The Private Sector Role in Supporting Malaria Control – Opportunities, Partnerships and Collective Actions against Malaria

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Introduction

- Examples covering aspects of disease vector control, integrated public health programs, and Public-Private Partnerships
- Focus on large resource/extractive development industries
  - Mining (precious and base metal projects)
  - Energy (Oil & Gas, hydropower, coal)
  - Associated construction industry (development phase operations)
  - Large agricultural projects (sugar cane, oil palm, rubber...)
- Malaria focus – with integrated mosquito-borne disease control
- Objective: Translating the complexity and scale of vector-borne disease control for addressing larger social and economic issues in public health through coordinated partnerships.
Mining

Large scale, long-term ecological & social impact on malaria transmission
Disease risk and operational complexities associated with large-scale development projects in VBD endemic areas

Development and Production environment:

- Increased mobility of populations (dramatic social change)
- Large workforces (indigenous & foreign)
- Displaced local populations
- Increased and rapid urban and semi-urban population growth – poor planning
- Poor infrastructure base, lacking basic services
- Inadequate public and private institutions
- Political instability
- Security concerns
- Large-scale changes to the ecosystem (direct and indirect effects)
- Often low income areas with limited capabilities
- Dynamic interplay and constant change: All can contribute and exacerbate disease transmission risk, influence control strategies and impact
Need for Malaria Programs

- Supersedes all other diseases involving mosquitoes, esp. in impoverished rural areas.

- Many areas lack any meaningful vector control or capacity. Generally coupled with poor access to primary health care.

- Often tied with regulatory national and international requirements, international conventions (ILO, UNDP) and primary investor commitments (World Bank – IFC), industry group policies (ICMM, WGC, IPIECA), and country requirements for formal contract of work.

- **Primary 1** - to maximize productivity by reducing impact of disease on workforce. Reduction in health costs (curative and preventive). Recruitment of talent and experience dependent on ensuring safe environment.

- **Primary 2** – CSR policies, a leading driver (guiding principle) for expanding control outside the direct workforce and into the local (development ‘affected’) community.
## Malaria Control Programs

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Entomology & Control in Basic Settings

**Essential Components - comprehensive control program**
- Evidence-based, site-specific program designs
- Findings drive control design, activities and schedules
- Routine monitoring of vector populations (i.e., transmission risk, control impact)
- Permanent trained staff and dedicated budget

**Capacity Building**: Generally little background beginning with rudimentary techniques – training a critical component

**Target Key Vectors** and most vulnerable points in lifecycle

**Routine Monitoring Tools**
- Larval and adult mosquito identification
- Insectary/laboratory
- Insecticide susceptibility monitoring
- Advanced techniques/methods (operational research)
Vector Control

Establish control based on local vector bionomics and community dynamics
Environmental planning & management
Vector monitoring and integrated control
Vector Monitoring

Mapping habitats, larval and adult mosquito densities, insecticide susceptibility, residual activity...
Vector Studies

Vector species distribution & natural vector infection rates, insecticide resistance patterns, longevity of residual insecticides on various surfaces, product comparisons, new chemicals and tools....
Program partnerships assisting communities

Collaboration

Extractive industry project

Community

Sustainability
Indonesia

Batu Hijau Mine, western Sumbawa

Timika/Tembagapura, southern Papua
Papua, Indonesia

Mimika District

Tamika
Southern Papua malaria epidemiology

- Focal, perennial hypo- to holoendemic malaria
- Highest prevalence/incidence in Indonesia
- Endemic from coastal lowlands, foothills up to ~1600m asl
- Sporadic to epidemic potential > 1600m to 2000m
- High year round malaria transmission
- Mainly forested, sparsely populated, remote
- Highly efficient vectors: 4 species Punctulatus Group (*An. farauti* s.l. and *An. koliensis*)
- Indoor/outdoor transmission – opportunistic, tends to be higher outdoors
- No discernible insecticide resistance
- Four species human *Plasmodium* species (no *P. knowlesi*)
- No evidence of drug resistance to ACTs
- Fast growing population – economic opportunities, expanding formal & informal (gold panners) sectors
Tamika Area, Papua

