

Visualising malaria intervention prioritisation pathways with uncertainty.

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M3CPI pre-brief

Pete Winskill

Modelling impact and cost

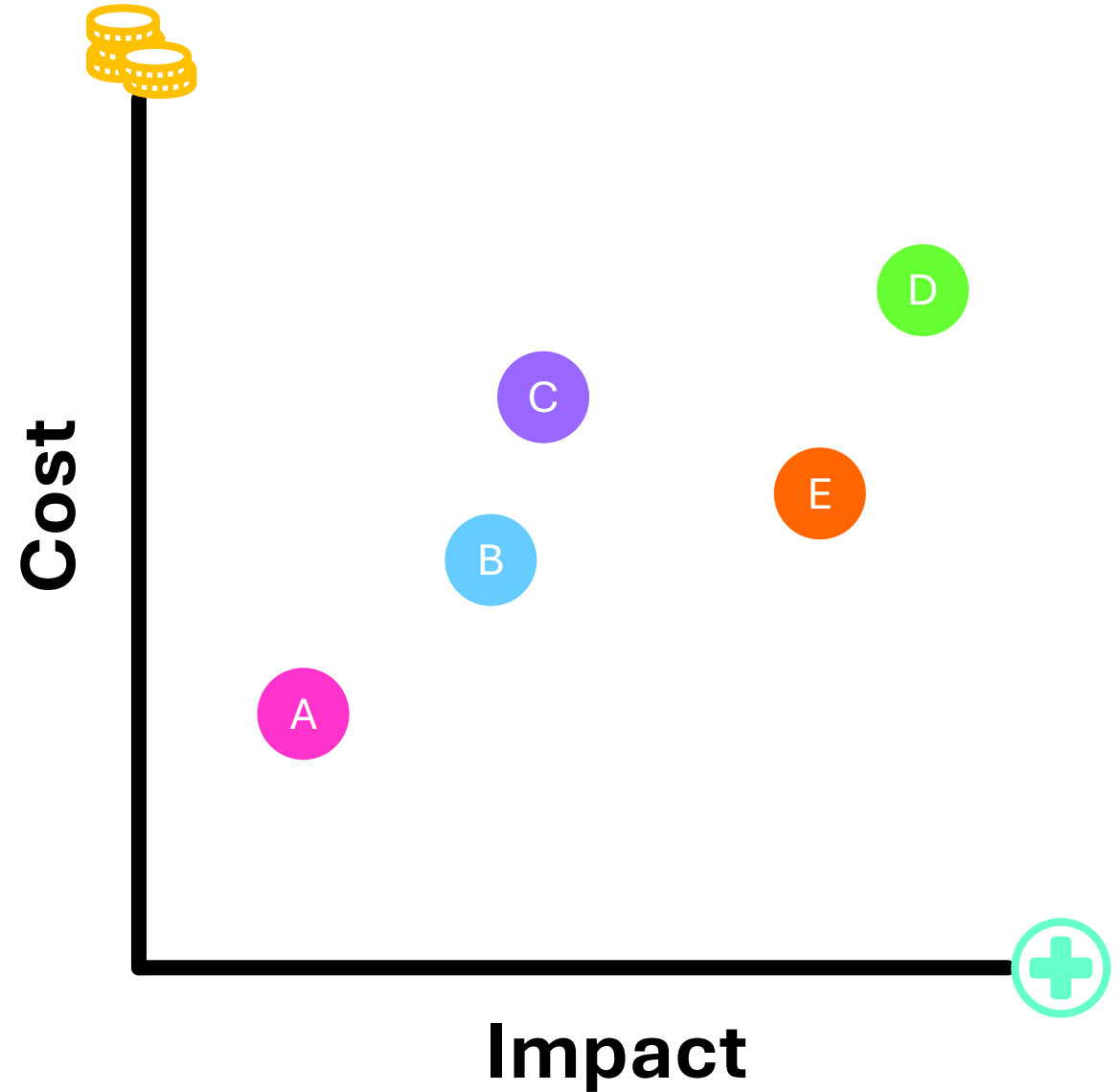
Let's consider a single setting

We have 5 different packages of interventions:



For each we can model the:

