VaxSim Simulation Discussion Plan

Question: Is it worthwhile to introduce Disease X vaccination in your country

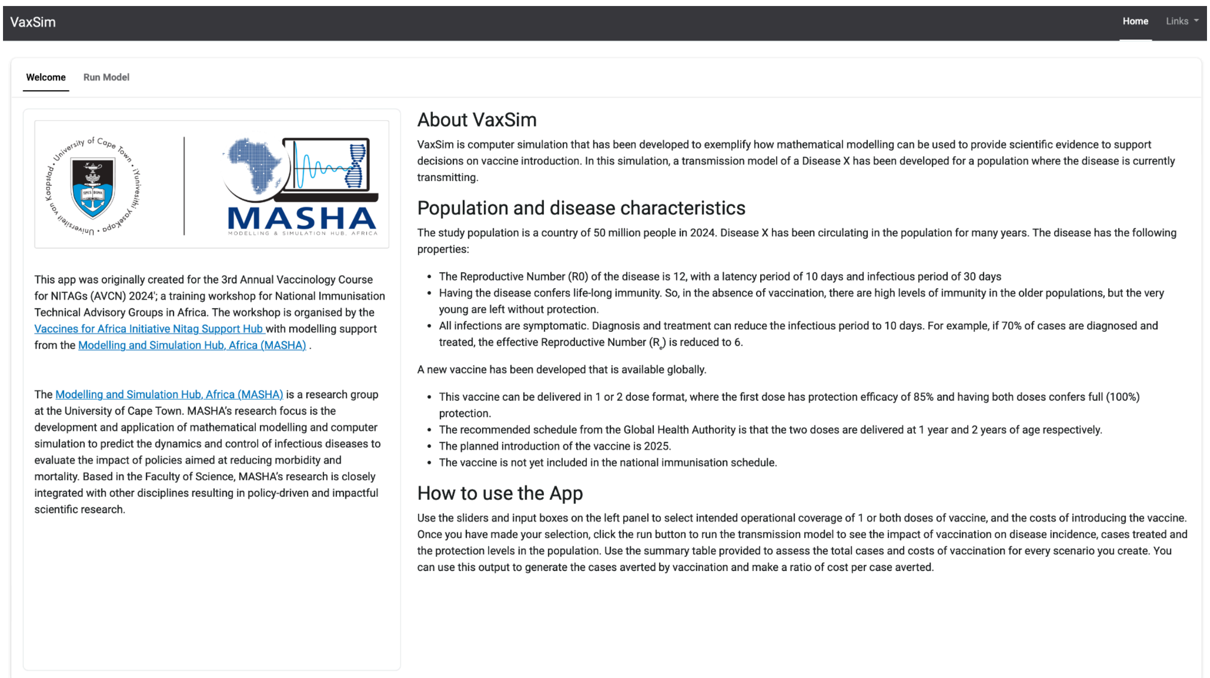
Step 1: Define the question

- *What does worthwhile mean?*
- *How will we introduce it?*
- *Key factors to measure which demonstrate worth?*
- *To who, when and how?*

Note to facilitator: Have this discussion with the participants engaging with the landing page.

- The vaccine introduction date under consideration is 2025, with recommended ages of 1 year and 2 years.
- Costs associated with vaccine introduction.
- Benefits can be measured in infections prevented. All infections are symptomatic, so therefore all can be considered the responsibility of the public health system.
- Need to consider the incremental gain in infections averted for every incremental dollar spent.
- Consider the who, when and how in more detail when determining the cost inputs.