- Set-up: Freeport Workforce & Community MCP + Public Health (PHMC)
  - Malaria & Dengue Control (Gov’t integrated)
  - Tuberculosis Control (Gov’t integrated)
  - HIV – STI Prevention (Gov’t integrated)
  - BCC: Health Promotion & Awareness
  - General Public Health Services (Environmental health, water & food)

- Primary Collaboration: Indonesian Ministry of Health and local foundations
- Malaria workforce/community program initiated 1992
- Population growth >10% per annum
- Pop coverage: >350,000 (workforce ~32,000) / 280,000 ha
- >80% reduction in malaria prevalence since 2000
- < 200 per 1000 in control areas (annual school surveys < 2 to 15%)
- Workforce savings incentive >$7 million year
Integrated MCP

Five pillars of the MCP
(1) Prompt diagnosis and effective treatment,
(2) Focal Indoor Residual Spraying,
(3) Environmental management and larval control,
(4) Community awareness and personal protection (LLIN),
(5) Monitoring & Evaluation (evidence-based)
(6) Case investigations
Mimika District MCP Coverage

Pre-2003 Control Zones
Tamika Malaria Control Program

Stakeholder contributions:
- PTFI CHD: Funding, administration, implementation
- Health Service Mimika: Mimika Malaria Center
- MoH Jakarta: LLINs, IRS insecticides & larvicides
- LPMAK: Mimika Malaria Center hires
- Bank Papua: Transportation
- PTFI-PHMC: Technical support & analysis

Integrated Vector Management Strategy in Tamika (>90% district population)

Personal Protection: Universal coverage with LLINs
Vector Control: IRS (x2/yr) + environmental management (+ dengue vector control)
Expanded PCD community access
Active Case Detection (RDT + ACT)
Malaria Awareness Campaigns
Monitoring and Evaluation

PT Freeport Indonesia
Affiliate of Freeport-McMoRan Copper & Gold
Evidence of Impact – Workforce

Monthly Workforce Malaria Cases – 2012 to 2014

46.5% two-year (2012-2014) reduction

IRS 2013

- 46.4 % ↓ Malaria cases
- 50.9 % ↓ Crude incidence
- 19.1 % ↓ Slides collected
- 33.8 % ↓ SPR
Evidence of Impact – Tamika Area
RSUD, RSMM, CHD, Tamika Clinics

Monthly ‘TIMIKA’ MALARIA 2012-2015

IRS 2013
66.3% three-year (2013-2015) reduction

Cases

Jan  Feb  Mar  Apr  May  Jun  Jul  Aug  Sep  Oct  Nov  Dec
1762  1824  1830  1969  2283  2554  2503  2268  2456  2870  1936  1828
5279  5846  5804  5921  6088  6616  6420  6653  5967  5379  4693  4107

Total 2012
Total 2013
Total 2014
Total 2015

R² 0.432
R² 0.704
R² 0.616
R² 0.168
Additional Collaborations Mimika District

- Eijkman-Oxford Clinical Research Unit (EOCRU)
- Eijkman Institute for Molecular Biology
- Menzies School of Health Research (MSHR, Darwin Australia)
- University of Gadjah Mada (Yogyakarta)
- FHI360/ILO (Indonesia)
- Indonesian National Health Research & Development (LitBangKes)
- Papuan Health & Community Development Foundation (PHCDF)

**Community Malaria Operational Research Program** (MSHR & PHCDF)
- Assessment of DHA-Piperaquine impact (incidence, adherence, and cost)
- Malaria prevalence surveys
- Risk factors for anemia and nutritional status
- G6PDd and RBC polymorphisms
- Immunity in symptomatic and asymptomatic malaria infections
- *Plasmodium* genotyping
Western Sumbawa malaria epidemiology