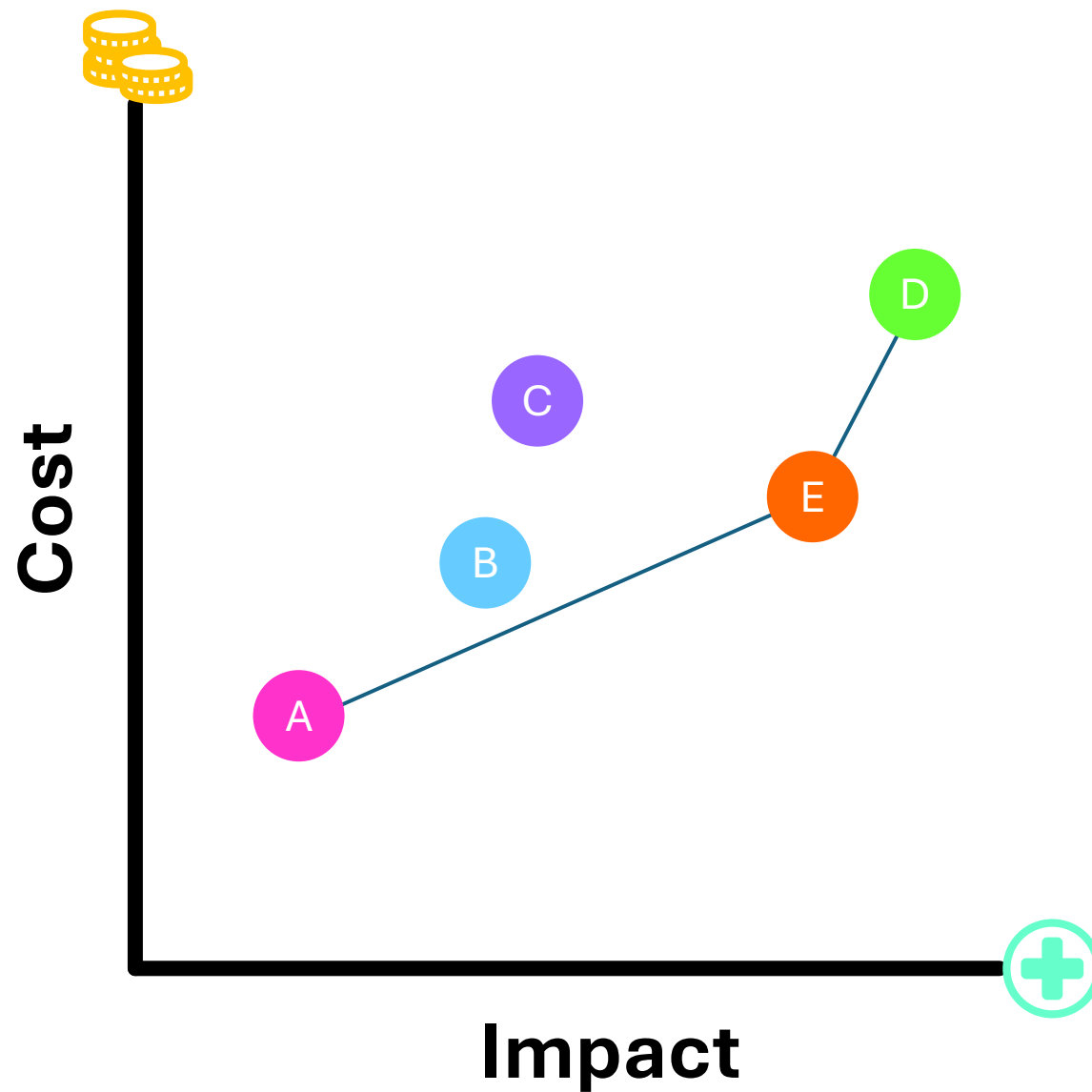
 **Impact**  **Cost**



Modelling impact and cost

We can estimate the cost-effectiveness frontier, asking *for a given spend which package maximises our health impact?*

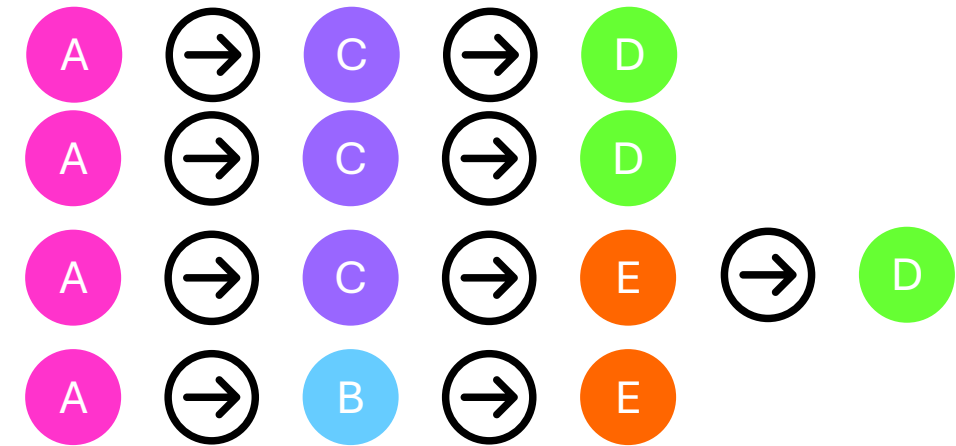
This gives us an answer of how to scale up (or down) interventions as our budget changes:



Prioritisation pathways with uncertainty

For each setting we obtain many estimates of the most cost-effective prioritisation pathway because:


- **Uncertainty** in inputs, model structure, parameterisation and costs produces multiple plausible outcomes.
- **Each package has a range** of cost and impact estimates, not a single value.
- **Different WTP thresholds** shift which pathways appear optimal.
- **Non-linear intervention effects** mean small changes can lead to different next steps.
- **Current strategies constrain** which transitions are feasible.
- **Contextual differences** (epidemiology, ecology, delivery conditions) drive further variation.

