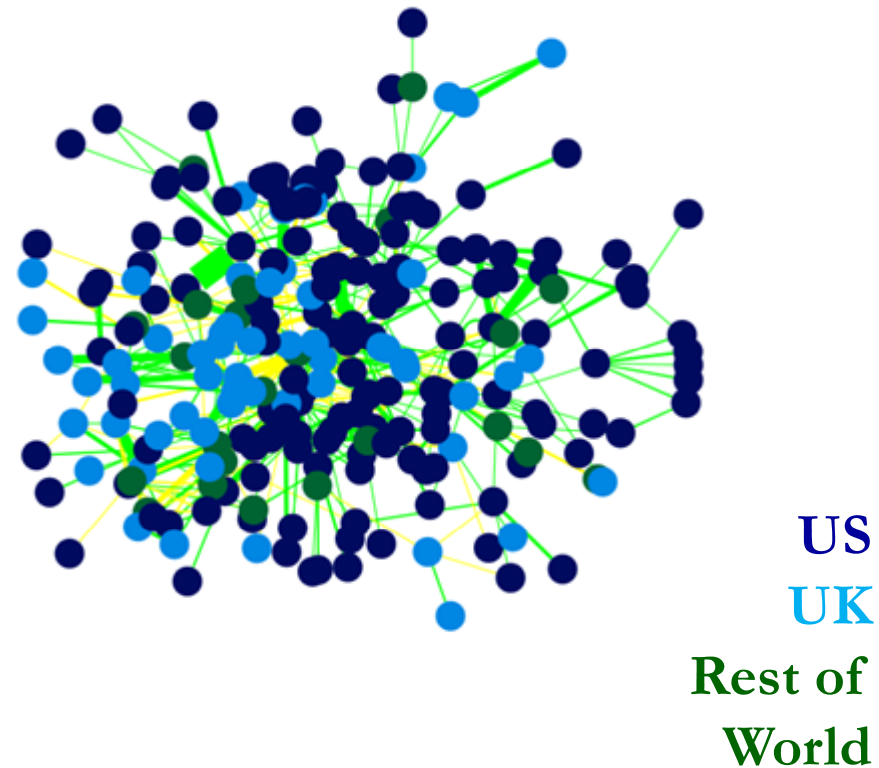
Collaboration

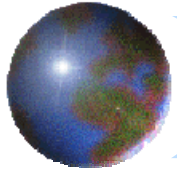
Collaboration
Central
players
Density of
network
Agreements

1990-1994



2004-2008





Collaboration

- ⊕ Shortest path between actors decreased
- ⊕ More international collaboration
- ⊕ ‘Giant Component’ became more inclusive
- ⊕ → More tight knit research community but also less transparent in policy making