Developing Logic Models

An introduction to using Logic Models in CIDG reviews.

What are Logic Models?

Logic models are diagrams which map out important concepts within a systematic review. They typically appear in the background of a review, but may provide an underlying framework for both the results section and the discussion.

Why use Logic Models?

Systematic reviews are increasingly complex. The interventions may be complex (programmes with multiple components), the proposed mechanism of action may be complex (the theory of change), the interplay of multiple confounding factors may be complex, and the relationship between intermediate and impact outcomes may be complex.

Logic models can help to explain some of this complexity to the reader.

Perhaps more importantly, logic models can help systematic review authors to critically appraise the theory of why and how an intervention might work, and unpick any underlying assumptions.

Are Logic Models compulsory in CIDG reviews?

No, they are not. However, the more complex the review the more likely we are to request one.

What other resources are available to help us develop a Logic Model?

These papers provide an introduction to logic models, and some examples:

1. Anderson LM, Petticrew M, Rehfuess E, Armstong R, Ueffing E, Baker P, Francis D, Tugwell D: Using logic models to capture complexity in systematic reviews. Res Synth Meth 2011, 2:33–42.

2. Baxter SK, Blank L, Woods HB, Payne N, Rimmer M, Goyder E. Using logic model methods in systematic review synthesis: describing complex pathways in referral management interventions. *BMC Medical Research Methodology*. 2014;14:62. doi:10.1186/1471-2288-14-62.

3. Kneale D, Thomas J, Harris K (2015) Developing and Optimising the Use of Logic Models in Systematic Reviews: Exploring Practice and Good Practice in the Use of Programme Theory in Reviews. PLoS ONE 10(11): e0142187. doi: 10.1371/journal.pone.0142187
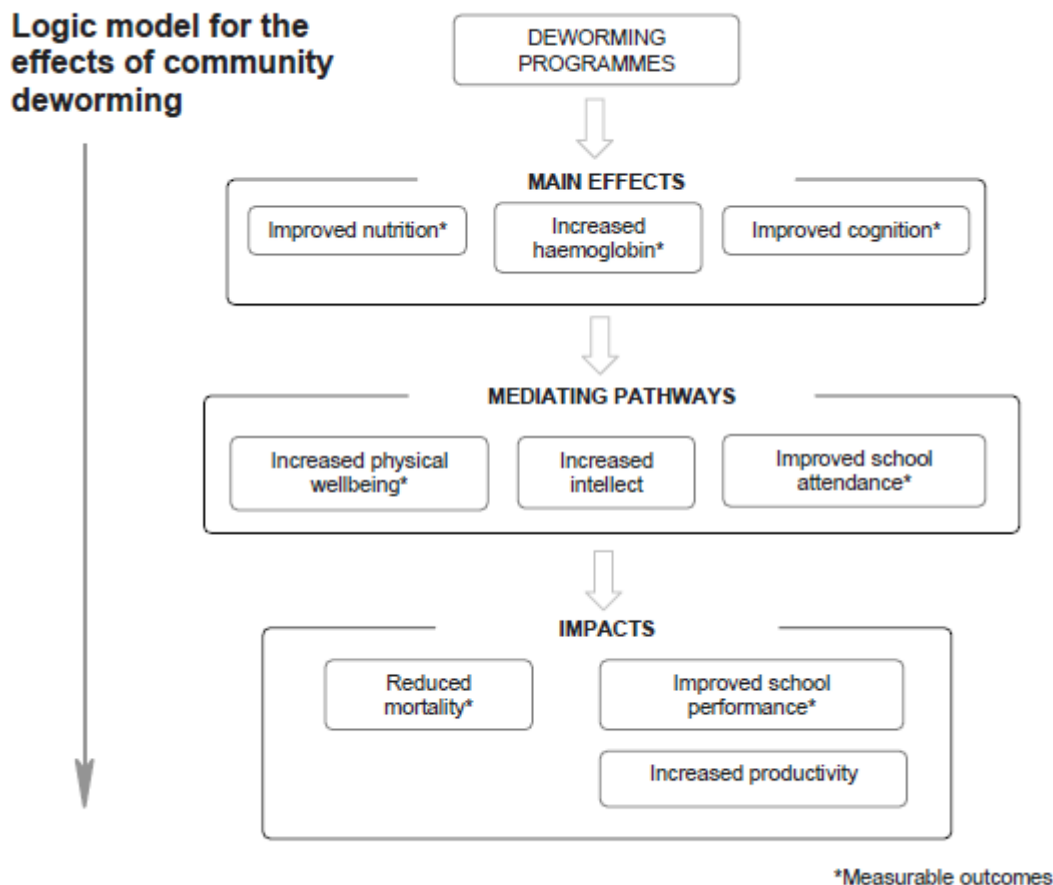
Do you have some examples of Logic Models in CIDG reviews?

Some examples are given in the following pages. You may also want to go to the reviews themselves to see how the logic models were used to simplify the background, frame the results, and inform the discussion and conclusions.