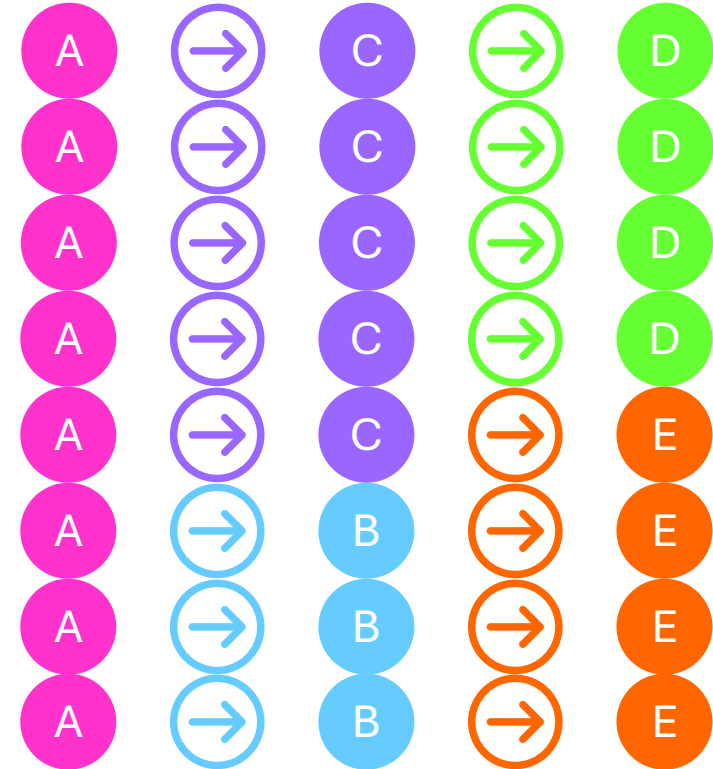


Combining outputs

We want to summarise cost-effective options whilst being transparent about *uncertainty*.

If we stack up all our options, we can start to get a sense for which options occur and how often.

Let's assume we're prioritising (increasing budget) and our current intervention package is  A



Sankey diagram

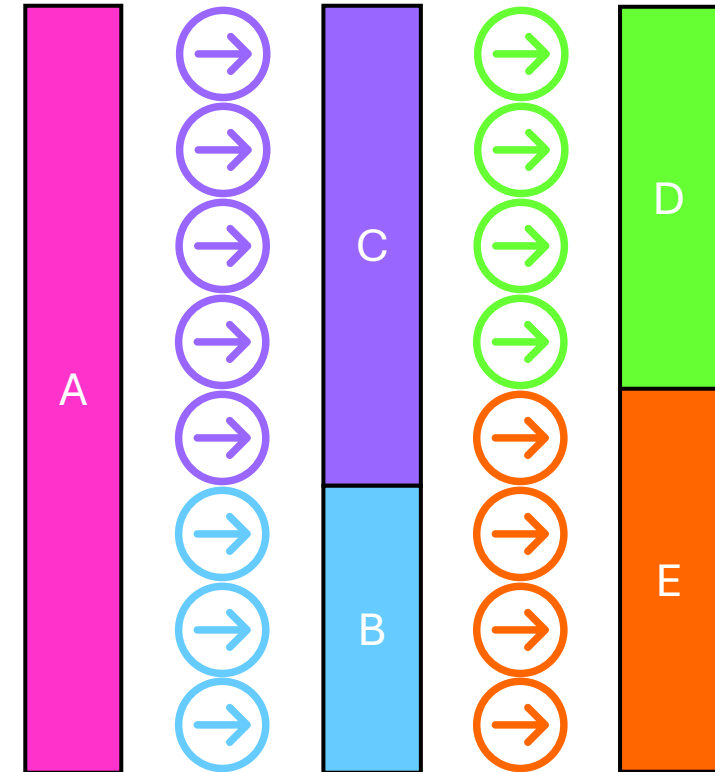
We want to summarise cost-effective options whilst being transparent about *uncertainty*.

We can stack up all of the options and summarise them with a [Sankey Diagram](#).

Bars represent our intervention packages.

- Taller bars indicate that a given intervention package was chosen more often in our outputs

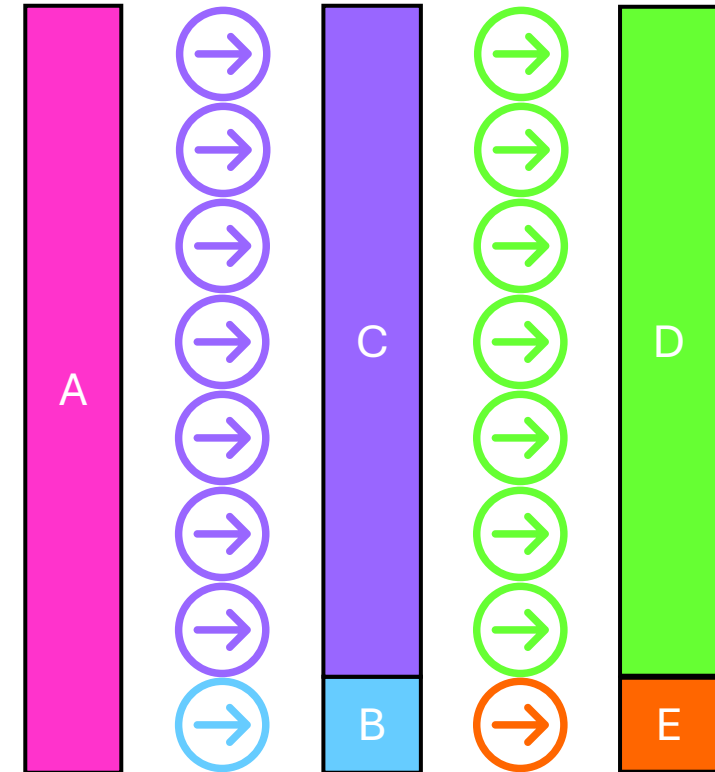
Flows (arrows) represent our next steps.



Certain findings

For some settings, the conclusion might be **very certain**, showing little variation.

Even when we include many sources of uncertainty, the best decisions are very clear and stable.