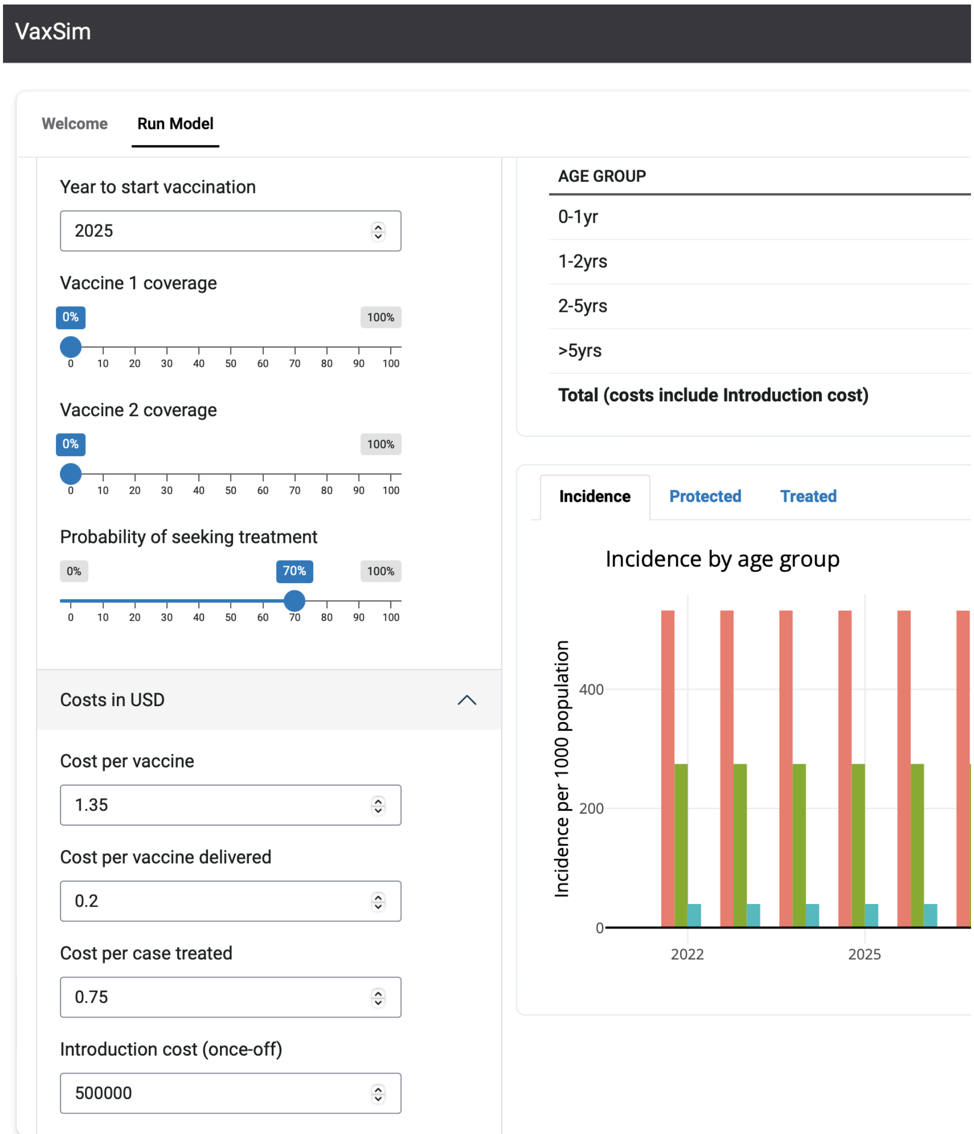
Refined question: What is the cost per infection averted when introducing 1 or both doses compared to the baseline of no vaccination?



Step 2: Consider the inputs to the model

- *Describe the model parameters (vaccine characteristics, prop who seek the treatment)*
- *Consider the costs to build a budget around vaccine introduction such as training, social engagement and communication, system development, the delivery platform (Early childhood facilities, companion vaccines such as measles)*
- *The costs are in USD at 2024 base year values.*
- *How might you get these input costs? Is data collection required? Analysis of health budgets and expenditure reports?*

Note to facilitator: Have this discussion with the participants engaging with the left side panel of the Run Model page.



Step 3: Run Model Scenarios to provide estimates to answer the question.