Logic model that shows the likely mechanism of action of the intervention

This logic model, shows how the different outcomes included in the review relate to each other: Which are intermediate outcomes and which are impact outcomes.
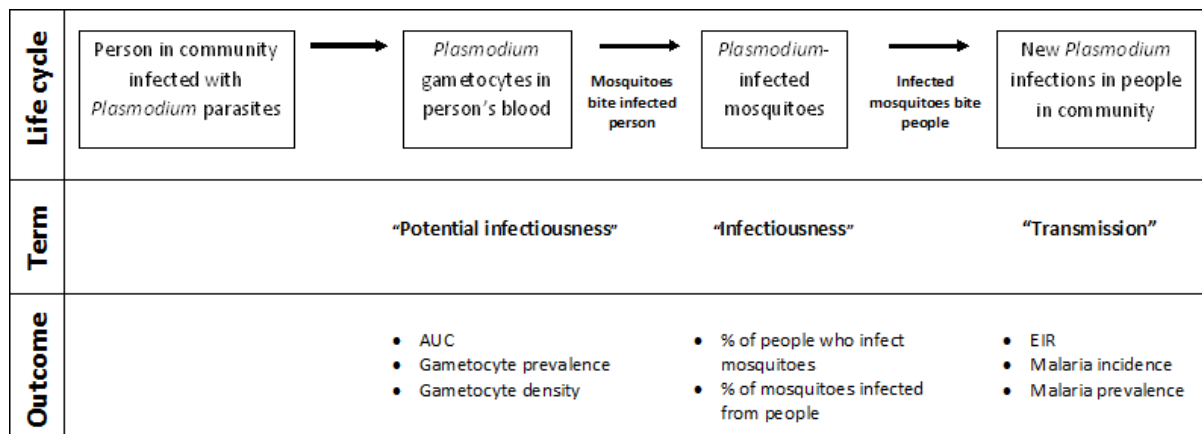
Interestingly, evidence of an effect on the intermediate outcomes (which are easier to measure) does not guarantee an effect on the impact outcomes. However, evidence of no effect on the intermediate outcomes can be used as an argument that an impact effect is very unlikely (unless there is another mechanism).

Taylor-Robinson DC, Maayan N, Soares-Weiser K, Donegan S, Garner P. Deworming drugs for soil-transmitted intestinal worms in children: effects on nutritional indicators, haemoglobin and school performance. Cochrane Database of Systematic Reviews 2012, Issue 11. Art. No.: CD000371. DOI: 10.1002/14651858.CD000371.pub5.
http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD000371.pub5/abstract

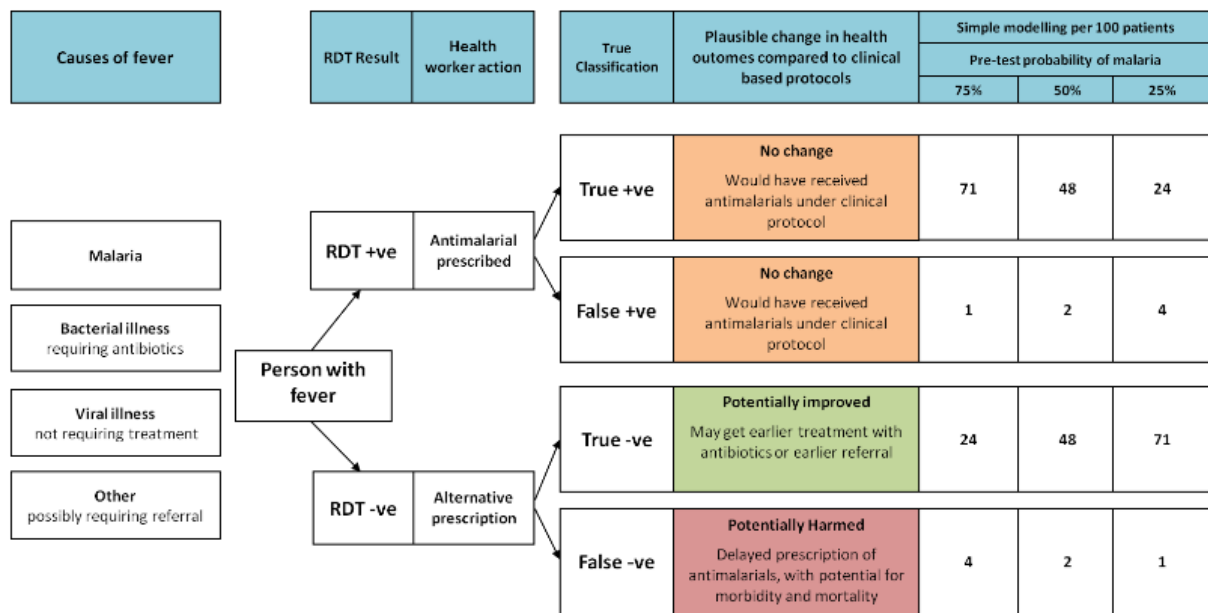## Logic model that shows the likely mechanism of action and defines the outcome groups used in the review.