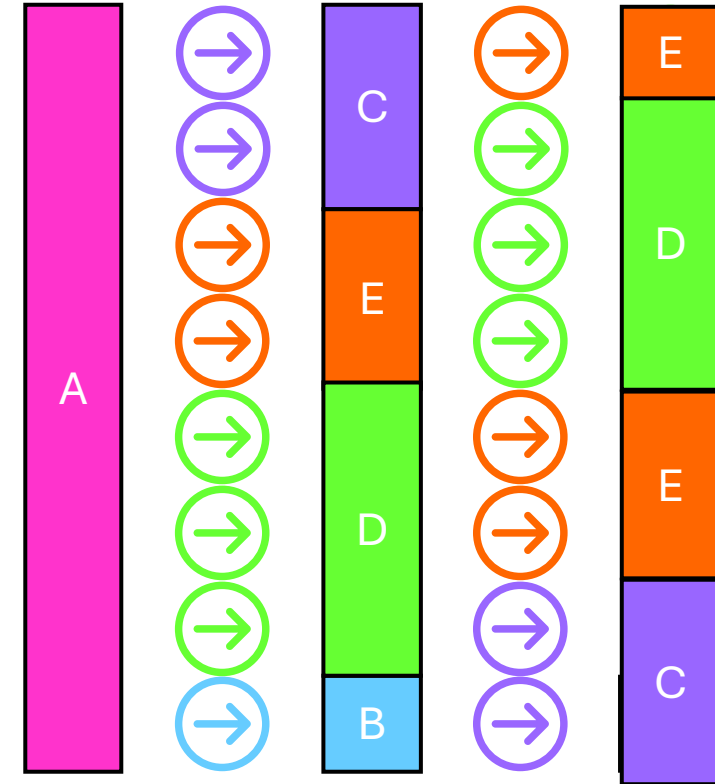
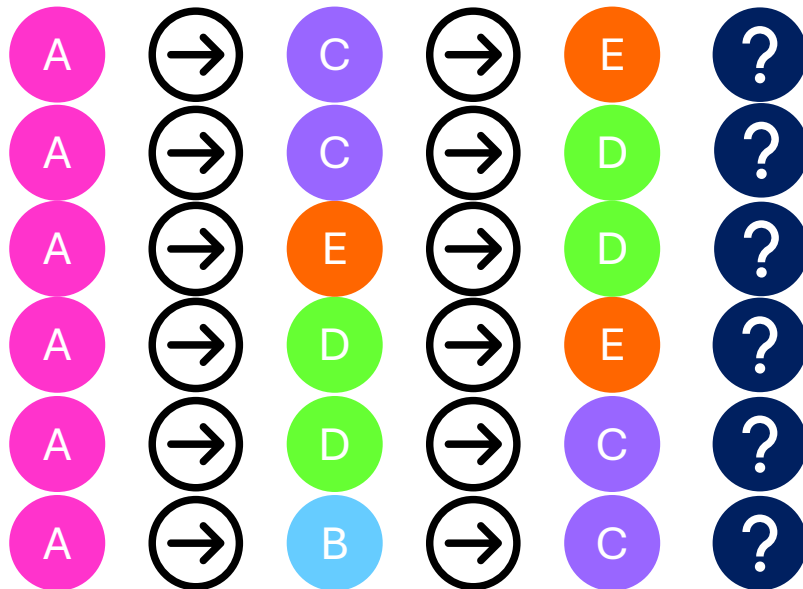


Uncertain findings

For others, the conclusion might be **very uncertain**.

This may indicate that multiple options have similar cost-effectiveness, and additional decision-making layers will be the decisive ones.

It may also highlight gaps in our understanding, the data or differences between the models or modelling approaches.

