The potential for housing improvements to reduce vector-borne diseases and the challenges of scale-up

> Dr Fiona Shenton Durham University, UK Roll Back Malaria Partnership MSWG Wednesday 30th June 2021



What's the problem?

- Vector-borne diseases are a major environmental threat to countries in the tropics & their economies
- Building out vectors and designing healthier homes in general will lead to more resilient dwellings, villages, towns and cities



The basic split



Rural/Peri-urban = malaria



Urban/Peri-urban = dengue & worse

But note emerging threat of malaria transmitted by *An. stephensi*

Historical evidence that housing improvements work

THE NEW PROPHYLAXIS AGAINST MALARIA: AN ACCOUNT OF EXPERI-MENTS IN LATIUM. BY PROFESSOR ANGELO CELLI. (Specially translated for THE LANCET from the Supplemento al Policlinico, Anno VI., N. 51.)

THE modern theory of the propagation of malaria by means of mosquitoes had scarcely been confirmed experimentally when, in my lectures in May and June of 1899 and shortly afterwards in book form,1 I gave an exposition of the new epidemiology and the prophylaxis following from it. This, I pointed out, in order to be completely successful must be directed against (1) the causes bringing about infection, either by (a) destroying these (by disinfection of the blood of malarious persons and by the destruction of mosquitoes) or (b) by preventing their entrance into the human organism (by protection of dwelling-houses and of the exposed parts of the body); and (2) against the pre-disposing causes (organic, physical, and social). In view of the arduous nature of any attempt to battle against the latter set of causes I endeavoured (even before the commencement of the malarial season of 1899) to put into practice those only of the prophylactic measures which have for their aim the suppression of the direct causes of the epidemic, that is to say, the causes bringing about infection. I was even then persuaded, and am now more than ever convinced, that a complete and certain prophylaxis by disinfection of the blood by means of quinine is practically impossible, although Koch, and later Gosio, and at first Grassi also, believed in its efficacy. And I had likewise come to the conclusion, through my own and Casagrandi's researches,² that although the destruction of the mosquito in the aquatic and the aerial stages of its existence is in itself not a difficult thing, this is not practicable on a large scale, chiefly because there is not the same immediate material advantage in killing insects which are injurious to man that there is in destroying those which are injurious, for example, to the grape-vine.

My first prophylactic experiments of 1899 had consequently for their object the testing of the means best 7/181 malaria cases in people in intervention houses200/217 malaria cases in people living in control houses

Angelo Celli A La nuova profilassi della malaria nel Lazio. *Supplemento al Policlinico* 1900a;6:1601–1606 Systematic review on malaria and housing

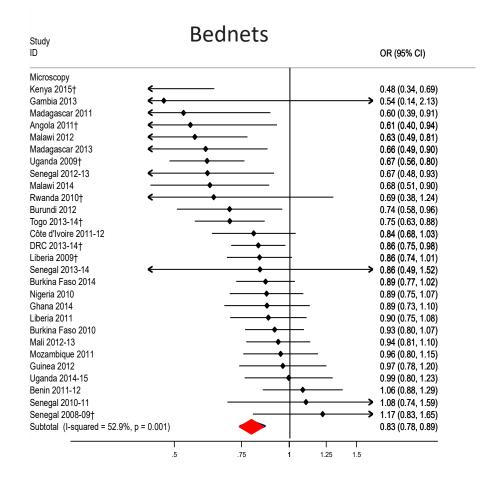
Tusting et al. 2015 Malaria J 14: e209

- 15,526 studies reviewed
- 53 studies included
- 47% lower risk of infection with good housing
- 45-65% lower risk of clinical malaria with good housing



Malaria risk in 29 surveys in sub-Saharan Africa

Tusting *et al.* 2017, *PLoS Medicine*, 14, e1002234.