This logic model maps the measurable outcomes onto the stages of the malaria parasite lifecycle which allow transmission from person to person via mosquitos. It presents a logical hierarchy of measurable outcomes, and makes clear that a reduction in gametocyte numbers is only an indirect measure of what we actually want to achieve – a reduction in malaria incidence and prevalence

Life cycle	Person in community infected with *Plasmodium* parasites	→	*Plasmodium* gametocytes in person's blood	Mosquitoes bite infected person	*Plasmodium-* infected mosquitoes	Infected mosquitoes bite people	New *Plasmodium* infections in people in community
Term			"Potential infectiousness"		"Infectiousness"		"Transmission"
Outcome			• AUC • Gametocyte prevalence • Gametocyte density		• % of people who infect mosquitoes • % of mosquitoes infected from people		• EIR • Malaria incidence • Malaria prevalence

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Logic model that demonstrates the potential effects of an intervention.

When describing the introduction of rapid diagnostic tests, many documents including those from the WHO, state that RDTs will improve the care of people with malaria. This logic model demonstrates that compared to clinical diagnosis, introducing RDTs is actually only likely to improve health outcomes for those without malaria, who test negative. It also incorporates some simple modelling to demonstrate the epidemiological setting where RDTs could be expected to have their biggest effect on antimalarial prescribing.

Causes of fever	RDT Result	Health worker action	True Classification	Plausible change in health outcomes compared to clinical based protocols	Simple modelling per 100 patients		
					Pre-test probability of malaria		
					75%	50%	25%
Malaria	RDT +ve	Antimalarial prescribed	True +ve	**No change** Would have received antimalarials under clinical protocol	71	48	24
Bacterial illness requiring antibiotics			False +ve	**No change** Would have received antimalarials under clinical protocol	1	2	4
Viral illness not requiring treatment			True -ve	**Potentially improved** May get earlier treatment with antibiotics or earlier referral	24	48	71
Other possibly requiring referral	RDT -ve	Alternative prescription	False -ve	**Potentially Harmed** Delayed prescription of antimalarials, with potential for morbidity and mortality	4	2	1

Person with fever

Odaga J, Sinclair D, Lokong JA, Donegan S, Hopkins H, Garner P. Rapid diagnostic tests versus clinical diagnosis for managing people with fever in malaria endemic settings. Cochrane Database of Systematic Reviews 2014, Issue 4. Art. No.: CD008998. DOI: 10.1002/14651858.CD008998.pub2.

http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD008998.pub2/abstract

effective health care
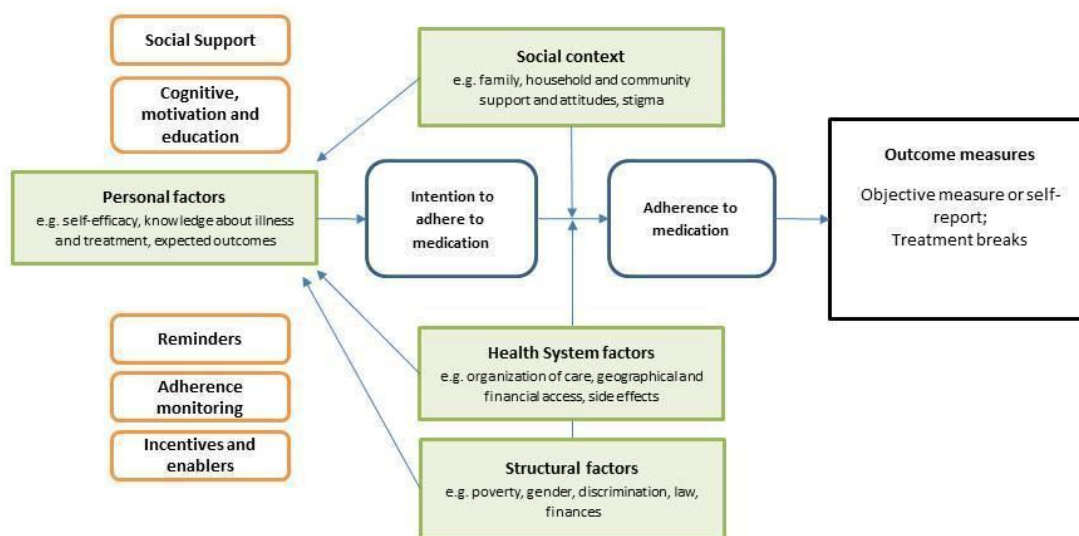RESEARCH CONSORTIUM

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Logic model that demonstrates how many different factors influence the potential effects of an intervention, and the range of interventions available.

This model is probably still too complex to fully help the reader. It is attempting to present several complex ides:

- There is an important step between the patient intending to adhere, and actual adherence.
- This step is influenced by many social, personal and health system factors.
- These factors in turn influence each other.

We would like to also map onto this framework, the different components of any intervention – The orange squares, and which factors these influence.

Roberts DJ, Rylands J, Sinclair D. Interventions using mobile devices (phones, smart phones or tablets) to improve adherence to treatment for HIV or tuberculosis. [Protocol]. Cochrane Database of Systematic Reviews [Year], Issue [Issue].