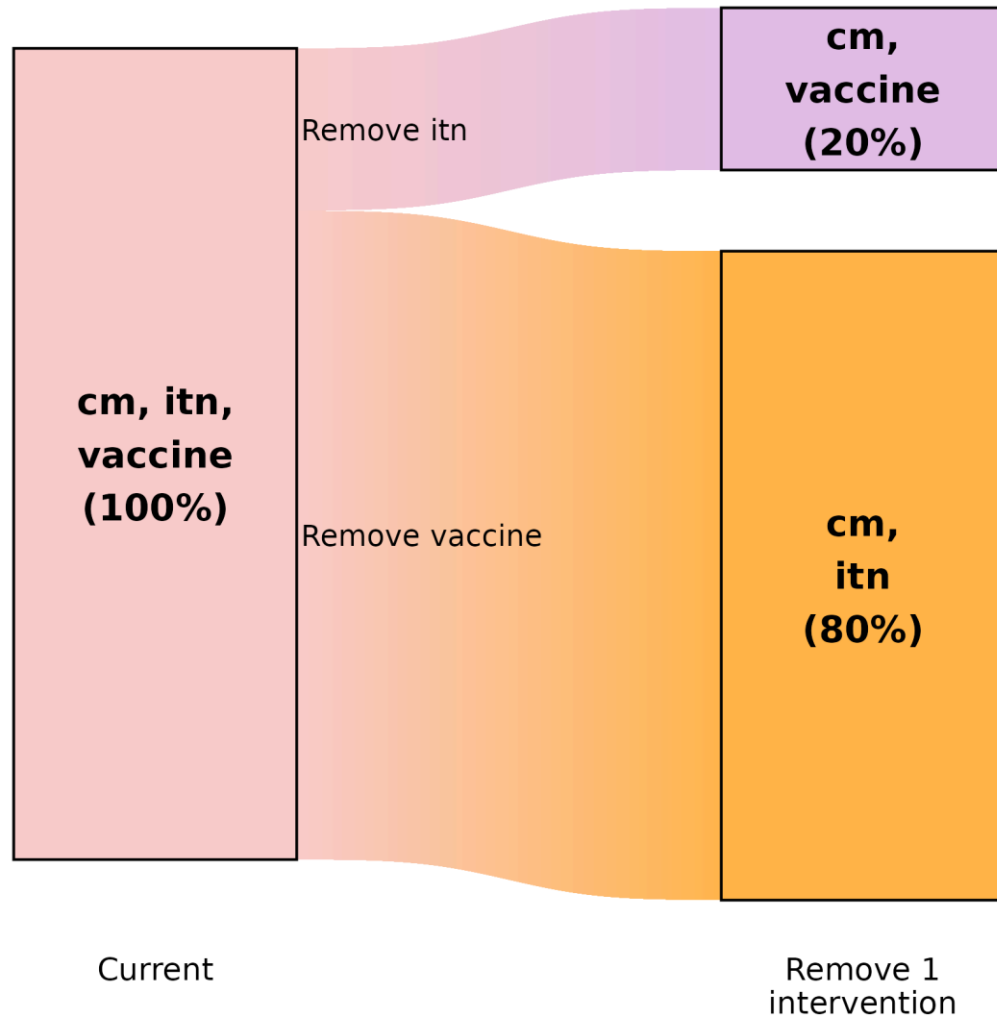


Examples of the types of Sankey diagrams we will present:

De-prioritisation (scaling down)



Step 1: Remove 1 intervention



Current intervention package:

- Case-management, ITNs and vaccine

Options:

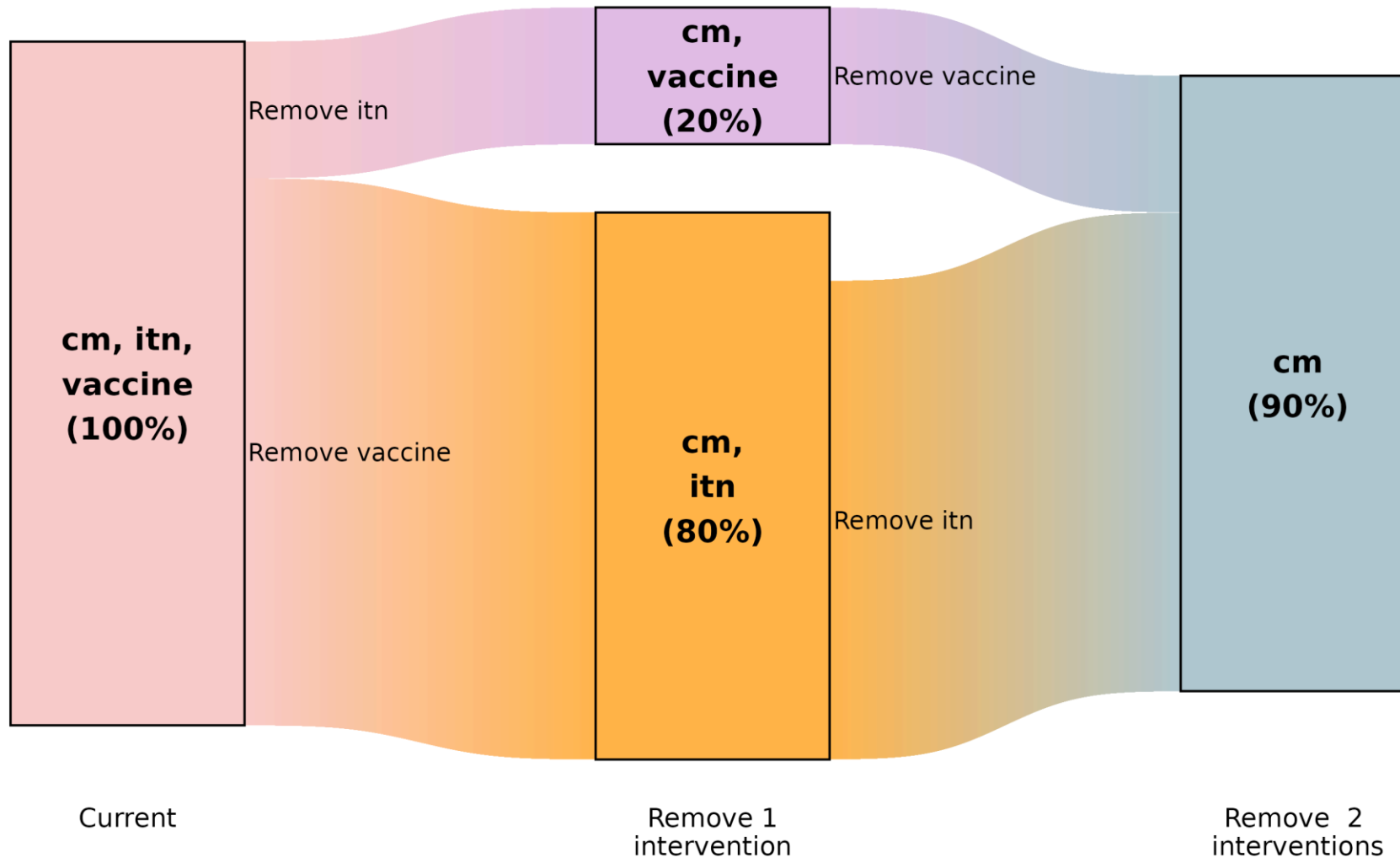
- Remove ITNs
- Remove vaccine

Result:

- In 80% of pathways, vaccine is removed
- In 20% of pathways ITNs are removed



Step 2: Remove a 2nd intervention



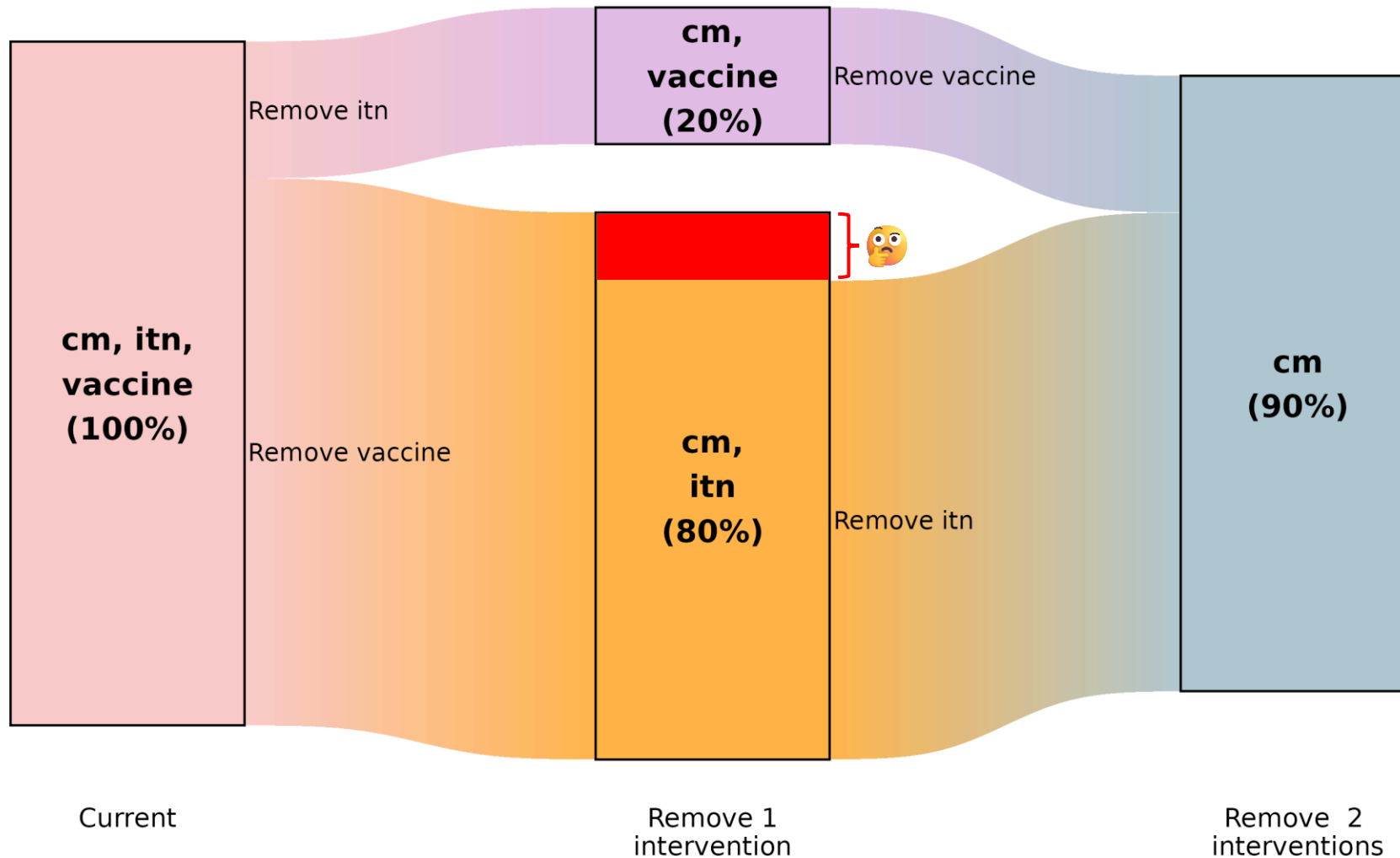
2nd step options:

- Remove vaccine
- Remove ITNs

Result:

- 90% of pathways remove vaccine or ITNs, finishing with case management only.

Step 2: Remove a 2nd intervention



Note that 10% of pathways don't go any further than case management and ITNs.

Why?

For these settings, **removing ITNs would increase total costs**, so the pathway cannot proceed further.