- *Formulate a logical set of scenarios*
    - *Sc 0 (Baseline): run without vaccination (0% coverage). Record cases and costs from table.*
    - *Sc 1 (1 dose at 1 year in 2025): run with vaccine coverage for dose 1 set at targeted operational coverage.*
    - *Sc 2 (2 doses at 1 year in 2025): run with vaccine coverage for dose 1 and 2 set at targeted operational coverage.*
    - *Consider if there are proxies for coverage based on other vaccines at the same age. Consider local delivery platforms.*
    - *Think about how long it may take to reach the targeted operational coverage.*
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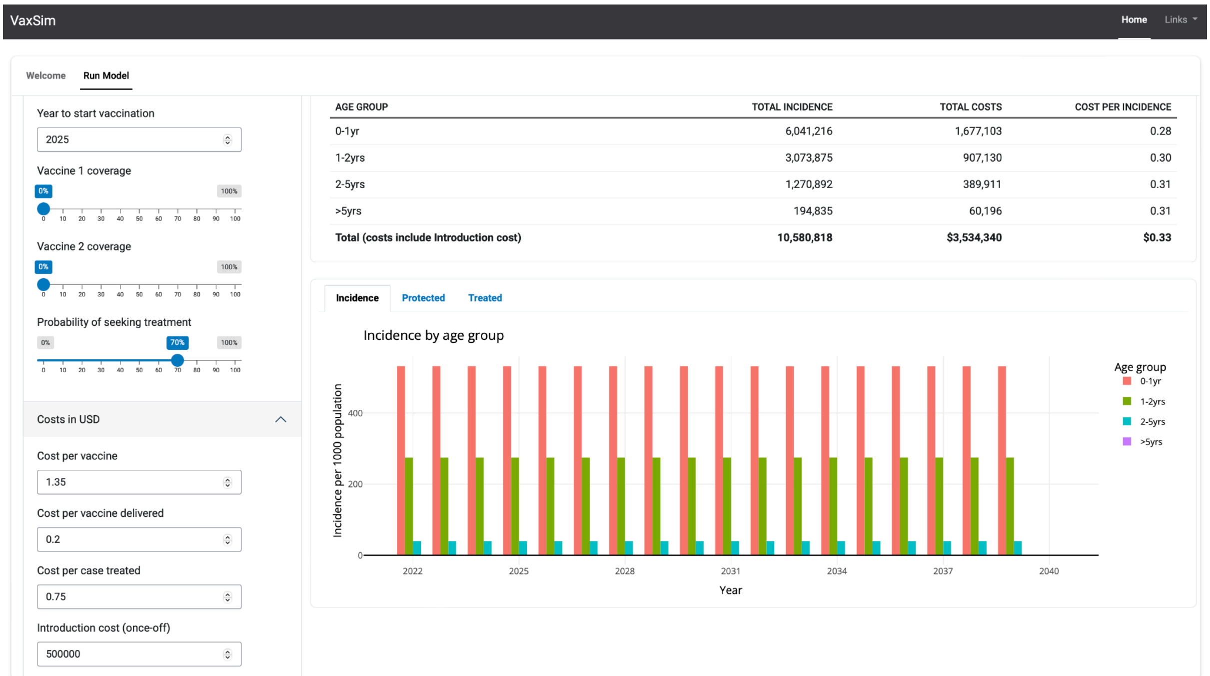
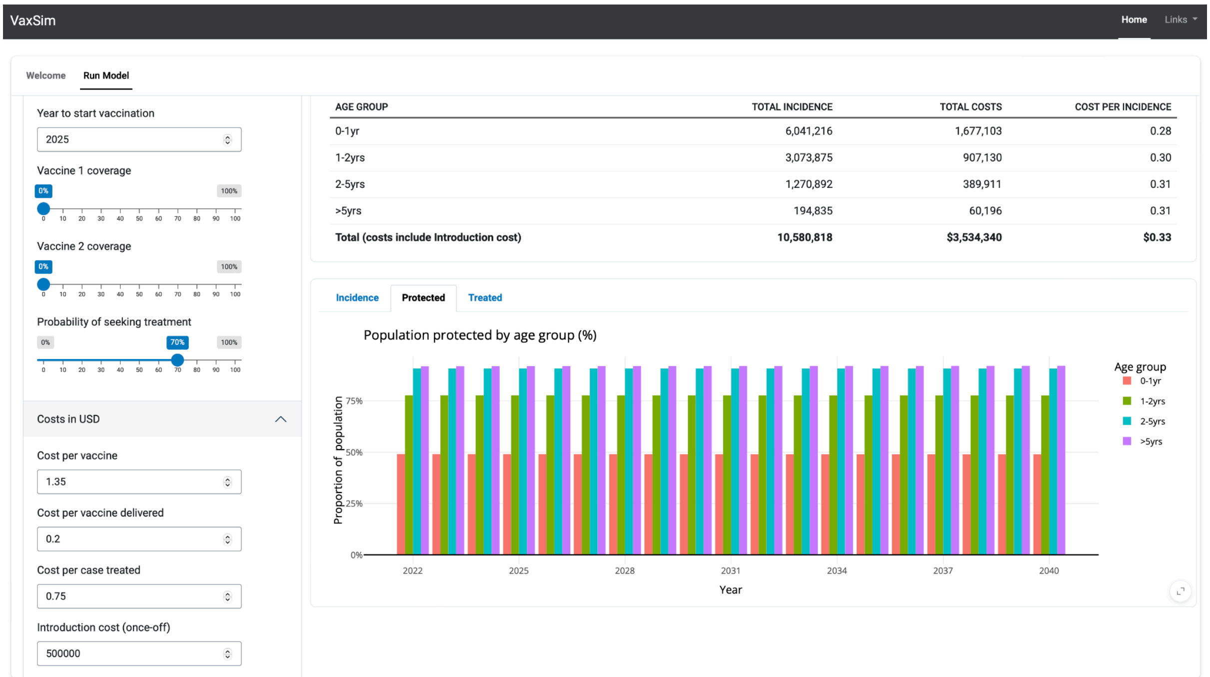
Note to facilitator: Encourage the participants to create a worksheet for all data inputs and list the sources of their information.