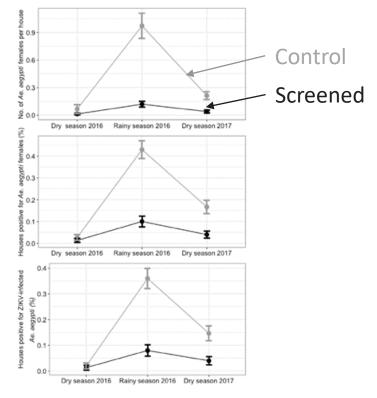
17% reduction

Also effective against Aedes mosquitoes...

Screened houses ≈80% less infested with *Aedes* females



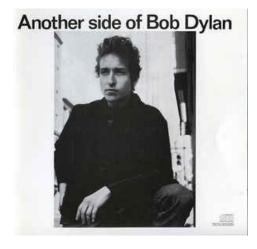
Aedes aegypti proof-houses



Aedes aegypti numbers

Manrique-Saide P, et al. (2021) Insecticide-treated house screening protects against Zika-infected Aedes aegypti in Merida, Mexico. PLOS Neglected Tropical Diseases **15**(1): e0009005. https://doi.org/10.1371/journal.pntd.0009005

Scale-up



"I'm not the one you want, babe I'm not the one you need"

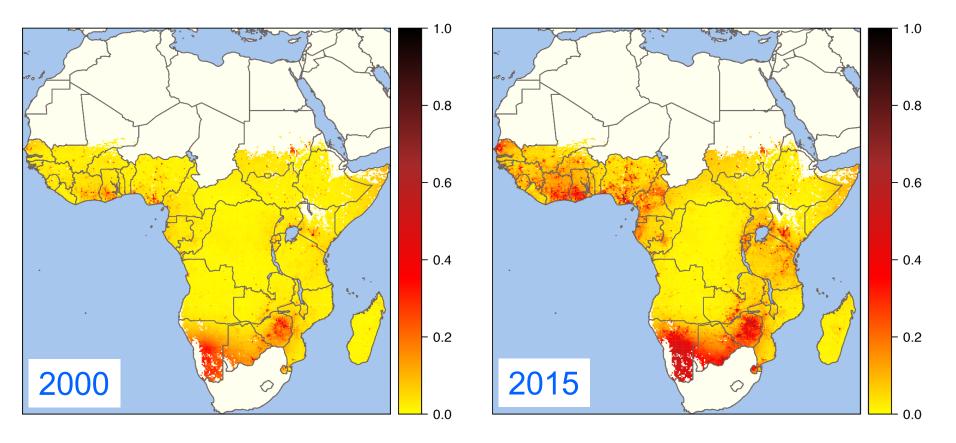
"It Ain't Me Babe" from Another Side of Bob Dylan, 1964

Opportunities

- People are doing it for themselves, harness this growth
- Improved housing has co-benefits in addition to protecting against VBDs
- COVID-19 coupled with the CLIMATE CRISIS is concentrating minds build back better



Prevalence of improved housing doubled in sub-Saharan Africa from 2000 to 2015



Predicted prevalence of housing with finished building materials, improved water & sanitation and sufficient living area

Tusting et al Nature, 2019

Improved housing is associated with better child health in sub-Saharan Africa

Outcome	0	dds Ratio (95% CI)			
Malaria infection (microscopy)		0.88 [0.83; 0.93]			
	Insecticide treated net	0.83 [0.78; 0.88]			
	Improved house	0.88 [0.80; 0.97]	_	-	
Malaria infection (RDT)	Finished house materials	0.85 [0.80; 0.89]			
	Insecticide treated net	0.84 [0.79; 0.88]			
	Improved house	0.82 [0.77; 0.88]			
Diarrhoea	Finished house materials	1.01 [0.97; 1.05]			
	Improved drinking water	0.97 [0.92; 1.03]			
	Improved sanitation facility			▰┼	
	Improved house	0.92 [0.88; 0.97]		-	
Acute respiratory infection		0.99 [0.93; 1.06]			
	Improved house	0.96 [0.87; 1.07]			
Low height-for-age	Finished house materials	0.88 [0.83; 0.92]			
	Improved house	0.83 [0.77; 0.88]			
Low weight-for-height	Finished house materials	0.96 [0.88; 1.05]			
Lauren inhet fan an e	Improved house	0.90 [0.83; 0.99]		—	
Low weight-for-age	Finished house materials	0.87 [0.82; 0.91]			
Any encourse	Improved house	0.85 [0.80; 0.90]		_	
Any anaemia	Finished house materials	0.95 [0.90; 1.01]		- +	
	Improved house	0.87 [0.82; 0.92]			
Severe anaemia	Finished house materials	0.95 [0.89; 1.03]		B	
	Improved house	0.89 [0.84; 0.95]			
			0.0	4	1 05
			0.8 0.1da		1.25
				Ratio (95% CI)	