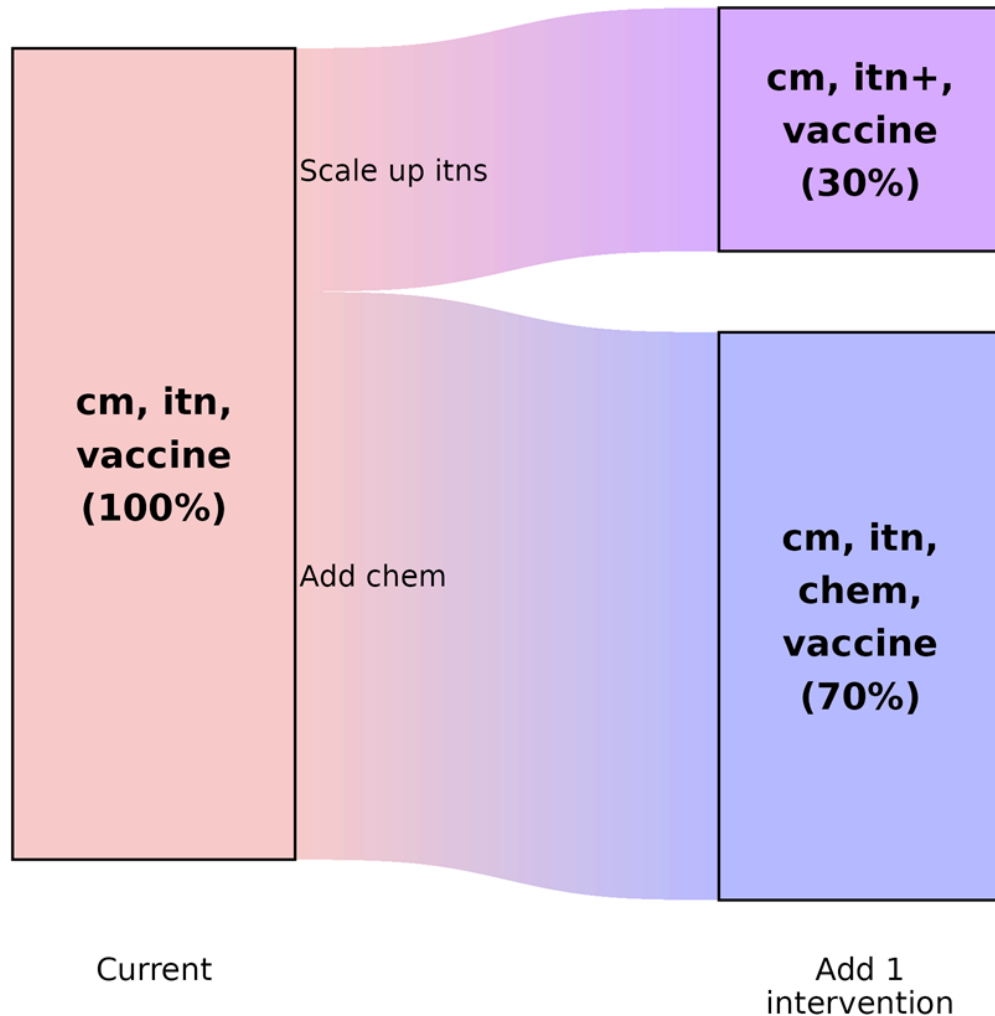
Even though prevention costs fall when ITNs are removed, the resulting rise in case-management costs can more than offset this, making the overall outcome net more expensive.

Examples of the types of Sankey diagrams we will present:

Prioritisation (scaling up)



Step 1: Add 1 intervention



Current intervention package:

- Case-management, ITNs and vaccine

Options:

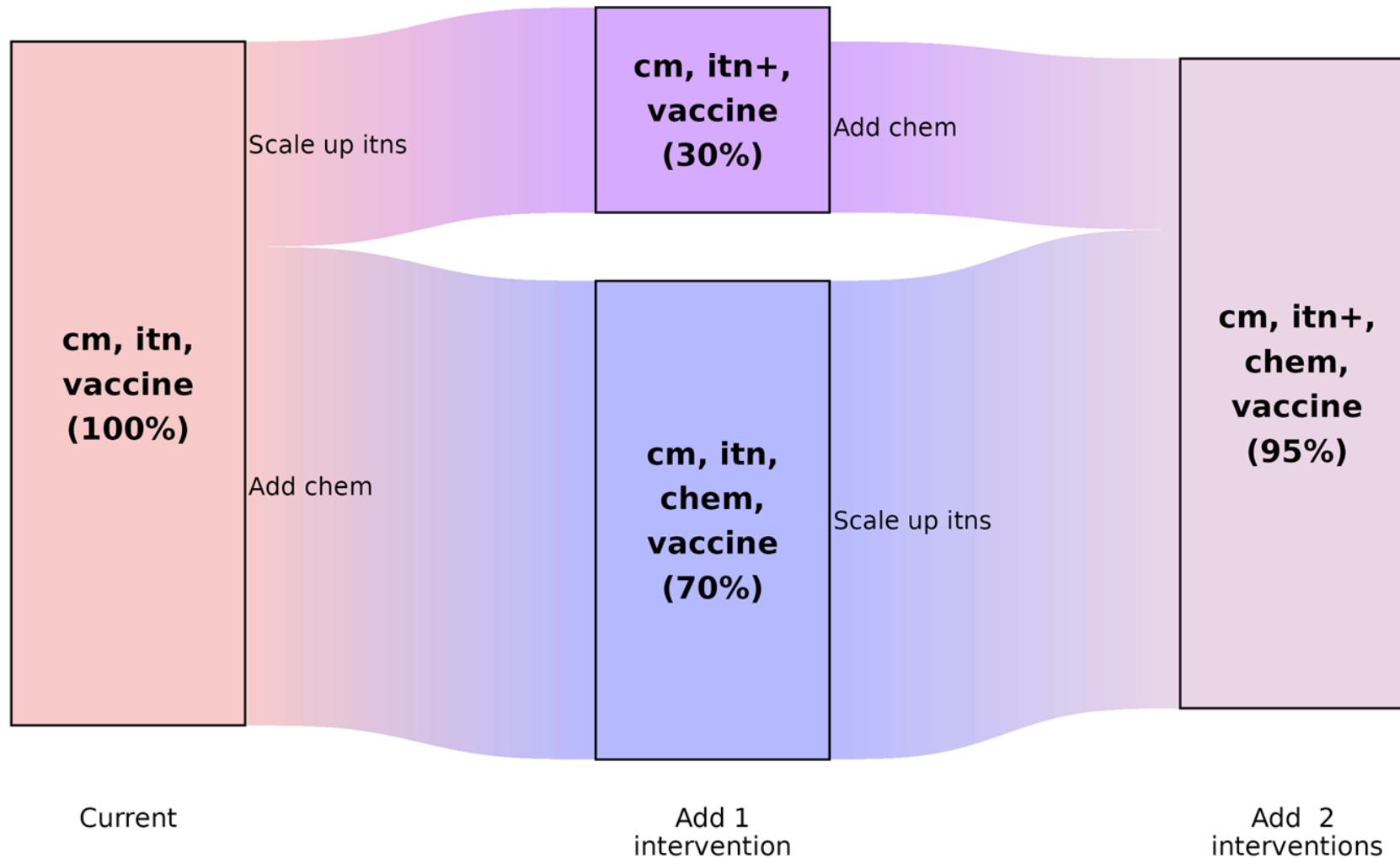
- Scale up ITNs
- Add chemoprevention

Result:

- In 30% of pathways ITNs are scaled up
- In 70% of pathways chemoprevention is introduced



Step 2: Add a 2nd intervention



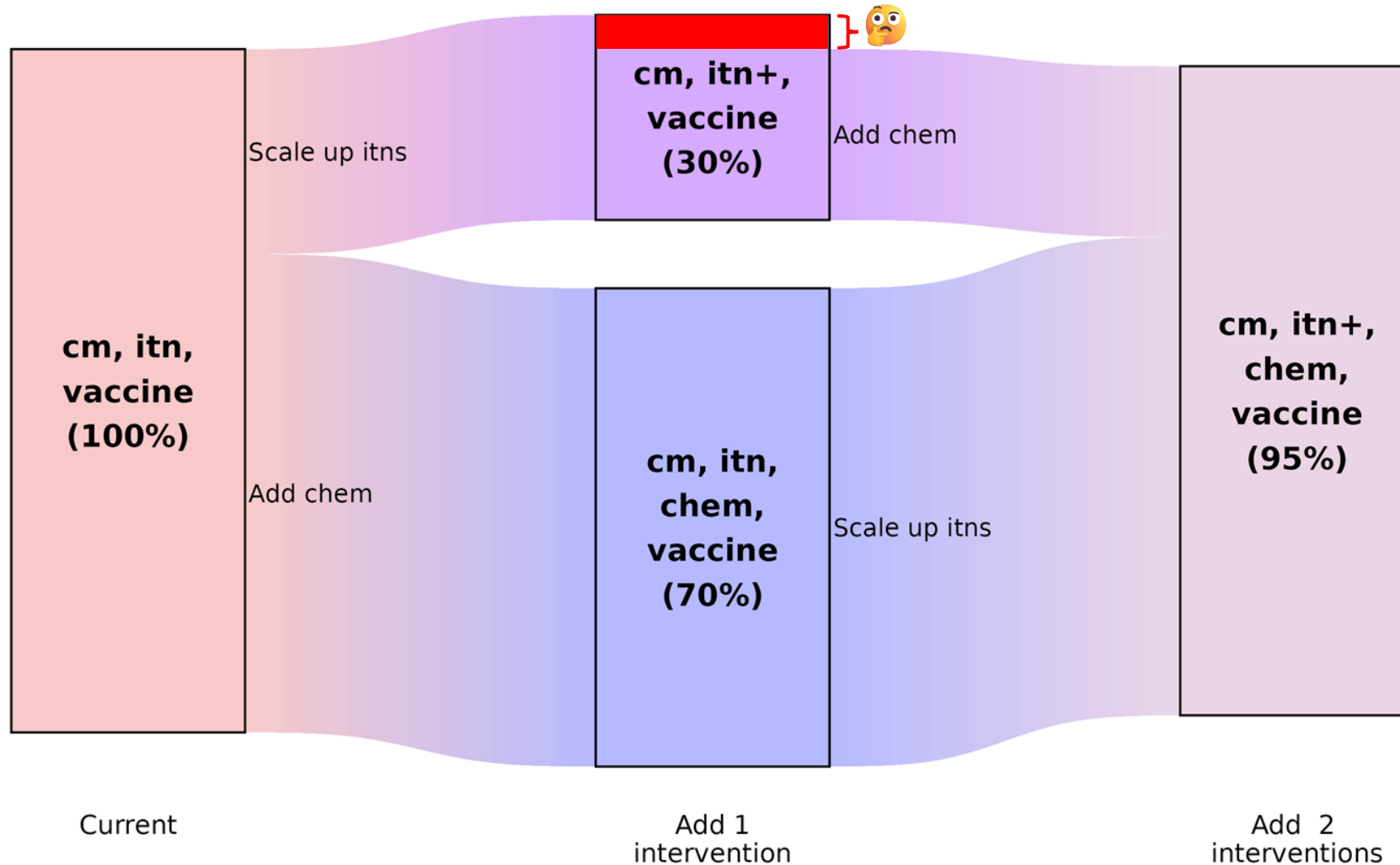
2nd step options:

- Introduce chemoprevention
- Scale up ITNs

Result:

- 95% of pathways introduce chemoprevention or scale up ITNs, finishing with case management, ITNs+, chemoprevention and vaccine.

Step 2: Add a 2nd intervention



Note that 5% of pathways don't go any further than Case management, ITN+ and vaccine.

Why?

For these settings, adding additional interventions does not increase the modelled impact, or falls under the willingness to pay threshold, so the pathway cannot proceed further.