- Hypo- to mesoendemic malaria (baseline)
- Southern malaria ‘belt’, less developed regency
- Endemic from coastal lowlands, minimal in foothills, deep forest transmission
- Sporadic to epidemic potential
- Seasonal malaria transmission
- Mainly forested, sparely populated, small towns
- No discernible insecticide resistance
- Indoor/outdoor transmission – opportunistic
- Three species human *Plasmodium* (*P. knowlesi* transmission? – local *Macaca*)
- No evidence of drug resistance to ACTs
- Growing but stable population – economic opportunities, formal & informal (gold panners)
Sumbawa, Indonesia

- Set-up: Workforce & Community MCP + Public Health
  - Malaria & Dengue Control
  - Tuberculosis Control
  - HIV – STI Prevention
  - Health Promotion & Awareness
  - General Public Health Services (water quality, food inspections)

- Primary Collaboration: Ministry of Health
- Baseline, workforce program initiated 1997
- Integrated WF & Community program implemented November 1999
- Population coverage: 40,000+ community (w/ workforce)
Sumbawa, Indonesia

Key Control Practices

Environmental management/larval control

Adult vector monitoring indicators & control

Community-based monitoring & treatment

District Population (2013): 117,004
Sumbawa, Indonesia

Environmental Management

Malaria - *Anopheles sundaicus*

Modification: Lagoon & stream channeling

Manipulation: algae control, larviciding
Sumbawa, Indonesia

Total Malaria Patients at Workforce Clinic 1998-2013

Malaria slide positive schoolchildren (5-17 yrs-old) in mine-impacted communities from 1997-2014
Sumbawa, Indonesia

Malaria Cases around Mining area by Active Case Detection

School Malaria Prevalence/Slide Positive Rate

Number of Malaria Cases Worforce Clinic

Workforce MCP 2007
Community MCP 2009
Other Programs – Case Studies

- **AngloGold Ashanti - Obuasi Ghana**
  - 2006 integrated disease control PPP-driven programs and northern Ghana with USAID/PMI and GFATM (US$140m from GFATM to expand program to 40 districts).

- **Freeport – Tenke Fungurume Mine, DRC**

- **Newmont - Bate Hanau Indonesia**
  - 1998 community program with 99% reduction in malaria, school prevalence 47% to < 1% since 2005

- **Marathon Oil - Equatorial Guinea**
  - Since 2003 malaria program on Bioko Island – significant reduction in malaria incidence.

- **BHP Billiton – southern Africa**
  - Lubombo Special Initiative (LSI), a public-private partnership for comprehensive malaria control covering parts of Mozambique, Swaziland and South Africa.
Keys for Program Success

- **Disease control in complex settings:** Malaria is local - each and every site unique from the technical, social, ecological, epidemiological, with varying expectations – combining unique private and public sector input essential.

- **Each site requires:**
  - Baseline data (basis of all future measures of impact)
  - Pragmatic, site-specific, integrated programming
  - Scale of development drive appropriate control program design and scope.
  - Evidence-based methodologies
  - Established benchmark program performance indicators
  - Built-in sustainability plans (10-30+ year timeline)
  - Establish strong partnerships over time
Public-Private Partnerships

5 general categories

- Donors: Multi-lateral GFATM, bi-lateral USAID (PMI)
- Implementers: Private industry, government, external contractors/NGOs
- Advisory Groups: WHO, RBM, ICMM, WGC, IPIECA, World Bank/IFC…
- Operational Research & Training: Universities, commercial industry.
- Emergency Response mechanisms: NGOs (MSF), UNICEF, WHO, IOM, …
Public-Private Partnerships

Complementary (not competitive or redundant)

PPP components of success:
- Mutual prioritized needs and goals
- Use of available local resources
- Long-term capacity building
- Long-term commitment by stakeholders
- Public acceptability
- Integration of health programming (target multiple health outcomes).

GOAL: Program expansion & sustainability based on evidence of success.
Private-Private Partnerships

- Mutually beneficial **operational research and product evaluations**
- Potential for large-scale field assessments within stable platforms

Examples:
- Vestergaard-Frandsen: LLIN, LLTM, DWL public acceptability and effectiveness (DRC)
- Sumitomo, BASF and Syngenta: reformulated residual chemicals and novel compounds with different modes of action (DRC & Papua)
- Evaluation/comparison of *Bti*-based products (estuaries Sumbawa)
- Field and semi-field assessment longer residual insecticides (DRC & Papua)
- AVIMA (IVCC) Insecticide Quantification Kits (IQK) field evaluation of IRS (DRC)
- Insecticide-impregnated mesh in houses (DRC)
- Potential – Evaluate ITC/M against outdoor transmission
- Potential – GIS-based surveillance
Partnerships – Messaging & Output

- National and international meetings
- Industry networks and recognition (CAMA, GBCHealth, ICMM, PIMI, IPIECA)
- Peer-reviewed publications, reports, guidelines, SOPs


Winning components with partnerships

**Complementary objectives** between stakeholders for health improvements in affected communities.

**Data sharing – outbreak reporting & response**
- CONFIN (Counterfeit Drug Forensic Network); WWARN (Worldwide Antimalarial Resistance Network); RBM, WHO, CDC/PMI
- Oxford (Oxford University Tropical Network), Menzies SHR (Tamika malaria epidemiology and control)
- KDRC EID Network
- Respective host country ministries and agencies

**Basic & operational research and product evaluations**
- Stable working environments – strong social and community liaison and trust, infrastructure and logistics, staff….
- Examples: RDT and IQK evaluations in field settings, insecticides (product comparisons, new formulations, novel compounds).

**Capacity building / training for sustainability**
- Work yourself out of job – a key measure of success. MSc and PhD programs. Project platforms for undergraduates.

**Stable platforms for collaborations and functional long-term partnerships**
Advantages linking with Private Industry

- **Mining industry uniquely well-positioned**
  - Strong risk management culture, systems and tools in place
  - Excellent logistics and networking capabilities
  - Secure locations
  - Advanced systems in health care & public health
  - Stable resources assets and availability
  - Development of strong long-term local, national & international relationships
  - Capacity building – ‘nationalization’ of people and institutions
  - Easily absorbed program costs relative to primary business objectives
  - Secure funding base - subcontract required skill sets as needed

- **Policies that promote safe and responsible natural resources stewardship**
  - Australian government “Mining for Development Initiative” (2011)
  - ICMM Sustainable Development Framework – many more….
Sustainability Development Timeline

- **Start 1990s**: Role of PTFI in Community Development
- **Today 2016**: Increase Partnership in Community Development
- **Mine Closure 50+ years**: Working Towards Sustainable Development

Gradual move from Private to Public domain
Conclusions

To ignore industry contributions, esp. in remote locations is to disregard unique opportunities for mutual long-term and productive collaborations.

Opportunities for collaborations:

- Malaria control programs can serve as ‘foundation’ to build in other health initiatives
- Health platforms that can serve as local/regional ‘Centers of Excellence’
- Lasting impact with capacity building across all levels (village-level to professional)
- Creation of regional ‘hub & spoke’ cooperative programming and network base
- Standardized information & data exchange network
- Leverage and complement local and regional resources to expand base of operations
- Participate EID Early Warning sentinel networks
- Promote and support operational studies and research
- Evidenced-based programming and support (support Health Impact Assessments/BLHS, intervention outcome evaluations)
- Goal: Develop integrated health systems, partnerships that build a sustainable future
‘Restless pig’ - Remote Yali village, early morning, Central highlands Papua (>2000m), 1998
AVOID MOSQUITO BITES
PREVENT MALARIA