Scenario 0 (Baseline):

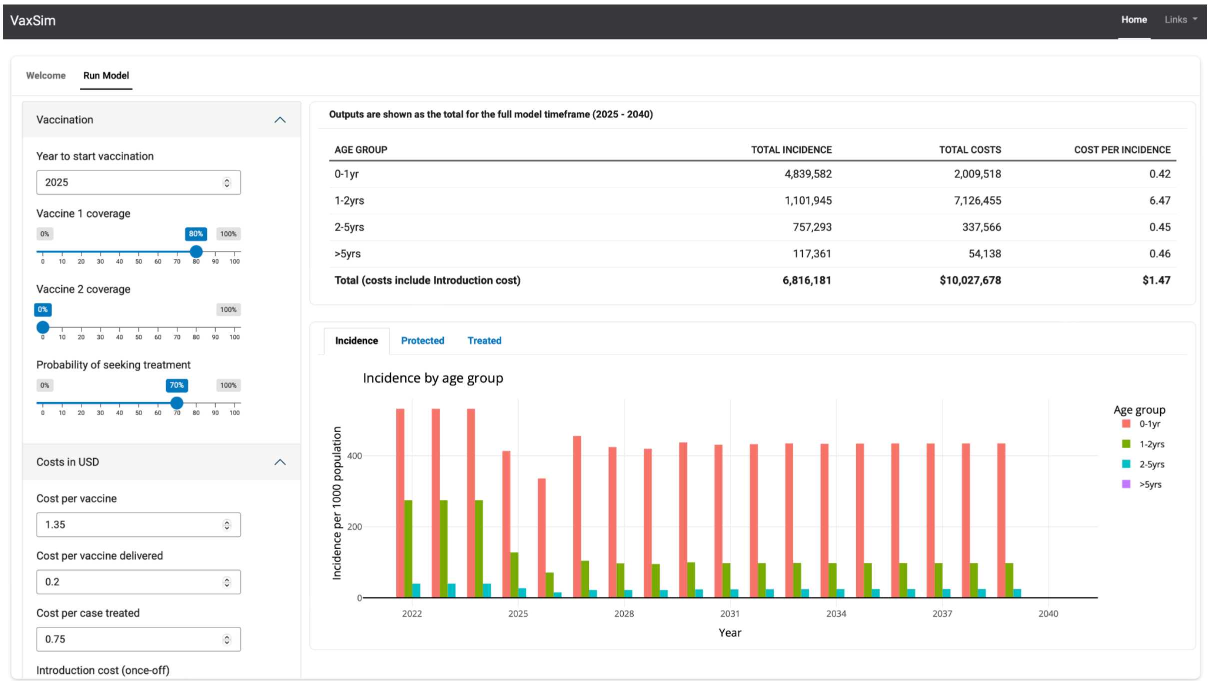


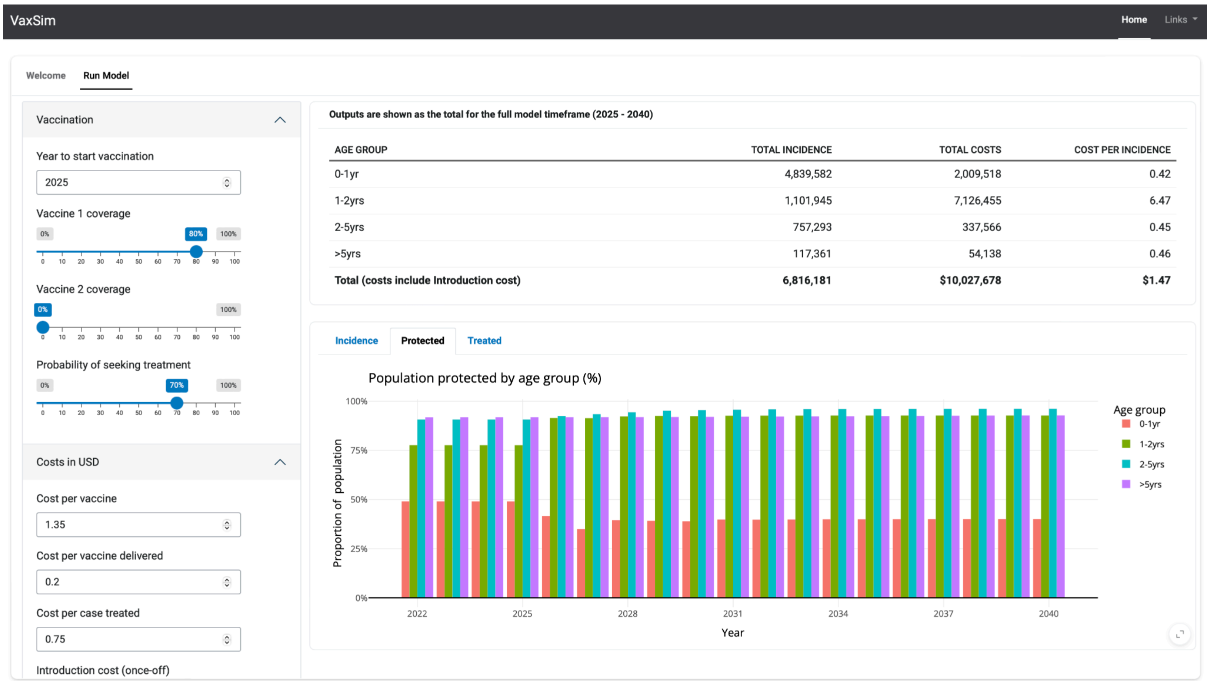


Key learnings:

- Infection is mostly in the younger age groups due to immunity gained from naturally circulating infection. Over time, the entire adult population has developed immunity.
- All costs are attributed to the cost of treating infection only.
- Over the 15 year period, there are 6 million infections in the 0 - 1 age group.