Data are from 824,694 children aged 0-5 years surveyed in 54 DHS surveys, 21 MIS surveys and 2 AIDS Indicator Surveys dating from 2001 to 2017 in 33 countries.

Tusting et al. PLoS Med. 2020

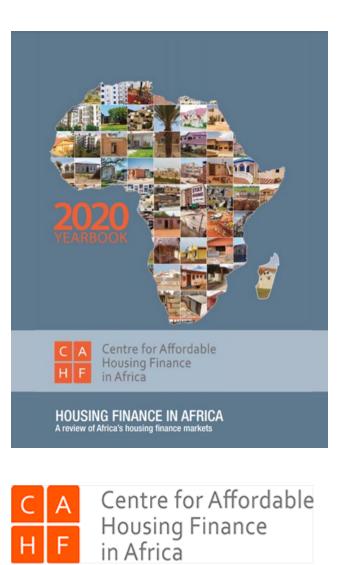
Green Buildings A FINANCE AND POLICY BLUEPRINT FOR EMERGING MARKETS

nvestment opportuni by property type and reg	ty gion (USD billions)						55
	7.	-	*		and the second s	7	
	Sub-Saharan Africa	Middle East & North Africa	South Asia	East Asia Pacific	Europe & Central Asia	Latin America & Caribbean	\$
Education	73.8	122.6	41.2	1,191.4	50.6	269.6	1,749.2
Healthcare	38.7	85.8	13-5	320.6	30.2	81.1	569.9
Hotels & Restaurants	11.9	35.2	38.8	1.345-7	23.6	54.2	1,509.4
Institutional/Assembly	27.6	50.2	17.3	733-7	24	26.7	879.4
Office	49.6	65.3	61.7	2,566.8	40.8	111.9	2,896.2
Retail	31.4	60.7	87.6	844.8	39.1	84.2	1,147.9
Transport	5-3	7.4	3.2	26.2	3.8	11.9	57.8
Warehouse	20.1	22.5	18.2	97.4	7.1	25.1	190.
TOTAL COMMERCIAL	258.4	449.7	281.5	7,126.6	219.2	664.7	9,000.3
Multi-Unit-Residential	96.6	158.1	542.9	7.555-9	201.3	745-2	9,300
Single-Family- Detached	413	528.4	933.8	1,331.7	460.2	2,751	6,418.
TOTAL RESIDENTIAL	509.6	686.5	1,476.7	8,887.6	661.5	3,496.2	15,718.
GRAND TOTAL	768	1,136.2	1,758.1	16,014.2	880.7	4,160.9	24,718.

viii Green Buildings | A Finance and Policy Blueprint



Creating Markets, Creating Opportunities



Centre for Affordable Housing Finance in Africa (2020). 2020 Yearbook: Housing Finance in Africa. Johannesburg, South Africa. http://housingfinanceafrica.org/

Find out more information on the housing finance sector of The Gambia, including key stakeholders, important policies and housing affordability:

- Macroeconomic Overview
- Access to Finance
- Affordability
- Housing Supply
- Property Markets
- Policy and Regulation
- Opportunities
- Availability of data on housing finance
- COVID-19 response

Websites





Challenges/Next steps

- Demonstration houses: Star Homes project
- Funding accessing the money that is going into housing, especially green building
- Microfinance and remittances
- Informal settlements
- Support for city leaders and mayor: devolved power and fiscal backing



Star Homes: low carbon, healthy and sustainable



Acknowledgments:







