TE TAI ŌHANGA
THE TREASURY

CBAx Tool User Guidance

Guide for departments and agencies using Treasury's CBAx tool for cost benefit analysis

December 2023

Te Kāwanatanga o Aotearoa
New Zealand Government

The Treasury URL at December 2023 for this document is
https://treasury.govt.nz/publications/guide/cbax-tool-user-guidance

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Introduction

Cost Benefit Analysis (CBA) is designed to support rigorous transparent evidence-based CBA of budget and policy initiatives. It is an important element to ensure that robust value for money assessment is applied to investment and budget options for decision-making. The tool encourages agencies to:

- take a long-term and broad view of wellbeing impacts, ie, identify benefits and costs,
- rigorously assess these by quantifying and where possible monetising key impacts, supported by evidence, and
- be transparent about the assumptions and evidence base.

To help agencies monetise impacts as part of a CBA, the Treasury has developed the **CBAx tool**. The CBAx tool is an Excel spreadsheet model with a database of potential impact values. CBA and CBAx should be used in a fit-for-purpose way, so that the information is useful for decision-making. Although CBAx has been designed for central government agencies, it can be used more widely - for example by local government, iwi, and community service providers.

What is the purpose of this guidance?

This guidance is intended for people preparing or endorsing spending and policy for Ministers, allocating cross-sector funds, or reviewing spending proposals. The guidance sets out instructions for using the Treasury's CBAx tool. It includes:

a. an overview
b. steps to completing a CBAx
c. a worked example
d. some quick tips and links to other resources and
e. a glossary of key terms (**bold in green** throughout the document) see Appendix 6.

To aid in the development of your CBA this guidance also provides some top tips, links to other resources and examples (see accompanying icon below).


Top Tips


Other Resources


Examples

This document is part of a suite of guidance that relates to preparing CBAs for high quality funding and policy proposals. Other documents to be considered when preparing proposals include:	
	Budget guidance and templates: Released each year on CFISnet – agency staff should contact your Finance and Budget teams for more information
	Treasury's CBA guidance http://www.treasury.govt.nz/publications/guidance/planning/costbenefitanalysis/guide
	Treasury's supporting information on answers and tips to FAQs (including using frameworks) and climate change / environmental impacts advice.

If you have little time, cut to Appendix 1 – a 5-minute CBAx Guide.

What's new in 2023?

This document is an update to the CBAx Tool User Guidance released in October 2022 and should be read in conjunction with Budget guidance. The CBAx guidance has been simplified to focus on using the CBAx tool and a worked example. Supporting Information can now be found on answers and tips to FAQs (including using frameworks) and climate change / environmental impacts advice. CBAx supports agencies meet decision-making principles including: "A. Principled – making decisions based on sound public policy principles, including problem definition, rigorous cost benefit analysis and economic efficiency."

The updates for the December 2023 CBAx are:

- The existing database values have been updated.
- The Value of a Statistical Life (VoSL) values and methodology were updated by the New Zealand Transport Authority in 2023. This has significantly increased the valuation to $8.1 million (low-point) or $12.5 million (mid-point) from the previous valuation of $4.4 million.
- The discount rates are unchanged at 5% real, consistent with the Treasury discount rates, and an alternative rate of 2% real.
- The CBAx tool has been updated to include a revised "*Navigating this model*" tab and a printable A3 summary extract called "*Output Summary*".

Where can I go for support?

If you have questions that are not covered in this guidance, please contact your Vote Team at the Treasury or the CBAx team. Details and further support are set out in the table below.

Type of support	Description	When
Treasury Vote Analyst	Vote Analysts can engage with policy, research and finance teams and discuss approaches to work through issues in applying CBAx.	Agencies can engage with their Treasury Vote Analyst at any time. We encourage agencies to engage early and raise potential challenges.
Treasury CBAx helpline	General enquiries about the information in this guidance can be directed to CBAx@treasury.govt.nz.	At any time.
CBAx Community of Practice for all users with extensive or limited experience	Treasury runs workshops for CBAx users to learn and share experiences about CBA steps, the inputs to CBAx, the analysis and the outputs. Contact CBAx@treasury.govt.nz.	Treasury runs these workshops mainly in the September – December period to support agencies and advisors in their budget preparation.
Tailored CBAx workshop	If you are interested in a workshop tailored for your agency, please contact the Treasury Vote Analyst.	Workshops can be tailored on an ad hoc basis depending on the specific needs.
Government Economics Network (GEN) CBA course	The GEN course "Introduction to Cost Benefit Analysis" provides a good introduction to CBA and includes some CBAx training. See https://gen.org.nz/upcoming-gen-training/	This course runs once or twice a year.

1 Cost benefit analysis / CBAx overview

What is cost benefit analysis and CBAx?

Cost benefit analysis (CBA) is a framework for systematically analysing the costs and benefits (ie, the negative and positive societal impacts) of various options. It is an economic evaluation of the available options helping decision-makers to compare options by providing a common language and framework. CBA requires sound analysis with clear **intervention logic**, supported by evidence, and with assumptions clearly documented for a broad range of monetised and non-monetised impacts.

The Treasury has developed the CBAx tool to help agencies to do in-house CBAs with advice based on:

- A common basis for assumptions when quantifying and monetising the impacts of different proposals (for example, impact values and discount rates).
- A robust framework for estimating the broader societal impacts of options.
- New Zealand specific publicly available information to value impacts.

CBAx is an Excel-based model that provides a database of values to monetise impacts and allows you to consider the impact of non-monetised impacts. An impact value provides a numerical value in relation to one or more impacts of an **initiative**. In some situations, a value may be a cost, in others it could be a benefit or a saving. Examples include the costs of an emergency department visit, the cost of the Jobseeker Support benefit and income for individuals. The values are adjusted to reflect a common period (**adjusted values**). The CBAx tool helps to monetise the impacts of a policy **intervention** and provides an overall **benefit cost ratio** (BCR), **return on investment** (ROI) and a **net present value** (NPV) for an initiative.

When should CBAx be used?

In general, CBAx should be used when you're seeking to understand the monetised impacts aspect in a CBA to support public sector policy decision-making. The Treasury encourages important public sector decisions to be informed by fit-for-purpose CBA, reflecting the significance and size of an option.

Budget initiatives need value for money analysis, supported by a fit-for-purpose CBA. CBA and CBAx should be used in a fit-for-purpose way, so that the information is useful for decision-making. The budget CBA and CBAx requirements are set out in the budget guidance, which is issued via CFISnet.

The CBAx tool provides a consistent method to monetise the impacts of your initiative and enhance your analysis (each impact in the **CBAx *Impacts Database*** is allocated to a **Living Standards Framework** wellbeing domain). Using the *Impacts Database* in the Treasury's CBAx tool provides confidence and consistency when valuing wellbeing impacts and links the intervention with the assessed impacts. **If you monetise impacts, use CBAx.** You can strengthen the value for money analysis with CBA through:

- identifying wellbeing impacts in the Living Standards Framework and other frameworks such as He Ara Waiora

- considering broadly who benefits or is negatively affected through use of distributional analysis and He Ara Waiora
- quantifying the wellbeing impacts using clear assumptions and evidence base, and
- valuing key impacts on a comparable basis.

The CBAx model includes a *Wellbeing Impacts* tab to record identified and quantified impacts, as well as monetised impacts – you can include this table with your proposal. The table is also available as a word template.

For supporting information on the Living Standards Framework, He Ara Waiora see answers and tips to FAQs (including using frameworks) and application of environmental impacts see the climate change / environmental impacts advice.

CBA analysis can be varied – it can be simple or comprehensive, in line with what makes sense for the proposal. Analysts should apply a fit-for-purpose approach to CBAx modelling. Small, simple funding proposals might not need monetisation or only need a simple CBAx, whereas larger proposals might justify more detailed analysis and additional modelling and research to strengthen the evidence base. When proposing to spend public money, a solid evidence base is desirable. This, along with reasonable assumptions and sensitivity analysis, can give confidence in the impacts.

If there is very little information or evidence available, an option is to use CBAx to prepare a reverse analysis.

A **reverse analysis** means approaching the CBA from the viewpoint of 'what would it take to make the proposal be worthwhile?' or generate a return on investment of one with societal benefits outweighing costs. Even if the evidence base is weak, eg, in the case of pilot programmes, being transparent about these assumptions provides a basis for developing an evaluation plan. See Appendix 3 for details on how to run a reverse analysis.

The Budget Guidance, issued via **CFISnet** each year, sets out the requirements of CBA and CBAx for Budget initiatives**.** Incorporate your findings into your Budget Initiative template. Treasury's focus isn't primarily on the CBA results, but on the underlying assumptions and evidence.

For specific advice contact your finance or budget teams within your agency, or the relevant vote team within the Treasury.

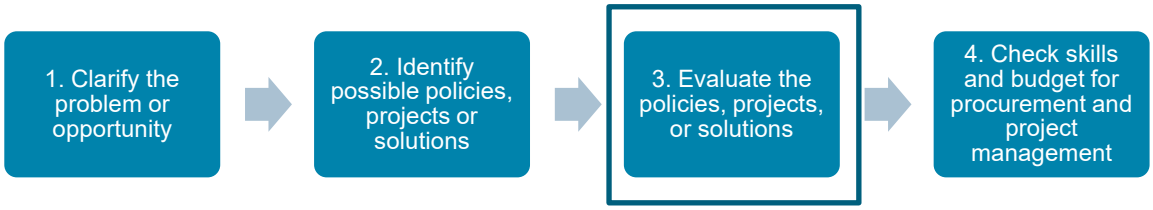
For limitations of the CBAx tool see Appendix 4.

2 The seven steps of cost benefit analysis

The Treasury's *Guide to Social Cost Benefit Analysis* provides a detailed explanation of the seven CBA steps, including how CBA fits into the generic policy development process.

Summary of the CBA steps

CBA is part of the *evaluation stage* of the policy development process. It is a method for assessing proposed options that have been developed to respond to a policy problem.



Using CBAx is a 7-step evaluative process as follows:

Policy evaluation *using CBA on each feasible option*	
Inputs to CBAx	**Step 1:** Define policy and counterfactual **Step 2:** Identify those who gain and those who lose **Step 3:** Identify the benefits and costs; allocate to time periods
Analysis in CBAx	**Step 4:** Quantify the benefits and costs within ranges **Step 5:** Discount to a common period, compare benefits and costs
Outputs from CBAx	**Step 6:** Is the result clear enough? If not, consider whether it is worth investing in more research, repeat previous steps **Step 7:** Write report

We recommend checking these steps frequently while completing policy work and a CBA. In situations where you may be struggling with compiling the information to complete a CBA or input into CBAx, consider whether it is worth (even briefly) revisiting some of the earlier steps in the policy process. For example, if you are struggling to capture pre and post intervention levels due to an intervention, it may be worth going back to step 1 and considering the counterfactual. Or you may come across an alternative solution that has a higher success rate that leads you to reconsider earlier parts of the policy process – it could be worth completing a CBAx for both options.

Steps 1 to 3: Inputs to CBAx

Before populating the CBAx model generate the information you'll need (the **inputs**). This involves establishing the evidence base and working through any assumptions (these are required in the budget initiative template).

It is useful to check out the **CBAx *Impacts Database*** before doing your own research to help understand the types of metrics and impacts to look out for when researching. If your agency has a dedicated research team, it is recommended that you engage with them early to assist with gathering evidence, as this can be the most time consuming but also most fundamental activity in completing a CBAx. Also consider whether there are external organisations that could help, such as the Social Wellbeing Agency, where applicable.

Step 1: Define policy alternatives and counterfactual

The first step involves defining the problem and identifying several potential policy solutions. You should undertake CBA on each of these potential solutions. Doing a draft CBAx can clarify the main impacts, provide initial evaluation of the potential options, and help to focus the policy and evidence efforts. In practice, it is an iterative process, where CBAx inputs and results inform further options and evidence development.

In this step, define the **counterfactual** of the initiative, that is, the situation that would exist if the intervention does not go ahead. CBAx, and CBA in general, requires a clear counterfactual to calculate the **marginal impact** of the intervention over time. The counterfactual needs to be realistic.

In **some** situations, the status quo of 'doing nothing' is not a realistic counterfactual.

You need to have a good sense of the problem and the **target group** for the intervention. You should consider questions like:

- What is the status quo? What are the current impacts of 'business as usual'?
- Would an intervention for the same problem be provided by someone else?
- What other factors already affect the impacts?
- What would you do if you did not undertake the proposed intervention? What is the next best alternative?
- Are there other things that might influence the situation? If we weren't to fund the proposal, would the problem remain the same, or decline over time, or get better?

Counterfactuals

Fund a vaccine to prevent the outbreak of an infectious disease	vs	Do nothing
Fund New Zealand's participation at the Dubai 2020 World Expo	vs	Benefits at risk (such as the early implementation of the Gold Coast Free Trade Agreement, and improved business connections)

If you think that there is more than one probable counterfactual, you can run a CBA to test the scenarios for each one this is often called 'sensitivity' or 'scenario' analysis. See Step 6 for more on **sensitivity analysis**. For now, just understand this involves modifying assumptions in the existing model rather than re-running an entire CBAx.

For more detailed guidance see the Treasury's *Guide to Social Cost Benefit Analysis*.

Step 2: Identify who gains and who loses

Next, we identify who is going to be impacted, both positively and negatively, by the initiative. An intervention can have numerous positive and negative impacts (fiscal and non-fiscal benefits and costs) occurring at different future years, and each of these might apply to a different group of people.

Think broadly about the impacts. 'Casting the net' wide early on can help to identify impacts that aren't immediately obvious, but which may change the pitch of the funding proposal and those you need to engage with. You should consider questions like:

- Who might gain?
- Who might lose?
- Who might be affected, and in what way?

A good way to do this is to gather some stakeholders, or subject matter experts, and brainstorm the potential impacts. Consider using the Living Standards Framework and He Ara Waiora to prompt your thinking on those who might be impacted.

For each impact, CBAx includes a field for "*who is affected*". While this does not affect the calculations (CBAx does not apply weightings), it can help with considering **distributional analysis** when interpreting the results. See Appendix 5 for distributional analysis prompts.

Be as specific as possible for each impact. Include people who gain and lose outside the immediate organisation and sector. Try to capture all people affected by the intervention. Note that some impacts might be easier to monetise than others.

To figure out who will be impacted and how, a good place to start is to consider the intervention group, called a **cohort** in CBAx. Consider who outside the intervention group might also be affected and include them in the analysis. As your analysis progresses, and your understanding of the problem deepens, you may find that other impacts come to mind.

Identifying who gains and who loses

Consider a proposal to fund a vaccine for all six-year-olds in New Zealand. Here is a list of those who might be impacted:

- The children themselves (in that their wellbeing is positively impacted)
- Parents
- Employers of parents
- Schools and teachers
- Wider community (benefits from herd immunity)
- Fewer hospital admissions and GP visits

Some of these might be easier to quantify than others. Hospitalisation avoided has clear values. Wellbeing impacts on children could also cover their own subjective wellbeing, which might be hard to precisely quantify. However, it is still an important impact, and should be included in the analysis.

For more detailed guidance see the Treasury's *Guide to Social Cost Benefit Analysis*.

Step 3: Identify the costs and benefits; allocate to time periods

To complete Step 3, you will need to produce the following information:

- The costs of the initiative (up front and ongoing, including both operating and capital)
- The impacts of the initiative (either negative or positive)
- An estimate of when each impact will start and how long each impact will last for
- An estimate of the part of the **policy intervention cohort** impacted per year (or **segment**), as well as how they might be affected.
- An estimate of the **success rate** (ie, the probability of success for the number of attempts) of each impact occurring for those impacted.

Keep a record of the information that you use for making assumptions and developing the input for your CBAx modelling. The *Assumptions* tab enables you to include the underlying information that you are using for the assumptions in the CBAx model. This does not affect the calculations, though you could link some of your inputs to this tab.

Initiative costs

Costs include all one-off setup costs (including any operating and capital expenditure), evaluation costs and ongoing costs (operating expenditure) incurred through the lifetime of the initiative. This is a **whole of life costs** approach.

You only need to include total annual operating and capital expenditure**.** However, these should be for the entire length that funding would be made available ie, not just the budget year and outyears (up to 50 years).

If the funding is a Multi-Year Appropriation for a fixed term of five years, the costs should be input for those five years. If the funding would be incorporated into baselines after outyears, these costs should also be included in the inputs.

The initiative costs should be supported by and sourced from detailed financial calculations outside the CBAx tool. This should cover the details of the fixed costs that do not change with the scale of the initiative, and the variable costs and the drivers of the variable costs. For example, doubling the number of people that are covered by the intervention may only increase the initiative costs by half, and improve the initiative's ROI and value for money. Ensure that impacts and costs are entered for the same initiative scale.

All costs and values should be in today's dollars (ie, in **real terms**). Costs should be in the base (current) year prices and measured in base year dollars - you do not need to adjust for inflation. The CBAx tool applies **discount rates** automatically and you do not need to discount the costs, or the impacts, that you input.

If your costings are not in real terms, unhide row 6 in the *Cost Input* tab to adjust.

For information on discount rates see https://www.treasury.govt.nz/information-and-services/state-sector-leadership/guidance/reporting-financial/discount-rates

Impacts, positive and negative

The CBAx model focuses on estimating a monetary value of impacts ie, monetising impacts. Some of the impacts you have identified may be given a monetary value (monetised) using values in the CBAx *Impacts Database*.

Currently, there are around 200 monetised impacts in the CBAx *Impacts Database*. All impacts are publicly available, and the source is provided in the database. If you have a relevant impact that is not in the database (and that has a monetary value), you can add it to the database at the bottom of the table for use in your analysis.

It may be helpful to initially summarise impacts in a table as set out below. Think about the impacts within government – often changes in governmental costs against changes in governmental revenues (fiscal impacts) and society more broadly (wellbeing from use and non-use). Be as comprehensive as possible. Consider both gains / positive impacts and losses / negative impacts. Consider impacts across wellbeing domains and time.

Illustrative examples	Government (often fiscal)	Wider Societal (wellbeing, non-government)
Gains / Positive impacts	• Reduced costs (fiscal / non-fiscal such as staff retention) • Resilience • Response capability	• Increased health / Lives saved • Increased income • Cleaner water / Protected birds • Safer communities
Losses / Negative impacts	• Increased costs • Inefficiencies • Risks	• Pollution • Compliance or user costs • Time delays

The costs and benefits to government tend to be the easiest impacts to quantify because they are often already measured in monetary terms. Costs and impacts of government provided or funded services (whether positive or negative) should generally be prepared on a marginal rather than average basis.

You can also identify the impacts from the perspectives of total economic value for society thinking broadly and using the Living Standards Framework. CBA goes beyond the fiscal impacts for government and is interested in the impacts from a New Zealand societal perspective. In CBAs we cover the total economic value that is being created, or destroyed, for society. Elements are set out below covering use values for New Zealanders and non-use values where others' benefits are valued.

Type	Who is affected?	Elements of value
Use values	**Individual/self** benefits or bears the costs	• **Direct use** – Actual use • **Indirect use** – Flow-on effects • **Option value** – Option to use
Non-use values	**Others** benefit or bear the costs	• **Existence value** – Knowing it exists • **Bequest value** – Future generations benefit • **Altruistic value** – Others benefit

Many of these impacts are included in the CBAx *Impacts Database* for easy use.

Focus on quantifying and monetising the *significant* impacts, rather than all impacts.

Timing

An impact will apply to a cohort across three dimensions in timing:

Dimension	Considerations
In a particular year / Impact time lag	How long after the intervention will the impact come into effect for each cohort. For example, the benefits from formal education come into effect after the lag.
With a certain length / duration of impact	The impact can last from one to several years per cohort. For example, an impact from an intervention increases income – is it for one year, two, more? At what point is the impact due to other factors such as skill or experience? As a rule of thumb, a reasonable period for length of impact is 2-5 years (there will be exceptions to this).
Recurrence for a cohort impacted in future years.	How long does an intervention last for before it no longer impacts the cohort? For example, in a 5-year programme where the impacts aren't expected to continue without it, the next cohort will miss out. Consider ramp up and churn when setting cohort sizes. If it will take some time for the programme to reach its projected long-term capacity through a ramp up period, this should be considered when setting the cohort sizes.

An example of assessing the timing of an impact

A programme targeting increased income of 25-year-olds, runs for five years from 2020 and the impacts are not expected to continue without it. There is a one-year lag. The 25-year-olds in 2025 would miss out, the cohorts only run from 2020 to 2024. The size of the cohort changes over time, in the example ramping up from 20,000 to 40,000 in 2021. If the programme is a service that people can participate in, leave, and then return to, then the degree of churn should be considered when setting the cohort sizes. The table below demonstrates the marginal impact.

Cohort		Timing of impact $million								
Period	Size	2020	2021	2022	2023	2024	2025	2026	2027	2028
2020	20,000	Lag	100	100	100					
2021	40,000		Lag	200	200	200				
2022	40,000			Lag	200	200	200			
2023	40,000				Lag	200	200	200		
2024	40,000					Lag	200	200	200	
2025	0							0		
Total			100	300	500	600	600	400	200	0

Segment of policy intervention cohort impacted

Identify what percentage of the policy intervention cohort that an impact relates to. A specific segment of the policy intervention cohort may have different impacts, and different populations may have different segments. In the previous example the impact may relate to only a portion of 25-year-olds – assume that 80% of the 25-year-old cohorts are employed, you would record 80% as the 'segment' impacted.

Thinking about the segments of a cohort

Consider a proposal to fund a programme to prevent family violence in New Zealand. Suppose that the programme includes a range of interventions, such as a social media campaign that will apply to the whole 40,000 strong cohort, as well as more intensive and costly interventions (such as family therapy), that will apply to a much smaller sub-group of the cohort.

In this case, it would make sense to segment the impacts as they relate to the cohort. The social media campaign might apply to the full 100% of the cohort, whereas the family therapy might only apply to the 10%. This may affect the way in which the impacts are modelled, since the specific intervention might result in a different impact. If the costs of a programme differ between segments, then the impacts may also differ.

Probability / success rate

What is the likelihood the outcome will occur? This can be thought of as the 'success rate'. Using the previous example, perhaps not all 25-year-olds are guaranteed to receive the income increase, the proportion of those that do determines the **success rate** of that impact.

Evidence quality

All proposals should be supported by evidence. It is a judgement call on how you consider each impact, based on the evidence (low, medium, or high) available to support it. Here are some things to consider:

- Have there been any previous evaluations undertaken on the proposal elsewhere?
- Is there information on how successful similar proposals have been in realising benefits?
- How applicable is the evidence to the New Zealand context? For proposals that are imported from overseas, what evidence or information exists to suggest that it can be successfully delivered in New Zealand? How confident are you that the evidence might apply in the same way?
- For pilot initiatives evidence on effectiveness will be limited. Perform sensitivity analysis or use advice from independent experts and stakeholders to indicate confidence. There should also be a commitment to collect evidence of impact of the pilot (as should be the case for non-pilot initiatives) to support any extension of the pilot in the future.
- Clearly document any assumptions made about the evidence.

The Social Wellbeing Agency's guide *How to produce a social investment evidence brief* (https://swa.govt.nz/assets/Uploads/How-to-produce-a-SI-evidence-brief-June-2017.pdf) and refer to the practical tool for rating evidence *An evidence rating scale for New Zealand* https://thehub.swa.govt.nz/resources/evidence-rating-scale/.

Steps 4 to 5: Analysis in CBAx

Step 4: Quantify the costs and benefits

This step involves inputting the analysis in steps 1 to 3 into the CBAx model. CBAx is designed for completing steps 4 and 5 of a CBA.

The CBAx *Impacts Database* provides a list of publicly available impacts and their associated values. Use these to provide consistency between interventions with the same impacts. You can also input your own impacts that you have identified through the policy development process and CBA steps 1 to 3.

More research might help to quantify impacts that can't easily be quantified. There are options for how to address situations such as these, including reverse analysis and including commentary on non-monetised impacts in the advice. The summary table in the *Wellbeing Impacts* tab can be used to set out all impacts, whether monetised or not.

See answers and tips to FAQs and application of climate change / environmental impacts for supporting information on using and developing values. Be aware that there are a range of non-market valuation methodologies for estimating impacts.

Check the list of quantified wellbeing values available through Treasury's licence arrangements with the Australian Social Value Bank see: www.asvb.com.au

See the worked example in Section 3 and for more guidance use Treasury's *Guide to Social Cost Benefit Analysis*.

Step 5: Discount to a common period, compare with costs and benefits

CBAx automatically completes this step once all the information has been input into the model. The *Output Results* and *Outputs Summary* tabs in the model presents a range of different calculations and graphs. The outputs that may be of most interest:

- Lifetime net present value (NPV) of the initiative.
- Lifetime NPV of individual impacts.
- Return on investment (ROI) to society and to the government. The ROI societal total is the same as the benefit cost ratio unless there are negative impacts. If there are negative impacts, then the benefit cost ratio will be different.
- Note: there is an additional summary tab called *Outputs Results (Alt)*. This alternative tab is used for the purpose of completing sensitivity analysis and uses a lower discount rate.

The Treasury's *Guide to Social Cost Benefit Analysis*. Provides further detail on the importance of discounting.

Steps 6 to 7: Outputs from CBAx

The main output is the CBA summary metrics: a net present value (NPV), a benefit-cost ratio (BCR) and overall return of an intervention (RoI). The CBAx model includes "Output Results" and a printable A3 summary extract called "*Output Summary*" with the CBA summary metrics and present value charts, together with the present value for specific impacts.

Step 6: Is the result clear enough?

If not, consider whether it is worth investing in more research and analysis, and repeat the previous steps.

If the CBAx results aren't clear, you can run different scenarios to test the sensitivity to assumptions and consider obtaining additional information. You should decide whether it is worth investing in more research to get better information and improve quality of the CBA. It is important to weigh up the importance of improved information and more research. The value of obtaining additional information should outweigh the cost.

Be mindful of non-monetised impacts. You can use the Wellbeing Impacts template in the CBAx model to include these and in the Summary Output tab you can use the dropdown box to select the level of non-monetised impacts influencing your initiative. For example, a proposal may have an ROI of 0.5, but have large non-monetised impacts that could increase the total ROI above 1. In such cases, the interpretation of the CBAx results hinges on the non-monetised impacts. Use sensitivity analysis to test the assumptions for the non-monetised impacts for the initiative to break-even.

For more detailed on the trade-off in obtaining additional information / further research see the Treasury's *Guide to Social Cost Benefit Analysis*.

Sensitivity analysis involves working through some alternative scenarios.

Running sensitivity analysis could be as simple as considering the impact of applying different discount rates. The CBAx model produces two output sheets, one with the standard discount rate (called *Output Results*), and one with the alternative lower discount rate (called *Output Results (Alt)*). The alternative output tab is automatically populated with your inputs.

To do sensitivity analysis you can easily change the assumptions in CBAx. For example, changing the segment, success rate or length of impacts. This can also be useful early in the policy process, to help focus evidence effort where it matters most.

The *Sensitivity Analysis* tab makes it easy to capture the sensitivity analysis.

Sensitivity Analysis

Results from Outputs Summary tab | *Discount rate* | Copy and paste your results in column C or D into this table, when you have changed the assumptions in the model.

Net benefit summary 50-year PVs	5%	2%	Central	Worst case	Best case	Scenario A	Scenario B	Scenario C
Initiative costs present value i.e. Government investment $m	(88)	(153)	(88)			(88)		
Government impacts $m	84	148	84			84		
Wider societal impacts $m	39	69	39			56		
Total societal impacts, net present value $m	34	65	34			52		
Non-monetised impacts	Low (+)	Low (+)	Low (+)			Low (+)		
Benefit cost ratio, Societal Total (50y)	1.4	1.4	1			2		
Return on Investment, Societal Total (50y)	1.4	1.4	1			2		
Return on Investment, Government only (50y)	1.0	1.0	1			1		

Description of case / scenario. Set out the key assumptions.	
Central	Conservative assumptions - Low QALY value
Worst case	
Best case	
Scenario A	Assumptions - Using a 1.5 * QALY value more comparable internationally. Only change to the model is on the post-intervention assumption to the QALY Impact 5 to 0.045.

Make your initial inputs in the model and copy and paste the results into this tab. Adjust different assumptions and scenarios in a new run of the model so you can compare the previous run. This does not affect the CBAx calculations, rather it is a way to capture the different results so you can give a sense of the range.

Rules of thumb for assessing the return on investment

It is important to confirm that realistic assumptions have been used.

- If the societal return on investment (ROI) is > 5, ensure that the impacts are not over estimated, and assumptions are not too optimistic.
- If the ROI is around 2-5, it is highly likely that some impacts are overestimated or that tenuous impacts have been included.
- If the ROI is around 1-2, the assumptions are likely to be more robust.

Common problems that can lead to overestimated impacts are:

- The “length of impact” assumption for specific impacts is too long and may double count for each impacted person / group. NB It is fine for the impacts to be long term, for example through “Time lag” assumptions and cohort profile in future years.
- Including groups more than once – check the primary input profile.
- Over optimistic assumptions about success rate or magnitude of impact relative to the counter factual.

Step 7: Write report – provide advice and complete the relevant template

This step involves providing advice (for example, completing the relevant template and including the results of the CBAx)[1]. The report should:

- Contain a problem definition the initiative is addressing
- Describe the initiative, including the intervention logic
- Summarise any assumptions made
- Contain any scenario/options analysis
- List the identified non-quantified, quantified, and monetised impacts
- Provide summary measures for example net present value (NPV), benefit cost ratio (BCR) and return on investment (ROI).

CBAx output includes headline numbers and wellbeing impacts, the charts and metrics can be copied into relevant reports (see tabs in the model: *Output Results, Outputs Summary, Wellbeing Impacts* and in some cases, *Sensitivity Analysis.* The *Outputs Summary* is set up to be printable). The table below summarises the metrics provided in the CBAx model.

Summary Metrics provided in the CBAx Model	Calculations of the Summary Metrics	Discount Rate – Real		Evidence Certainty
		5% (Default)	2% (Sensitivity)	
Initiative costs / investment present value $m	A	(88)	(153)	High
Government impacts present value $m	B	84	148	Medium
Wider societal impacts present value $m	C	39	69	Medium
Total societal impacts, net present value $m	= A + B + C	34	65	Medium
Un-monetised impacts	Magnitude	Low (+)	Low (+)	Low
Benefit cost ratio (BCR), Societal Total (50y); BCR = ROI, unless there are negative impacts which the BCR includes in the denominator	= (Positive impacts B + C) / (A + Negative impacts B + C)	1.4	1.4	Medium
Return on Investment, Societal Total (50y)	= (B + C) / A	1.4	1.4	Medium
Return on Investment, Government only (50y)	= B / A	1.0	1.0	High

In some cases, the monetised values from the CBAx modelling may be all that is needed. However, populating the *Wellbeing Impacts* tab helps to summarise what the monetised and non-monetised impacts are.

Note any assumptions that you used to generate the results (for example, why you think the success rate is a reasonable assumption). A CBAx might not be required for all options considered, but for each option under active consideration where appropriate.

[1] Agencies should refer to the budget templates and guidance available on CFISnet.

3 Worked Example – Lurgi Vaccination

This is a simplified example to give new users an idea of how to go through CBAx if everything is tidy and organised. In practice, identifying impacts and generating these inputs is more complex, requiring evidence and iteration.

Fictional example: Lurgi is rampant for children aged seven to nine in 2023. This is detrimental to health and wellbeing. A possible solution is to fund a recently developed vaccine.

For practice you can fill in a clean CBAx model for practice. The CBAx model for the illustrative Lurgi example is available for reference.

Steps 1 to 3: Inputs for CBAx

Step 1: Define policy and counterfactual

Let's assume the counterfactual is 'no change to current practice' (this may differ in many situations). In this case we will also assume the health impacts of Lurgi will persist.

Step 2: Identify the people who gain and those who lose

The main group that gains are the Lurgi afflicted children. The vaccine would be administered to six-year-olds, a year before they potentially become vulnerable to Lurgi at the age of seven. This means the cohort is made up of all six-year-olds in New Zealand for any particular year.

For simplicity, we will assume there are **62,000 six-year-olds each year**[2] and that there is still 62,000 by the time they all reach nine years old. This is demonstrated in the table below:

	2023	2024	2025	2026	Outyears
Six-year-olds	62,000	62,000	62,000	62,000	62,000

There may be other people who are impacted, for example the parents of the six-year-olds. However, the impacts for other people can be linked backed to the six-year-olds. The cohort is the group that drives the impacts. In this example, the group of six-year-olds drive the impacts. The impacts for the six-year-olds can be considered the *primary impacts*, and the impacts for the parents considered the secondary *flow-on impacts*.

When identifying the people who are impacted, think about the people who may experience losses or negative impacts as well as those who gain. In this example, we have assumed that the negative impacts of immunisation are negligible as there are no adverse reactions.

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2 Based off Stats NZ Summary of New Zealand population projections in 2022. While there is a slight downward trend in the median projected number over the projection period, keeping the cohort population assumption the same helps to keep the worked example simple.

Step 3: Identify the benefits and costs, allocate to time periods

In this step we generate the detailed inputs for the CBAx model.

Impacts

We will focus on the two main impacts for the health system*, reduced inpatient hospital visits and reduced GP visits*, and one wellbeing benefit, *improved quality of life*.

1 Inpatient hospital visits reduce. The **pre-intervention level is 0.3** hospital visits per child per annum**,** and we will assume that the **post-intervention level is 0.27** after the vaccine. Around 10% of inpatient hospital visits are due to Lurgi, and we will assume that if we fund the vaccine, these hospital visits will cease.

2 GP visits reduce. The **pre-intervention level is 6** GP visits per child per annum and we will assume that the **post-intervention level is 5.7** after the vaccine. Around 5% of GP visits are due to Lurgi. We assume that if we fund the vaccine, these GP visits will cease.

3 Quality of life improves with greater health. We can measure this in quality adjusted life years (QALYs). A way to understand the QALY gain is that, without Lurgi a child is in perfect health (ie, their quality of life is 1.0 and each year of life is 1.0 QALYs). Mild cases of the illness have a reduction in average utility of 0.03 for the period of the illness, ie, if a child is otherwise in perfect health and they have the illness for one week, they lose QALYs = (0.03 * 1/52). We assume that **pre-intervention level is 0 QALY gain** per child per annum as without the vaccine we will not prevent the QALY loss. We assume that the **post-intervention level is 0.03 QALY gain**, as the QALY gain is 0.03 when preventing a child getting sick from Lurgi.

The values of these three impacts are included in the CBAx *Impacts Database*.

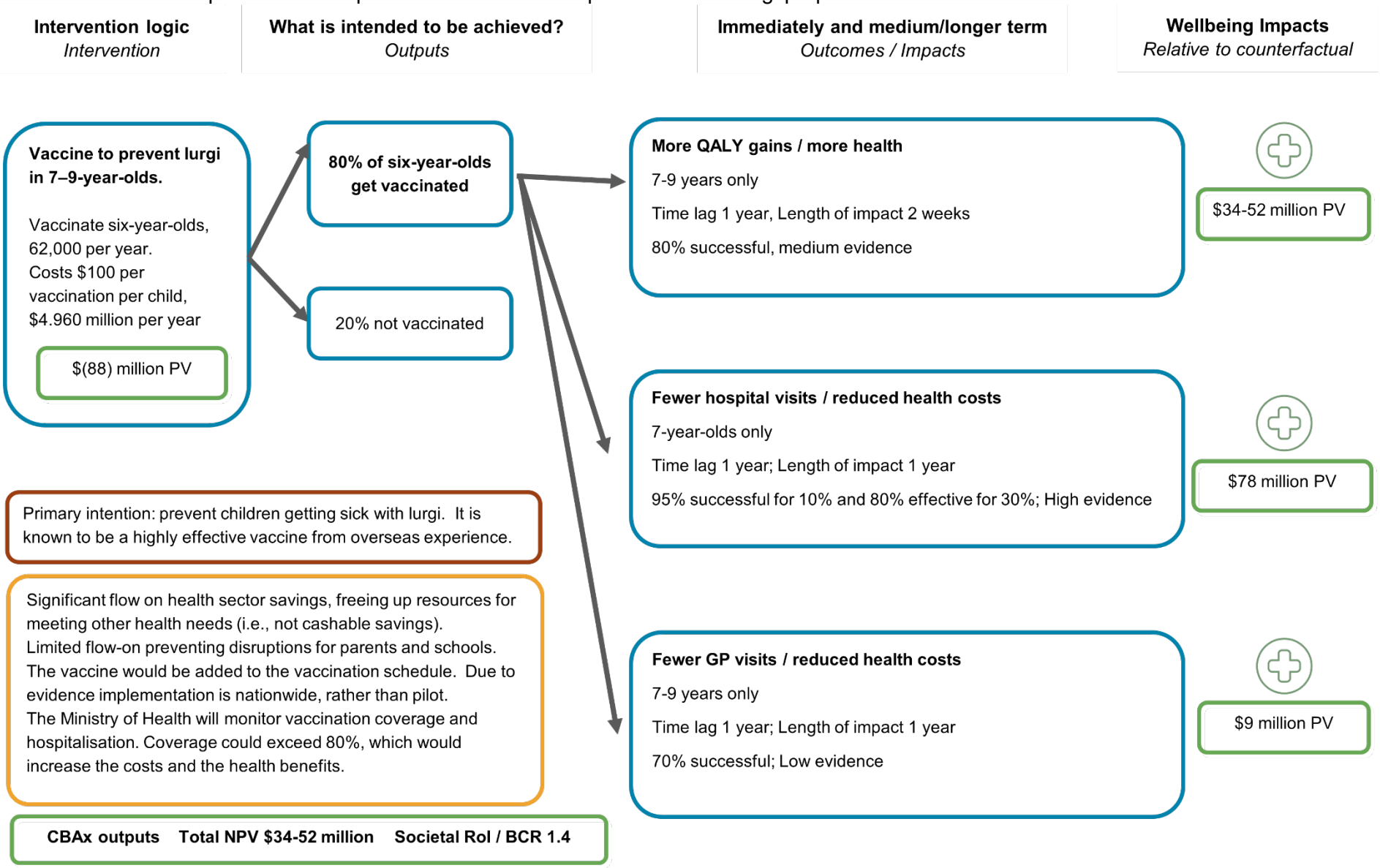
It is important to know the extent of the reduction resulting from this intervention. This is the pre and post intervention level listed above. In practice, arriving at a number for these assumptions requires evidence.

Allocating time periods (and success rates / evidence base)

Dimension	Considerations
In a particular year / Impact time lag	The vaccine is administered at age six, but Lurgi only starts to affect seven-year-olds, so the impact begins after a year. Lag for all three impacts is one year.
With a certain length / duration of impact	Lurgi afflicts 7-9-year-olds. Once they turn 10-years old they are unaffected. This means there is a maximum length of impact of 3 years covering children aged 7, 8 or nine years. However, since they won't get sick more than once, the maximum length of impact is one year • Inpatient hospital visits reduction: only seven-year-olds get Lurgi bad enough to be sent to hospital. Once they are eight Lurgi can be fixed from a trip to the doctor. Therefore, the **length for this hospital visit impact is one year**. • GP visits reduce: GP visits will reduce for kids 7-9-year-olds. We will also assume that the reduction happens for eight-year-olds. This is a **lag of two years for GP visits**. • Health and quality of life gains: children with Lurgi experience a 0.03 QALY reduction for two weeks, which is avoided by taking the vaccine. The **length of QALY gain is 0.04 years** ie, 2 weeks / 52 weeks.
Recurrence for a cohort impacted in future years.	Based on our evidence base, we will assume that without this vaccine Lurgi related health problems will return. This proposal is to have the vaccination programme continue indefinitely. We assume that the vaccine stays effective and that there is no tapering in the vaccine effectiveness over time. **The period is the maximum 50 years**.
Segment of policy intervention cohort	There are 62,000 six-year-olds in the pilot each year but not all will take the vaccine. Some parents will choose not to. Some children might not be able to get it for health or other reasons. We will assume that of all six-year-olds **a segment of 80%** receive the vaccine. An 80% vaccination rate is expected for six-year-olds as the central scenario. The vaccine is particularly effective (95%) at preventing hospitalisation for the 10% most vulnerable. It is also very effective (80%) at preventing hospitalisation in a further 30% of cases. For the remaining 40% vaccinated, the vaccine prevents GP visits (70% effective).
Probability	The vaccine is highly effective but will not work for all those who receive it. We assume 1% of those who get the vaccine will have the same chance of getting Lurgi and need for the doctor or hospital. **The success rate varies from 70-85%, for different segments and impacts.**
Evidence quality	In this example, we will assume that the evidence quality for the impact relating to hospital admissions is high, and the evidence quality for the impacts relating to GP visits is low, and the evidence quality for the QALY gain is medium.
Initiative costs	There is a dedicated worksheet for initiative cost inputs including operating and capital expenditure incurred for each year. The vaccine can be administered at the same time as others, so there are no additional administering operating costs. The vaccine costs $100 per child. Since we assumed 80% of the group of six-year-olds would get the vaccine, **this cost is $4.960 million per year** ($100 * 0.8 * 62,000).

Intervention Logic Map

We recommend you set out the impacts in an **intervention logic map (ILM)**, or any other simple and logical way of setting out the way in which the intervention results in a specific set of impacts. Below is an example ILM for the Lurgi proposals.



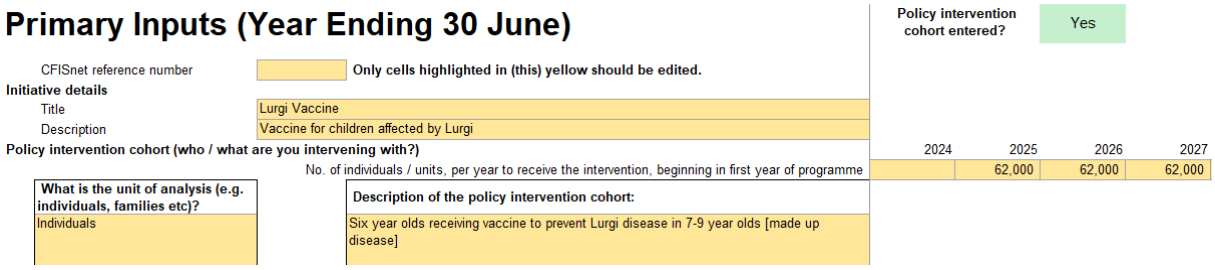
Steps 4 to 5: Analysis in CBAx

Step 4: Quantifying the benefits and costs within ranges

Here we enter all the information gathered in steps 1 to 3 into the CBAx model. In the model, the cells that are coloured yellow are the only ones that you need to input numbers or information, or check. The boxes that are not coloured can be left. There are 3 tabs used to populate your initial evidence *Primary Inputs*, *Cost Inputs* and *Impact Inputs*, the *Impacts Database* is for reference.

Primary Inputs

In this tab you input information about the proposal (including the CFISnet number, the title and description of the proposal, the unit of analysis, and the description of the policy intervention cohort).



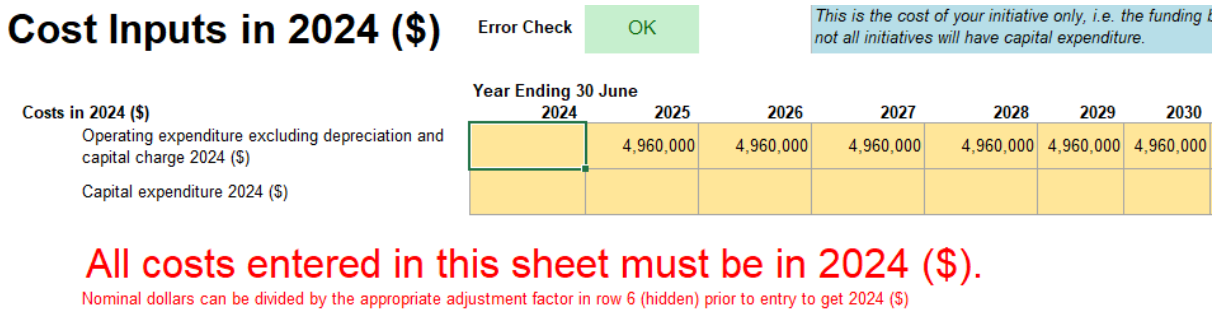
Primary Inputs (Year Ending 30 June)

				Policy intervention cohort entered?	Yes
CFISnet reference number		**Only cells highlighted in (this) yellow should be edited.**			
Initiative details					
Title	Lurgi Vaccine				
Description	Vaccine for children affected by Lurgi				
Policy intervention cohort (who / what are you intervening with?)				2024	2025	2026	2027
			No. of individuals / units, per year to receive the intervention, beginning in first year of programme		62,000	62,000	62,000
What is the unit of analysis (e.g. individuals, families etc)?	**Description of the policy intervention cohort:**						
Individuals	Six year olds receiving vaccine to prevent Lurgi disease in 7-9 year olds [made up disease]						

We have entered in the information about the proposal and have got the CFISnet number of the proposal from our finance team. We have identified a cohort of 62,000 six-year-olds per year. The period is fifty years (the max for CBAx), so we enter in the cohort number in each yearly cell with final year that CBAx represents. We have assumed no delay in implementing this proposal.

Cost Inputs

In this tab you input the annual costs to the government of the programme.



Cost Inputs in 2024 ($)

Error Check: OK

This is the cost of your initiative only, i.e. the funding b not all initiatives will have capital expenditure.

Costs in 2024 ($)	Year Ending 30 June 2024	2025	2026	2027	2028	2029	2030
Operating expenditure excluding depreciation and capital charge 2024 ($)		4,960,000	4,960,000	4,960,000	4,960,000	4,960,000	4,960,000
Capital expenditure 2024 ($)							

All costs entered in this sheet must be in 2024 ($).

Nominal dollars can be divided by the appropriate adjustment factor in row 6 (hidden) prior to entry to get 2024 ($)

In this example we have no capital expenditure. We have calculated the operating costs as $4,960,000. The period is fifty years (the max for the CBAx model), as we are proposing that this programme of vaccination be kept ongoing. Enter the operating costs in each yearly cell. These costs are the real costs, based on prices in the base year (which is 2024 in this example).

Impacts Database

This tab contains a collection of publicly available quantified impacts (and source information). There are no inputs for you to make in the model in this tab. However, if you have your own quantified impacts, you can add them in at the bottom of the table. You can also filter the database by wellbeing domain The three impacts we are modelling are already contained in the database.

Impacts Database

Take note of the row number (column A) for the relevant impact(s) values you want to use in the Impact Inputs tab. Or you c bottom of this table. See the CBAx Tool User Guidance for more information about entering your own impacts.

Row Number	Wellbeing Domain	Description	Value adjusted to 2024	Value	Unit	Government/Non-Government	Sector	Year of data	Sourc
137	Safety	Social cost of fatal road crashes	-15,173,469	-12,500,000	Per life	Non-Government	Private Impact	2021	Waka
138	Safety	Social cost of serious road crashes	-953,042	-831,100	Per incident	Non-Government	Private Impact	2022	Socia
139	Safety	Social cost of minor road crashes	-112,952	-98,500	Per incident	Non-Government	Private Impact	2022	Socia
140	Housing	Average maximum annual private contribution for rest home costs (aged residential care	-76,613	-72,376	Per year	Non-Government	Private Impact	2023	Maxir
141	Health	Dementia care	-240	-170	Per day	Government	Health	2018	Pharn
142	Health	Hospice care	-972	-690	Per day	Government	Health	2018	Pharn
143	Health	Inpatient hospital visit	-7,488	-6,530	Per visit	Government	Health	2022	Minis
144	Health	Outpatient hospital visit	-493	-350	Per visit	Government	Health	2018	Pharn
145	Health	Intensive care unit	-8,318	-5,500	Per day	Government	Health	2017	Pharn
146	Health	Emergency room	-521	-370	Per visit	Government	Health	2018	Pharn
147	Health	Specialist visit (initial)	-493	-350	Per visit	Government	Health	2018	Pharn
148	Health	Specialist (subsequent)	-352	-250	Per visit	Government	Health	2018	Pharn
149	Health	Specialist (per hour)	-211	-150	Per hour	Government	Health	2018	Pharn
150	Health	Practice nurse visit	-60	-40	Per visit	Government	Health	2017	Pharn
151	Health	Home nurse visit	-141	-100	Per visit	Government	Health	2018	Pharn
152	Health	Hospital nurse	-78	-55	Per hour	Government	Health	2018	Pharn
153	Health	Community services nurse	-78	-55	Per hour	Government	Health	2018	Pharn
154	Health	GP visit (20 minutes) - Privately funded	-113	-80	Per visit	Non-Government	Private Impact	2018	Pharn
155	Health	GP visit (20 minutes) - Publicly funded (Patient co-payment)	-49	-35	Per visit	Non-Government	Private Impact	2018	Pharn
156	Health	GP visit (20 minutes) - Publicly funded (Government contribution)	-63	-45	Per visit	Government	Health	2018	Pharn
157	Health	Hospital pharmacist	-78	-55	Per hour	Government	Health	2018	Pharn
158	Health	Relief of dental pain service - Privately funded	-48	-45	Per visit	Non-Government	Private Impact	2023	Healt
159	Health	Dental Benefit - Publicly funded	-1,059	-1,000	Per year	Government	Health	2023	Work
160	Health	Quality-adjusted life year (QALY) gained (central) based on Pharmac	43,313	32,258	Per year	Non-Government	Private Impact	2019	Pharn
161	Health	Value of a Statistical Life (VoSL) - Central CBAx value (Low source value)	9,832,408	8,100,000	Per life	Non-Government	Private Impact	2021	Waka
162	Health	Value of a Statistical Life (VoSL) - High CBAx value (Midpoint source value)	15,173,469	12,500,000	Per life	Non-Government	Private Impact	2021	Socia
163	Housing	Annual aged residential care costs (rest home care) - average publicly funded portion	-23,182	-21,900	Per year	Government	Health	2023	Te Wl

The impacts we identified in our research were inpatient hospital visits, GP visits and quality-adjusted life year gains. Take note of their corresponding “row number” as these are used to pull through information into the “Impact Inputs” tab.

Impact Inputs

The *Impact Inputs* tab is where all remaining inputs need to go. First, we need to enter in the row numbers of the impacts we are modelling. Check the *Impacts Database* tab for the corresponding row number (column A) and enter these numbers into the yellow boxes for Impacts 1 through 6 in column B. Once you have done this, you will see several columns auto-fill: Impact, Wellbeing Domain, Sector, Adjusted Value, Unit and Type.

Impact Inputs

Only cells highlighted in (this) yellow should be edited

Start off by entering the row number of each impact (from the Impacts database) into the yellow cells in column B. Then follow the columns to the right and populate your assumptions. See the CBAx Tool User Guidance for more detail. Many of these columns are autopopulated from other tabs, only the cells in yellow should be edited. "Excluded" indicates an impact will not affect model results, "included" indicates that it will - it depends on the results you have entered elsewhere.

Row Number	Impact	"OK" tests that there are not '0's in the time / affect and success and that pre- and post-intervention levels are different. If "ERROR" one of the input assumptions needs to change for it to flow through the model.	Wellbeing Domain	Sector	Adjusted Value
Impact 1	143	Inpatient hospital visit	Health	Health	(7,488.33)
OK		INCLUDED			
Impact 2	143	Inpatient hospital visit	Health	Health	(7,488.33)
OK		INCLUDED			
Impact 3	155	GP visit (20 minutes) - Publicly funded (Patient co-payment)	Health	Private Impact	(49.33)
OK		INCLUDED			
Impact 4	156	GP visit (20 minutes) - Publicly funded (Government contribution)	Health	Health	(63.42)
OK		INCLUDED			
Impact 5	160	Quality-adjusted life year (QALY) gained (central) based on Pharmac	Health	Private Impact	43,313.23
OK		INCLUDED			
Impact 6	160	Quality-adjusted life year (QALY) gained (central) based on Pharmac	Health	Private Impact	43,313.23
OK		EXCLUDED			

In this example, we have included a patient co-payment, though it may be lower or not exist for children’s GP visits. This will show up as a non-Government impact, rather than a government impact. This distinction can be useful when analysing the results.

You might notice that your spreadsheet looks different to this. The boxes in column C may show as red and with 'EXCLUDED'. This is a simple check to show whether all the inputs have been added into the model. If they haven't, it will show as 'EXCLUDED', which means that they are not flowing through to the Output Summary sheet.

In this example we have also included the QALY impact twice – this makes it quick and easy to undertake sensitivity analysis. To avoid double counting, just make sure that only one of the QALY values are included at a time. To turn an impact on / off (or exclude from the analysis) just leave out some of the input data eg, the length of impact.

Impact 5	160	Quality-adjusted life year (QALY) gained (central) based on Pharmac	Non-G	7-9 year olds	Medium	1.0	0.04	1.0
OK		INCLUDED	Non-Government					
			Non-Government					
Impact 6	160	Quality-adjusted life year (QALY) gained (central) based on Pharmac	Non-G	7-9 year olds	Medium	1.0		1.0
OK		EXCLUDED	Non-Government					
			Non-Government					

The next set of inputs we need to enter is who is affected, the evidence quality, the time lag, and the length of impact.

For those affected, use the text entry box to be as specific as possible. For Impact 1 and 2 (Inpatient hospital visits) we have assumed that it affects health sector costs and that resources will be re-allocated within health, benefitting other patients. The evidence quality is high. For Impacts 3 and 4 (GP visits), we have assumed that cost is split with some co-payment from parents and that evidence is low. For Impacts 5 and 6 (QALY gains) children are affected, and we have assumed that evidence is medium. Note: we've kept the length of impact blank on Impact 6 to exclude duplication of this impact in the initial analysis.

Who (or what) is affected?	Evidence Quality	Time lag before impact occurrence (years)	Length of impact (years)
health sector, patients	High	1.0	1.0
health sector, patients	High	1.0	1.0
health sector, patients	Low	2.0	1.0
parents of 7-9 year olds	Low	2.0	1.0
7-9 year olds	Medium	1.0	0.04
7-9 year olds	Medium	1.0	

In the evidence quality there is a drop-down box for evidence quality – select from low, medium, and high as appropriate. Evidence quality is most relevant at the end of the process when understanding which impacts contribute most to the benefit to cost ratio. If an impact has low quality evidence, this reduces the confidence and reliability of the results.

Enter the time lag and length of each impact. As we identified in Steps 1 and 2, the three impacts have a time lag of one or two years. This is because the proposal is to vaccinate six-year-olds, one year in advance of the time when they would become susceptible to Lurgi. Impacts 1 - 4 (Inpatient hospital visits and GP visits) have a length of impact of 1 year. Impacts 5 and 6 (QALY gains) have a length of impact of 0.04 years.

The final columns in this tab include the segment of the policy intervention cohort, the success rate, and the pre and post intervention levels.

You can vary the segmentation and success rate across the different impacts. We model the segment of the policy intervention cohort per year as totalling 80%. This represents the proportion of the cohort who will receive the vaccination. The success rate of the vaccine, based on the evidence, varies from 70% to 95% as the vaccine is more effective at preventing hospitalisation (especially for the most vulnerable children) than preventing GP visits.

Segment of policy intervention cohort per year (%)	Success rate (%)	Impact type	Units per person / cohort member per annum
30%	80%	Pre intervention level	0.30
		Post intervention level	0.27
		Marginal impact	(0.03)
10%	95%	Pre intervention level	0.30
		Post intervention level	0.27
		Marginal impact	(0.03)
40%	70%	Pre intervention level	6.00
		Post intervention level	5.70
		Marginal impact	(0.30)
40%	70%	Pre intervention level	6.00
		Post intervention level	5.70
		Marginal impact	(0.30)
80%	80%	Pre intervention level	-
		Post intervention level	0.03
		Marginal impact	0.03
80%	80%	Pre intervention level	-
		Post intervention level	0.045
		Marginal impact	0.045

For Impacts 1 and 2, the pre and post intervention levels were 0.3 and 0.27 respectively. For Impact 3 and 4, the pre and post intervention levels were 6 and 5.7 respectively. For Impact 5 we assume the pre and post intervention levels were 0 and 0.03 respectively. We will use Impact 6 to test sensitivity and assume a pre-intervention level of 0 and a post-intervention level of 0.045 ie, a 1.5 additional QALY because of the intervention. Once these are entered, we have completed almost all the information that we need to put into CBAx.

CBAx then calculates the difference that the intervention makes ie, the marginal impact (that is, post intervention level minus pre intervention level).

Note: it might be that the cohort changes over different times and that you need to put the same impact in twice and vary the assumptions (time lag, % of segment affected, success rate and length of impact).

The screenshot below shows the other automatic calculations within the *Impact Inputs* tab. It shows the value per cohort member, for each child.

Impact Inputs

Only cells highlighted in (this) yellow should be edited

Start off by entering the row number of each impact (from the Impacts database) into the yellow cells in column B. Then follow the columns to the right and populate your assumptions. See the CBAx Tool User Guidance for more detail. Many of these columns are autopopulated from other tabs, only the cells in yellow should be edited. "Excluded" indicates an impact will not affect model results, "included" indicates that it will - it depends on the results you have entered elsewhere.

"OK" tests that there are not '0's in the time / affect and success and that pre- and post-intervention levels are different. If "ERROR" one of the input assumptions needs to change for it to flow through the model.

						Year ending 30 June	Year ending 30 June				
						Year ending 30 June	2024	2025	2026	2027	2028
						Start of year counter	-	1	2	3	4
Row Number		Impact	Impact type	Units per person / cohort member per annum	Annual value ($) Per cohort member	End of year counter	1	2	3	4	5
Impact 1	143	Inpatient hospital visit	Pre intervention level	0.30	(539)		-	(539)	-	-	-
OK		INCLUDED	Post intervention level	0.27	(485)		-	(485)	-	-	-
			Marginal impact	(0.03)	54		-	54	-	-	-
Impact 2	143	Inpatient hospital visit	Pre intervention level	0.30	(213)		-	(213)	-	-	-
OK		INCLUDED	Post intervention level	0.27	(192)		-	(192)	-	-	-
			Marginal impact	(0.03)	21		-	21	-	-	-
Impact 3	155	GP visit (20 minutes) - Publicly funded (Patient co-payment)	Pre intervention level	6.00	(83)		-	-	(83)	-	-
OK		INCLUDED	Post intervention level	5.70	(79)		-	-	(79)	-	-
			Marginal impact	(0.30)	4		-	-	4	-	-
Impact 4	156	GP visit (20 minutes) - Publicly funded (Government contribution)	Pre intervention level	6.00	(107)		-	-	(107)	-	-
OK		INCLUDED	Post intervention level	5.70	(101)		-	-	(101)	-	-
			Marginal impact	(0.30)	5		-	-	5	-	-
Impact 5	160	Quality-adjusted life year (QALY) gained (central) based on Pharmac	Pre intervention level	-	-		-	-	-	-	-
OK		INCLUDED	Post intervention level	0.03	832		-	33	-	-	-
			Marginal impact	0.03	832		-	33	-	-	-
Impact 6	160	Quality-adjusted life year (QALY) gained (central) based on Pharmac	Pre intervention level	-	-		-	-	-	-	-
OK		EXCLUDED	Post intervention level	0.045	1,247		-	-	-	-	-
			Marginal impact	0.045	1,247		-	-	-	-	-

The benefits will apply to each cohort member and cohort year of our policy intervention cohort entered in the *Primary Inputs* tab. Note the lag of one year until 2024 (for 2023 cohort which is zero in this case), before there is any value to the first group of six-year-olds. This is because of the time lag of 1 year. The value for Impacts 3 and 4 only appears in 2025, as the impacts don't take effect until 2 years later and only last for one year. If impacts were longer than 1 year, the value would appear for several years.

Step 5: Discount to a common period, compare benefits and costs

CBAx automatically completes this step once all the information has been input into the model.

Steps 6 to 7: Outputs from CBAx

Steps 6 and 7: Finalise and report the results

You now have the information that you need to review the results.

You may find that the results are different to what you might have expected. For example, you might get a negative impact value when you expected a positive net present value. Policy analysis is often an iterative process. As you get deeper into work and do more research, talk to more stakeholders, or subject matter experts, or discover other evidence you could consider doing sensitivity analysis. Any new information might make you adjust your assumptions or revise things like the problem definition or the intervention itself. You may need to do iterations of the CBAx model before finalising. As you gather more evidence, you can adjust the assumptions you have input into the CBAx model. Make sure to clearly document the assumptions made.

On the *Output Results*, and *Output Summary* tabs the model has calculated several things. You can copy charts and headline numbers into advice as appropriate. The *Output Summary* tab can conveniently be printed (ideally in A3) to attach to your advice.

Output Summary chart interpretation

Return on Investment (ROI)

Summary metrics (for full period of analysis)	
Return on Investment, Societal Total (50y)	1.4
Return on Investment (high evidence quality only), Societal Total (50y)	0.9
Return on Investment, Government only (50y)	1.0
Return on Investment (high evidence quality only), Government only (50y	0.9
Benefit cost ratio, Societal Total (50y)	1.4
Benefit cost ratio (high evidence quality only), Societal Total (50y)	0.9

The ROI shows the impact per dollar that the government spends on an initiative. In this example, for every $1.00 dollar that the government spends on the vaccine, New Zealanders receive about $1.40 worth of benefits.

The outputs summary presents two ROIs – a societal total, and a government only. The societal ROI considers all the impacts that have been modelled. The government-only ROI only uses the government-specific impacts.

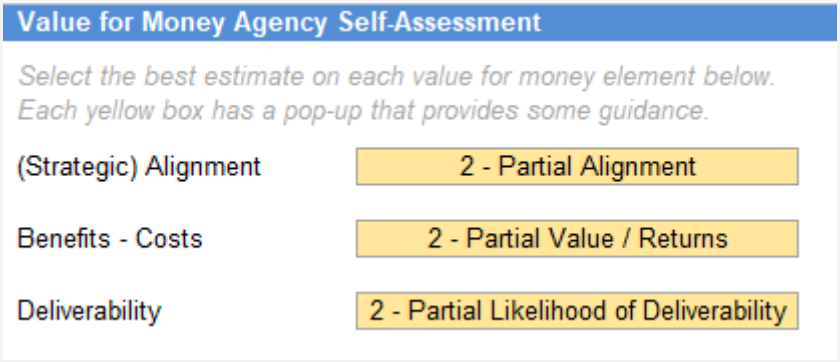
VFM and strategic alignment scores (self-assessment)

Select your best estimate on each value for money element. This does not impact on the CBAx model calculations but makes clear that the “Benefit-Costs” element which CBA informs is part of an overall value for money judgement. The “Equity” element of value for money should be considered across all dimensions where practical – including thinking widely about intergenerational impacts and impacts on specific population groups. Just because you consider one element to be lower this does not mean it is not a good or viable intervention.

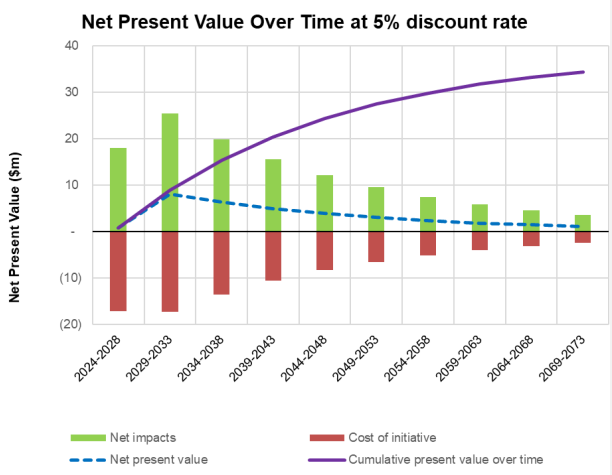
Alignment: The intervention should align with Government priorities and strategies (in an agency context). Judgement is required to assess how closely a proposal aligns with these and its relative importance eg, Budgets, sectoral goals and/or agency stewardship obligations. Scale of 0 – No Alignment to 4 – Excellent Alignment.

Benefits – Costs: Benefits and costs can be monetised and non-monetised. Consider these holistically through frameworks like the Living Standards Framework and He Ara Waiora. Overall, how do you consider the weight of the benefits and costs (including those non-monetised). Scale of 0 – Low value / poor evidence to 4 – Excellent value / returns.

Deliverability: Is there a reasonable likelihood that benefits and costs can be realised. Good delivery involves implementation that is timely, on budget and to the specified scale and scope. Is there capacity to deliver, is it credible and have risks been considered? Scale of 0 – No Likelihood of Delivery to 4 – Excellent Likelihood of Delivery.

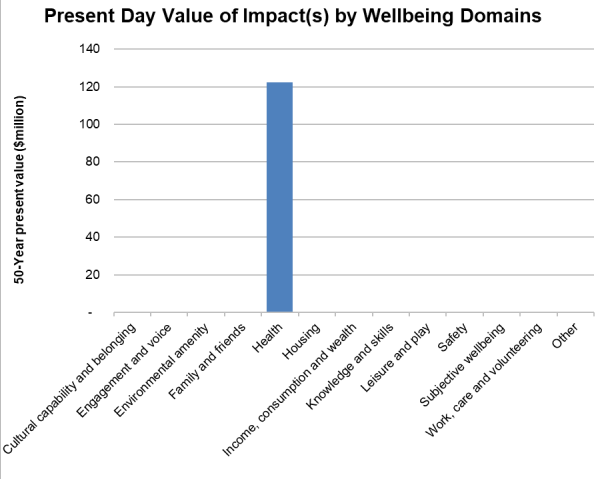


Net present value over time



This chart displays the profile of the impacts (net positive and negative impacts), the cost of the initiative, and the net present value over time. It also shows the cumulative net present value. Due to the lags between vaccinating and getting the impacts, the first five-year period only has a small overall net benefit. Due to the discounting, the impacts having the same real values in base year (2024 in this example) are valued less in later years.

Present values of impacts across domains



This chart shows the total value over the 50-year timeframe, adjusted to present value (ie, today's dollars) by wellbeing domain. This view can quickly highlight surprising or significant results.

Return on Investment Summary

Return on Investment Summary 50 years

	Discount rate		Evidence certainty
	5% real discount rate	2% real discount rate	
Initiative costs present value i.e. Government investment $m	(88)	(153)	High
Government impacts $m	84	148	Medium
Wider societal impacts $m	39	69	Medium
Total societal impacts, net present value $m	34	65	Medium
Non-monetised impacts	Low (+)	Low (+)	Low
Benefit cost ratio, Societal Total (50y)	1.4	1.4	Medium
Return on Investment, Societal Total (50y)	1.4	1.4	Medium
Return on Investment, Government only (50y)	1.0	1.0	High

This table provides a quick summary of the costs and impacts and overall ROI / BCR by discount rate applied and summarises the evidence quality associated with each.

Impact summary table

Impact summary

						Net Present Value (NPV)		
	Evidence Quality	Gov./Non-Gov.	Who is affected?	Wellbeing Domain	Impact Description	5-Year $m	10-Year $m	50-Year $m
Impact 1	High	Gov.	health sector,	Health	Inpatient hospital visit	8	20	56
Impact 2	High	Gov.	health sector,	Health	Inpatient hospital visit	3	8	22
Impact 3	Low	non-Gov.	health sector,	Health	GP visit (20 minutes) - Publicly	0	1	4
Impact 4	Low	Gov.	parents of 7-9 year	Health	GP visit (20 minutes) - Publicly	1	2	5
Impact 5	Medium	non-Gov.	7-9 year olds	Health	Quality-adjusted life year (QALY)	5	12	35

This table summarises the impacts and the net values across 5-year, 10-year and 50-year time horizons in today's dollars. The table also highlights the quality of the evidence. The table gives a quick sense of which impact is driving the bulk of the overall return on investment (ie, look for the highest numbers). Here hospital visits have the highest net value ($56 and $22 million over the period compared with other impacts), evidence quality for this impact is also high so we can have some confidence in the results.

Once you have finalised the CBAx analysis, you should incorporate your findings into your advice. You can incorporate the monetised net present values for impacts and the overall results into the budget initiative template. Your CBA advice incorporates all impacts, whether monetised or not, with transparent assumptions. Preferably, results include ranges from sensitivity analysis and confidence based on the quality of the evidence base.

Appendix 1: Quick Tips Summary

Intervention logic and who is the initiative affecting? Key considerations include:

- *Who or what are you intervening with?* Who or what is the target of the intervention? This is the CBAx cohort and may be individuals, families, schools, regions, rivers etc.

- *Who is the initiative impacting on or affecting?* This will be wider than who or what the initiative intervenes with. This will inform number of impacts and segmentation in CBAx. It will also cover non-monetised impacts that are not in CBAx. Analysis of who is affected can inform and draw on **distributional analysis**. Distributional analysis (see Appendix 5) informs Equity that is considered across all of the value for money elements, including "Benefits-Costs".

- *What is the nature, magnitude and timing of the impacts relative to the counter factual?* This includes assumptions about: what are the positive and negative impacts? For whom? When? For how long? This informs the assumptions about the individual impacts modelled in CBAx.

- *What is the evidence?* Focus on providing good evidence for the impacts that are significant overall. More weight can be placed on impacts that have a stronger evidence base. You can do quick modelling of assumptions in CBAx as part of the policy development process, but you can focus the final CBAx on the impacts that a stronger evidence base.

- **Think broadly about the impacts but be conservative in the extent to which they apply.** We encourage analysts to think broadly about the impact of their proposals. Who might be affected? In what way? Think outside the immediate sector and consider primary and flow on impacts. Consider long term as well as short term impacts. Consider fiscal and wider wellbeing impacts, government and non-government impacts. Be conservative and do not over-claim impacts. Consider: how confident are you that there is a causal link between the intervention and this impact? At what point do other factors help with the ongoing achievement of the impact?

- **Prepare your best estimate, with sensitivity and ranges.** The best estimate when quantifying impacts is in line with best practices in fields such as accounting and liability valuation. In preparing the best estimate be conservative rather than over-optimistic assumptions. This makes it easier to have confidence in the results. For assumptions that are particularly critical for the overall result, it is good practice to provide sensitivity analysis with your best and conservative estimate to inform decisions. The Treasury encourages the use of ranges, where evidence is weak.

- **What's the counterfactual?** Often agencies are uncomfortable with developing cost benefit advice. They typically have a lot of information about the impact of their proposals, but they are often less comfortable when it comes to quantifying these impacts. In this situation it is important to consider *what is the counterfactual*, that is, the impacts if the intervention does not go ahead? Where there is an absence of information on the counterfactual, it is best practice to advise decision-makers up front rather than overpromise on the proposal. There is an opportunity cost with funding something, as it means that another proposal, which may have been more worthwhile, will go unfunded.

The table overleaf provides some quick tips to frequently asked questions.

	Question	Tips
Using CBAx results	How is CBAx used in decision-making?	• Initiatives are not evaluated on CBAx results alone. • CBAx results together with non-monetised impacts, evidence base and assumptions inform value for money (VFM) advice. • VFM is considered along-side the wider case eg, strategic alignment.
	Who should be involved in completing a CBAx?	• Key people: initiative lead (policy/budget) and excel experience. • Involve different perspectives and use specialist capabilities: subject matter experts, policy, finance, actuaries, service delivery and evaluation. • Involve agencies with shared outcomes or intervention group, and Treasury vote teams.
	Prioritising CBAx efforts	• Prioritise efforts on those impacts with the greatest influence on the ROI. • Gathering evidence is often the most time-consuming part, but crucial.
	CBAx and wellbeing analysis	• Use frameworks such as the Living Standards Framework and He Ara Waiora to systematically identify the benefits and costs of a proposal. Think broadly about impacts.
	Intervention evaluation	• CBAx supports an improved evidence base for decision-making and provides a basis for an evaluation plan.
Fundamental elements	Intervention is not about people	• The intervention group is distinct from people affected and does *not* have to be people. It can be for example businesses, areas, society/New Zealand, houses or rivers.
	Determining cohort unit	• Try different units to see what works the best. • Keep the analysis as *simple* as possible and as *flexible* as possible.
	No appropriate impact value in CBAx database	• It is easy to add values to the database for a specific intervention. Analysis then flows like any other value. Document and source any values you add. • You can develop your own fit for purpose values through robust research and analysis. • Can add values to explore “what if” or “what would it take”.
	Pre and post intervention levels	• Specify pre and post intervention levels in one of three ways: binary, frequency or proportional dependent on the unit of the impact. Check that it makes sense.
	Cost pressure	• Counterfactual is key for appropriate CBAx analysis, or exemption.
Information / evidence	Poor information base	• Use judgement and available information for reasonable assumptions. • Undertake sensitivity analysis for varying assumptions. • Provide ranges and interpret your results in light of the evidence base.
	Assumptions	• Make on best information available and make transparent.
	Labour market impacts	• Adjust labour market impacts such as income, tax/ACC and income benefits for displacement effects and opportunity cost.
	QALYs	• Have sound evidence base for QALY assumptions.
	Australian Social Value Bank ASVB	• If you want to use the ASVB wellbeing impacts contact Treasury to purchase a sub-licence.
	Subjective wellbeing valuations	• Using subjective wellbeing values is relatively new. WELLBY is a subjective wellbeing measure, which equates to a one-point change in life satisfaction on a 0-10 scale, per person per year. CBAx takes a cautious approach to not overestimate the WELLBY impacts and provides a low, midpoint and high estimate.
Varying impact entries	Multiple entries of the same impact	• You can include the same impact value multiple times to model variation in impacts for different people or periods, for example across time and segments of the intervention population. • Ensure *not* to double count impacts.
	Affected people / impacts vary over time	• Use multiple impact entries for each period and vary assumptions about the affected people, success rates or pre and post intervention levels.
	Affected differently	• Use multiple impact entries for each segment and vary assumptions.
	Non-flat impact profile	• You can input an impact profile for pre- and post- intervention that varies across time. This may be results from separate modelling. Consult Treasury and do not re-use the model (changes formulae).

CBAx: 5-Minute Guide.

Update November 2023.

For further advice email us at: cbax@treasury.govt.nz

Why do it? And what is it?

CBAx is a spreadsheet designed to help you undertake cost benefit analysis (CBA). CBA is a systematic method for comparing the pros and cons across society of policy decisions. A CBA informs judgements about whether a proposal is worth it – **do the benefits outweigh the costs? You identify, quantify and value the positive and negative impacts for the group(s) affected.** CBA helps you compare impacts and options. You can use the CBAx tool to value impacts, i.e. monetise in dollar terms. You assess key impacts and monetise them where possible. CBA is a core **element** of value for money assessment to inform decisions, alongside considerations such as alignment and deliverability.

What do I need to think about first?

Intervention. Describe who or what the proposal intervenes with as part of the intervention logic. The unit does not have to be people – it can be for example, firms, animals, houses, schools, rivers, etc. Try different units to see what works best. Keep it simple and flexible for analysing different impacts of the intervention.

Impacts. Think about what the evidence supporting your proposal says what impacts it will **achieve and for whom**, as well as what your Minister / decision maker wants to achieve. Think broadly about the intended and unintended impacts. Beyond the fiscal costs and benefits for government, are there other impacts that you could include? You can look at Living Standards Framework and He Ara Waiora. The list of impacts in the CBAx "Impacts database" tab can help you think about specific impacts that can be valued in monetary terms for estimating the size of the impact that the proposal might have on identified group(s).

What assumptions or other impacts are there?

Note down any evidence for, and assumptions you've made, in selecting impacts, working out the costs, and what other impacts there could be for this proposal. These notes can be added into the Output Summary tab.

Think about the narrative around wellbeing impacts that can be identified and sometimes quantified, but not monetised that your proposal may have on the identified group(s). This includes thinking about distribution analysis, Living Standards Framework, He Ara Waiora etc. Add this commentary into the Output Summary (or fill out the Wellbeing Impacts tab). E.g. while we might not be able to put a price on the cultural Impacts of an initiative it may be an important result for the proposal to achieve.

More information is available:
https://www.treasury.govt.nz/publications/guide/guide-social-cost-benefit-analysis
Treasury's annually updated budget guidance and initiative templates are available on CFISnet – check with your agency Finance and Budget teams.

What numbers should I have in front of me?

To use the CBAx tool, agencies need to quantify impacts and estimate success rates based on the best available data and evidence for each impact of a proposal.

Primary inputs: Your **intervention** logic describes the group that the proposal intervenes with and associated unit of analysis e.g. per person as the cohort member. What are the estimated units per year (e.g. number of people) for the next 50 years? NB this is separate from the people who are affected, which you think about in relation to the impacts.

To compare impacts across time, CBAx calculates present values. CBAx applies the default public sector 5% real discount rate. An alternative 2% real rate tests how sensitive the proposal is to the discount rate.

Cost inputs: Estimate the **operating expenditure** (excluding depreciation and capital charge) in current year $. How much are you seeking? *Note: there are hidden rows in the Cost Inputs tab that help calculate to the current year's $ equivalent for future years.* Estimate the **capital expenditure**, if any, using the same process. NB You cover other negative impacts as part of the impacts.

Impact inputs: There can be non-fiscal impacts or fiscal costs. You can select impact values from the CBAx database or add bespoke ones. Think about the time lag between intervention and each impact might occur, and how long that impact may last (how strong is your evidence for this occurring?). How big is the estimated impact now and after the intervention per cohort member? Tip: Simplest to use 0 = impact does not happen and 1 = impact happens.

So what do I do with it?

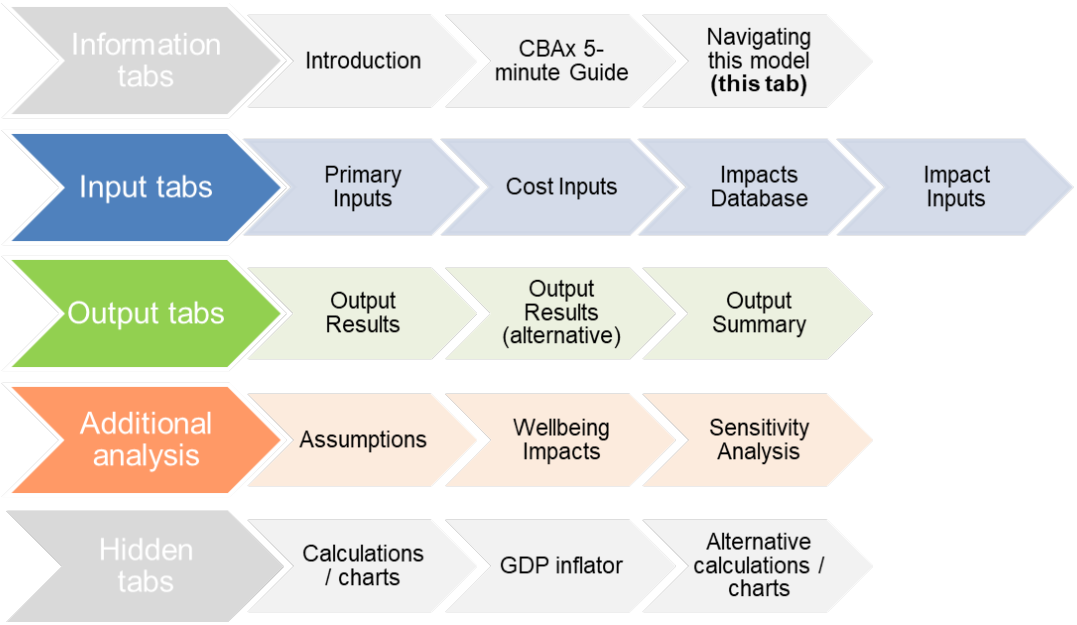
CBAx is a part of well-researched quality policy advice that incorporates alignment with the Government's strategic priorities, realistic costings, risk analysis, distributional analysis and implementation and evaluation plans.

There will likely be gaps in the evidence for the impacts a proposal may have, e.g., how effective a proposal might be when trying something new. You may need to do iterations of the CBAx model before finalising it. As you get deeper into work, you might do more research, talk with more stakeholders or subject matter experts, or discover other evidence. As long as your analysis is supported by evidence and clearly documented, assumptions can be adjusted to reflect new and better information for use in the CBAx model.

Once you have finalised the CBAx analysis, you should incorporate your findings into your advice. You can include the monetised values (produced in today's equivalent value or *net present value*) as part of your advice. Tip: Include all key impacts whether monetised or not, together with caveats in the budget initiative template.

Appendix 2: Navigating the CBAx Model

The CBAx model contains several worksheets to help with CBA analysis. This section explains the purpose of each worksheet and how they are related.



Input tabs: In these tabs you will input data on the policy intervention cohort, the summary operating and capital costs across the life of the initiative and the details of each impact on individuals (including time lag, length of impact, probability of success and percentage of the cohort impacted).

Note: *Impacts Database* doesn't require any input of data, but you'll need to reference the corresponding Row # of relevant impacts in the *Impact Inputs* tab. The values in this tab are publicly available values produced outside the model and adjusted forward so they are all on a common year basis.

Output tabs: These tabs provide the summarised results of the calculations based on the impacts and assumptions from the inputs tabs. The first uses a default discount rate, the alternative uses a 2% discount rate for sensitivity analysis. You can also input your contextual information, such as 'type' of analysis here. The *Output Summary* tab is printable (best in A3) and has charts / useful commentary to include in your initiative.

Additional Analysis tabs: *Assumptions*, *Wellbeing Impacts* and *Sensitivity Analysis* tabs provide a place for you to do any calculations to generate impact inputs, and to list wellbeing impacts that you have identified, quantified and/or monetised.

Note: The *Sensitivity Analysis* tab allows you to compare different assumptions and scenarios. Run the model with the relevant assumptions and then copy and paste them in the relevant scenario (and compare with the next round).

There are several tabs that are hidden (eg, GDP adjusters) to make the model simple and more accessible (and they perform calculations automatically). If you want to see these tabs you can unhide them.

Appendix 3: Reverse Analysis

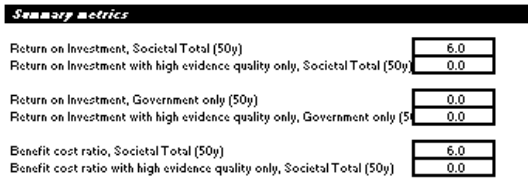
Reverse analysis – what would it take to break even?

Tips
• Reverse analysis enables you to see what you would have to assume to (for example) break even that is for the ROI to equal 1. • This can be a good option for completing a simple CBAx in situations where the impacts are identified, but hard to monetise for example where key variables are not well understood.

While CBAx is primarily a tool for calculating the impact net present value and overall return of an intervention, the model can be used to vary assumptions to see what would have to be assumed for it to break even. This process is called reverse analysis. It is a simple way of testing some assumptions, to provide a helpful (although limited) analysis.

Reverse analysis is most useful if you have a view of the costs, and a sense of what the impacts are, but no idea about the monetised value of one or more impacts. You can add the cost information and a single impact, or more, and work iteratively, changing the impact assumptions until you have a return on investment of one.

Intervention to Boost learning outcomes for children in Northland



Inputs (into Primary and Costs tabs)

Initiative costs: Capital $500,000 in the first year, and $200,000 in the second and operating $100,000 each year, for 50 years.

Cohort size: 31,000 (number of school children in the year).

Starting year: current year (assuming no delay in implementing the programme)

Create a new impact in the *Impacts Database* tab (at the bottom of the table). We can vary the value of the impact to see how high it would be to break even. Add $30 to the Value column for the initial experiment.