Scenario 1 (Dose 1 introduction):

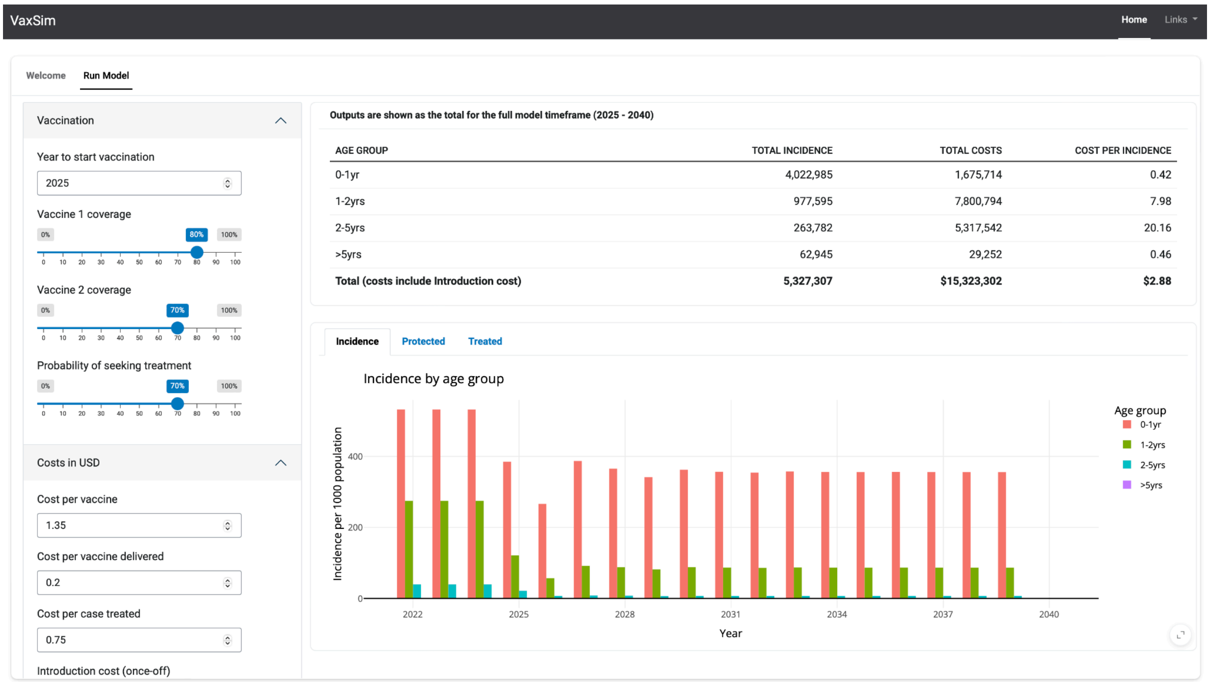


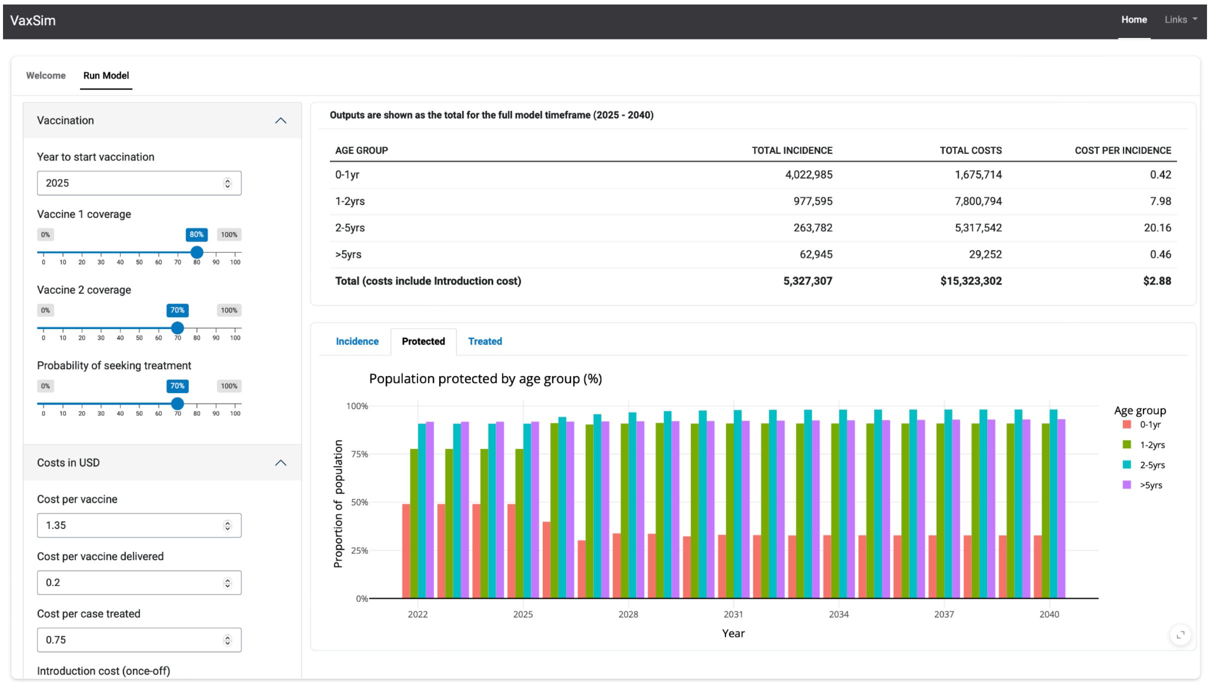


Key learnings:

- There is an immediate decrease in the incidence of infection in the 1-2 year age group in the years following vaccination (~67% decrease over 15 years).
- The increase in infection manifests in all age groups (indirect benefits of vaccination)
- Protection levels increase in the population above the 0-1 age group due to vaccine and infection-derived immunity.
- Due to decreased infection in the 0-1 age group (~20%), protection levels drop post the introduction of the vaccine
- The cost per infection increases with the introduction of 1 vaccine as the decreased costs of treatment are insufficient to offset the costs of vaccine introduction and vaccine procurement/delivery.

Scenario 2 (Dose 1&2 introduction):





Key learnings:

- The 2nd dose incrementally decreases the infections in the 2-5 age group (~65%) over the 15 year period compared to 1 dose vaccination.
- There is an additional decrease in infections in the 1-2 age group due to indirect benefits of vaccination in the older age group, as well as a second opportunity for unvaccinated 2 year olds to receive their first dose.
- Population protection levels are predicted to exceed 80% in all age groups above 1 year of age, with protection levels of ~30% in the 0-1 age group.

- Costs per infection over the 15 year period are close to double that of the 1 dose introduction scenario.

Summary results

Scenario Name	Total Incidence	Total Cost	Infections averted	Costs Incurred	Cost per infection averted
0: Baseline	10,580,818	$3,534,340	-	-	-
1: 1 dose	6,816,181	$10,027,678	3,764,637	$6,493,338	1.725
2: 2 doses	5,327,307	$15,323,302	5,253,511	$11,788,962	2.244

Step 4: Discussion: Sensitivity testing and knowledge translation

This is an opportunity for testing the sensitivity of the model projections, and how model projections can be translated to take population characteristics and operational considerations into account. Consider running the following scenarios:

- *What if operational coverage is not met? Will the 2nd dose have a reduced coverage compared to the first dose? [vary the coverage parameter of vaccines]*
- *How robust are the cost estimates of vaccine introduction? What if the vaccines are donated? Does it make the case for introduction more attractive? [set the vaccine cost parameter to 0]*
- *How sensitive is the model to the proportion of cases being treated? Are there risk groups in the population who disbenefit from reduced access to health facilities and may miss opportunities for vaccination and treatment? [reduce the vaccine coverage and treatment proportion parameters, or apply a qualitative assessment on the missed populations]*
- *Consider the delivery platform. Can delivery costs be attributed to existing vaccination programmes? [reduce vaccine delivery costs]*

What next steps should be considered?
- Is this evidence enough? What other data do I need to collect?
- How will I grade this evidence? What is the quality of the input data?
- Are there other cases to compare to (other countries, other disease)?
- What is the acceptable threshold for spend per infection averted in my country?