Use the corresponding row number (from column A) of the impact you've just created and enter it into a yellow box in the *Impact Inputs* tab and add in the usual inputs (who is affected, quality of the evidence, lag, length etc).

Start with length of impact 1 year, time lag 1 year, and 100% success rate. Pre-intervention level is zero, post-intervention is 1 (effectively, pre-intervention this impact is not achieved, however post-intervention this impact is achieved).

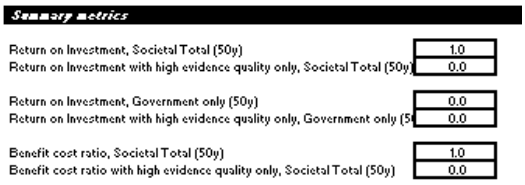
We can now make changes to see how the NPV varies, but to keep things simple, we will leave the pre and post intervention levels as they currently are, with the marginal impact of 1. This way we can focus on changing the value

of the impact in the Impact Database tab, to keep our assumptions simple and clear.

Once you've populated these details in the model, look at the *Output Results* tab. We can see that the return on investment (ROI) is 6.0. Based on our input, this 6.0 ROI tells us that a total benefit of $30 per year per student is more than is needed for this initiative to break even.

We can now repeat the process and change the value of the impact to see what it would have to be for the ROI to reach 1 (which is the point where the initiative breaks even). We could also change other assumptions, for example the segmentation and the success rate. For example, making more realistic assumptions for both segmentation and success rate 80% (ie, reach 80% of the students and have the positive effect for 80% of them) reduces the ROI to 3.8.

Going back to the Impacts Database tab, if we change the value of the impact per student to $10 it reduces the ROI to 1.3. Reducing the value per student again to $8 gives an ROI of 1. This means that the initiative would break even, if it was successful in delivering $8 value to 80% of the 80% of the students that it reaches. This is $8 per child for around 20,000 children in Northland.



To use these results, on the *Output Results* tab, select 'reverse analysis' as input. You can provide further information on how reasonable the assumptions are.

The value of the impact of $8 per child results in the ROI being 1, and therefore breaking even. This is a highly simplified way of doing reverse analysis. A judgement can then be made on whether it seems reasonable, or too high or too low. Is it going to reach 80% of the children? Is it going to be effective for 80% for these children? You could also compare this to other educational values to make a judgement about how reasonable the assumed value would be.

Appendix 4: Limitations of the CBAx tool

There are limitations to a tool like CBAx. To be able to use the CBAx tool, you need to quantify and monetise impacts and the **probability** of success based on the best available data and evidence about the relevant impacts of an initiative. There will be gaps in the evidence for the impacts of an initiative, for example how effective an initiative might be when trying something new.

CBAx modelling is just one part of CBA and policy analysis. CBAx supplements well-researched quality policy advice including alignment with the Government's strategic priorities, realistic costings, risk analysis and implementation and evaluation plans.

Be aware of the varied basis for the available impact values

The CBAx *Impacts Database* includes publicly available values for many types of impacts, this helps to provide a consistent approach and easy access to commonly used impacts. Various agencies developed these values, using a variety of valuation methodologies. Each type of non-market valuation has advantages and disadvantages, and no one type is "right".

Use the values appropriately for your analysis, with reasonable assumptions. The source of the values (included in the database) can help you understand the basis for the values. Many of the values are already in dollar terms. Other values are derived from survey data such as the General Social Survey. Users should take care in their assumptions, and make sure to not overstate the impacts when using subjective wellbeing measures.

CBAx requires information and judgements on assumptions

A thorough policy analysis is required when conducting a CBA. You will need to make judgements, based on the best available evidence, and what is a reasonable analysis for the proposal. For example, you will make judgements about the policy and intervention options (such as what options are feasible), the counterfactual and the impact assumptions.

The purpose of CBAx is not to deliver a judgement on what the assumptions should be. Instead, it is more about making these assumptions transparent, so that discussions and advice about wellbeing impacts can be better informed, and so that we can learn from our analysis in the future. Developing policy advice is inherently uncertain, as it requires advising on changes in the future. The job of advisors is to develop practical advice, based on the information available. Being clear about assumptions is key. The CBAx tool can help you do this by providing a consistent approach and standardised measurement.

Appendix 5: Distributional Analysis

Distribution is often not explicitly covered as part of undertaking CBA. This relates to how wellbeing impacts are distributed across people – eg, the income distribution, the distribution of health, and the distribution of housing outcomes – but also across space (like the regions of New Zealand) and across groups of people – eg, ethnicity, gender, and age.

Agencies are developing tools to support analysis.

For example, the Ministry for Women launched the "*Bringing Gender In*" gender analysis tool – see https://women.govt.nz/gender-tool.

The Child Impact Assessment Tool enables agencies to identify, analyse and assess the impacts of any proposed law or policy on the rights and wellbeing of children and young people – see https://www.msd.govt.nz/about-msd-and-our-work/publications-resources/resources/child-impact-assessment.html.

A CBA should as a minimum set out significant positive or negative impacts for (sub)-groups. This answers the question: Who gains and who bears the costs of the proposal? (Step 2 of CBA refers). Where there are important distributional implications, further distributional analysis may be appropriate. Quantitative distributional analysis can provide information on the nature and magnitude of the impacts for different (sub)-groups. If some impacts are given higher weighting due to distributional considerations, this is best done as a separate step and sensitivity analysis with transparent assumptions and reasoning.

The Treasury Wellbeing Report, *Te Tai Waiora*, and supporting papers can inform distributional analysis. Prompts for considering the distributional impacts of policy options:

- Is there any empirical evidence of the distributional impacts of the proposal, either positive or negative? How accurate is that evidence/data?
- Is the proposal targeted specifically at a particular population group? How would you define that group? Why is this group targeted? What will be the impacts on people outside the target group?
- If a proposal is not designed to target a specific group, will a proposal have different impacts on different individuals and groups? What groups might be disadvantaged by (face the costs of) the proposals (including any possible unintended consequences)? What groups might be advantaged (receive the benefits)?
- What factors could make a distribution of wellbeing outcomes equitable?
- Think about the extent to which the following questions might be relevant, and what they might imply for the 'equity' of the proposal:
  - To what extent – or in what ways - does the distribution matter?
  - Do differences in outcomes reflect different choices or levels of effort, or is there some degree of good or bad luck? If so, does this matter?
  - Is there a group of people that has particularly low outcomes? To what extent does the policy proposal reinforce existing patterns, or address these?

Appendix 6: Glossary and Acronyms

Adjusted value: The adjusted value uses the start year specified in *Primary Inputs* tab to calculate the values in the *Impacts Database* forward to a common year using **nominal** GDP (in the *GDP inflator* hidden tab). For consistency all values in the *Impacts Database* have been adjusted forward using GDP adjusters, even though some values could potentially be adjusted using CPI adjusters.

BCR: See benefit cost ratio.

Benefit cost ratio (BCR): The BCR is the ratio of total discounted benefits to the total discounted costs across society. A proposal with a BCR greater than 1.0 has a positive net impact, because the benefits (positive impacts) exceed the costs (negative impacts).

CBA: See cost benefit analysis.

CBAx / CBAx tool: CBAx is the Treasury's cost benefit spreadsheet model. The tool helps users monetise impacts for cost benefit analysis. The CBAx results are part of the CBA and wider case for the policy intervention. Along with non-monetised impacts, evidence base and confidence in assumptions, CBAx results inform value for money advice.

CBAx Impacts Database: The CBAx *Impacts Database* includes publicly available values for many types of impacts to help provide a consistent approach and easy access to commonly used impacts. Values are updated annually and adjusted to today's $ value. You can use these in your analysis or add your own.

CFISnet: Crown's Financial and Information System, which is used by the Crown for financial reporting and budget purposes.

Cohort: A group that experiences an intervention in a particular year. A cohort is made up of members from the policy intervention group / population.

Cost benefit analysis (CBA): A systematic approach to evaluate different options to improve decision making. CBA evaluates different options against a single welfare criterion: 'societal net benefit'.

Counterfactual: The counterfactual is the situation that would exist in the absence of an intervention (ie, what would happen if the intervention was not implemented). In many cases this will be different from 'do-nothing'.

Discount rate: The discount rate is used to discount impacts, costs and benefits that occur in the future to the base year (todays' value). The discounted value is known as the present value.

Distributional analysis: This relates to how wellbeing impacts are distributed across people – eg, the income distribution, the distribution of health, and the distribution of housing outcomes – but also across space (like the regions of New Zealand) and across groups of people – eg, ethnicity, gender, and age.

He Ara Waiora: He Ara Waiora is a framework that presents a holistic, intergenerational approach to wellbeing. When considering wellbeing impacts in CBAx, it may be useful to consider wellbeing impacts from a Te Ao Māori perspective, or from the perspective of affected communities.

ILM: See Intervention (or Investment) Logic Map.

Impacts: Benefits and costs are positive or negative impacts affecting people in society. See CBAx Impacts Database for valuations of impacts.

Initiative: An initiative is a funding or investment proposal for decision makers to consider.

Inputs: There are a range of considerations that need populating in the CBAx to get the best out of the tool they are covered in Steps 1 to 3 in the CBA. This involves establishing the evidence base and working through any assumptions (these are required in the budget initiative template, if applicable).

Intervention: An intervention targets a specific group of people/things/places and is designed to have a marginal impact. An initiative may be centred on an intervention, or a combination of interventions within or across sectors.

Intervention (or Investment) Logic Map (ILM): An intervention or investment logic map is a single page depiction of the logic that underpins an investment.

LSF: See Living Standards Framework.

Living Standards Framework (LSF): A wellbeing framework to help you consider the distributional population impacts and longer-term wellbeing and environmental / climate change impacts for New Zealanders (and beyond). Each impact in the CBAx *Impacts Database* is allocated to specific Living Standards Framework wellbeing domains.

Marginal impact: Marginal impact refers to the specific change in an impact. Rather than focusing on the overall impact CBA focuses on the marginal change in an impact from an intervention, relative to the counterfactual.

Net present value (NPV): The sum of the discounted benefits, less the sum of the discounted costs (relative to the counterfactual). This gives a dollar value representing the marginal impact on the collective living standards of all New Zealanders of the initiative, in today's dollar terms.

Nominal value: A nominal value is a value that is expressed in its nominal price level (ie, the price level at the time). A nominal value has not been adjusted for inflation.

NPV: See net present value.

Policy intervention cohort (target group): The policy intervention cohort is the group that an intervention targets and intervenes with. The target group may be individuals or other units. The unit can be identified at the appropriate level of aggregation, for example: individual, family, business, rivers, animals, community, city or country.

Present value: a value representing the impact in today's dollar terms. See also net present value.

Probability (Success rate): The likelihood of the benefit or cost materialising. The likelihood of a benefit or cost materialising can be thought of as the 'success rate' or effectiveness of an intervention.

Real terms / real value: A real value is a value that has been adjusted from a nominal value to remove the effects of inflation.

Return on investment (ROI): Calculate the return on investment by dividing the discounted marginal impact in wider societal impact, including benefits to government, by the discounted cost of the initiative. This can be interpreted as the impact on New Zealanders per dollar the government spends on the initiative.

Reverse analysis: The model can be used to vary assumptions to see what would have to be assumed for it to break even, this process is called reverse analysis. It is a simple way of testing some assumptions, to provide a helpful (although limited) analysis. Reverse analysis is most useful if you have a view of the costs, and a sense of what the impacts are, but no idea about the monetised value of one or more impacts.

RoI: See return on investment.

Segment: A segment is a part / sub-group of the cohort for the policy intervention group or population. The cohort segments should not total more than 100%.

Sensitivity analysis: Sensitivity analysis is a technique used to determine how independent variables such as assumptions and values of impacts will affect the overall results. Sensitivity analysis is important as it can reveal how important different assumptions are to the overall result. Carrying out sensitivity analysis helps determine how robust the results are.

Success rate: See probability.

Target group: See policy intervention cohort.

Whole of life costs: The present value of total cash costs of the investment over its life. This excludes dis-benefits because they are not a cash cost. Whole of life costs also exclude depreciation and capital charge. Only include the initial cost of procuring the asset.