

# Making causal claims

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An ongoing challenge in evaluation is the need to make credible causal claims linking observed results to the actions of interventions. In the very common situation where the intervention is only one of a number of causal factors at play, the problem is compounded – no one factor 'caused' the result. The intervention on its own is neither necessary nor sufficient to bring about the result. The Brief argues the need for a different perspective on causality. One can still speak of the intervention *making a difference* in the sense that the intervention was a necessary element of a package of causal factors that together were sufficient to bring about the results. It was a *contributory cause*. The Brief further argues that theories of change are models showing how an intervention operates as a contributory cause. Using theories of change, approaches such as contribution analysis can be used to demonstrate that the intervention made a difference – that it was a contributory cause – and to explain how and why.

## Introduction

All development interventions endeavour to make a difference and to demonstrate that they are doing so. They undertake activities and produce outputs that are expected to lead through a sequence of events to specific improvements in the well-being of beneficiaries. However, as is well known, making the causal link between the activities and outputs and subsequent impacts can be challenging:

- The causal path between the activities/outputs and the impacts can be quite extended, involving a long causal sequence of immediate and intermediate results and often a long time-scale
- Events and conditions outside those of the intervention can influence the extent to which the impacts are brought about
- There may be a number of causes, including other concurrent interventions, contributing to the realisation of the impacts in addition to the influence of the intervention. The intervention is not working alone.

The Natural Resource Management Research (NRMR) efforts of the Consultative Group on International Agricultural Research (CGIAR) are a good example. NRMR has been defined as "[research] interventions in the natural world of land, water, oceans, atmosphere and biota that can influence (positively or negatively) food security and rural poverty in the developing world" (Keating, 2011: 3). The causal path between the intervention on the natural world and the impacts sought is often distant. Many factors affect food security and rural poverty, and there are likely to be other government, donor and NGO interventions at play trying to influence these impacts.

In such cases, what can be said about the causal relationship between the NRMR and related intervention activities, and the observed results? Indeed, we expect that the intervention, as a cause, has some effect and want to be able to make some credible causal claim about the intervention, such as:

- The intervention caused the impacts
- The intervention made a difference
- The intervention contributed to the impacts.

What type of causal claim makes sense? And how can we go about making that claim?

## Concepts of causality

Can we say the intervention 'caused' the impacts? For example, that a particular intervention on farming methods caused a reduction in rural poverty. Clearly we cannot. There will be a number of 'causes' of any observed impacts and we hope that the intervention is one of these and, perhaps, a significant one. Saying the intervention caused the impacts is much too simplistic and scarcely credible.

Causality involves relationships between events or conditions and is often discussed in terms of necessary and sufficient conditions. Is then, the intervention a necessary cause of the impacts? I would argue that, most of the time, the answer is no. Necessity means that the impacts can only be realised if there is the specific intervention. Yet most desired impacts, such as better health or education, reduced poverty, improved environmental conditions, greater democracy, etc., can potentially be realised through a variety of different types of interventions, and not only the specific intervention of interest. It would be presumptuous to say that your intervention is the only way possible to bring about the desired impacts.

Might we instead be able to say that the intervention is sufficient? Again, clearly, the answer is no. We are assuming that there are a number of – perhaps many – other factors also at work. So, on its own, the intervention is not sufficient. In the NRMR case, it is widely recognised that many other events and conditions will have to be in place in addition to the activities of the intervention for the desired impacts to be achieved.

However, we do expect that *the intervention, along with the other influencing factors*, is indeed sufficient; that collectively this set of actions and conditions, including the intervention, did bring about the impacts. And indeed, when we say X causes Y in everyday discussions, sufficiency is probably what we usually mean; that X did indeed produce or lead to Y.

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There is of course, a large and long standing literature on causality, going back centuries, and these issues and concerns have been repeatedly addressed. Causes that are neither necessary nor sufficient are called *contributory causes*. Thus, for example, smoking heavily is a contributory cause of lung cancer. It is not a necessary cause, since there are other sources of lung cancer, and it is not a sufficient cause, since not all such smokers suffer from lung cancer. In the philosophy literature, a contributory cause is called an INUS cause – an Insufficient, but Necessary, part of a condition that is, itself, Unnecessary, but Sufficient for the occurrence of the effect (Mackie, 1974).

In a recent study undertaken for the Department for International Development (DFID), we found that thinking about and conceptualising development interventions as contributory causes was especially helpful (Stern et al., 2012). In fact, many interventions are designed to be part of a package of other causal events and conditions, and even when not so designed, need to take these other influencing conditions and factors into account. Cartwright and Hardie (2012) call these *supporting factors* – other events and conditions that need to happen in order for the intervention to work, i.e., to make a difference. Identifying and understanding supporting factors is clearly important in assessing NRMR type programmes since these factors often entail other partners doing things that are needed for the programme to work.

In these cases, the key causal question becomes the following: was the causal package of the intervention plus its supporting factors sufficient to produce the intended result? It is recognised that there could be other ways in which the desired result could be brought about and, hence, that the particular causal package in question is not necessary to achieve the result. In addition, we would want to know if the intervention was an essential part of the specific causal package. Perhaps the desired result could be realised with just the supporting factors and without the intervention. The causal package with these two characteristics – sufficiency of the package and necessity of the intervention as part of the package – is the *intervention causal package*.

If these conditions hold, then the intervention is a *contributory cause* and has 'made a difference'. That is, the intervention was a necessary element of the causal package which was sufficient to produce an observed result. This is a useful and operational definition of 'making a difference'.

As a contributory cause, an NRMR programme is one among several 'causes'. Yet our interest is on the programme as an 'intervention' – a collection of activities deliberately undertaken to get change happening where adequate change was not happening before. We would like to know what *role* the intervention played in bringing about the impacts. We may expect that, at a minimum, the programme acts as a *trigger* to start the causal chain. And in the complex contexts we are considering, the programme may also involve other subsequent actions taken along the causal pathway to *sustain* the causal pathway. Thus, we would like to assess whether programmes were triggering contributory causes and/or sustaining contributory causes. In such cases, a programme can be said to be a *principal contributory cause*. In other cases, the programme might see itself as playing a more modest supporting role, joining others in an already ongoing process; *enhancing* a change process already underway so that better, or more timely, results are achieved.

For NRMR, we would expect that the intervention is a principal contributory cause in reducing rural poverty and increasing food security. That is, that the research and related intervention activities, plus a number of other supporting factors, were sufficient to realise the expected impacts and that the research and related intervention activities played an essential role in making the causal package sufficient.

Here, so far, the discussion of contributory causes has been in deterministic terms, i.e., a cause is either sufficient or it is not. However, the discussion needs to reflect the probabilistic nature of causality for socio-economic phenomena. Mahoney (2008: 421) argues that "a treatment is a cause when its presence raises the probability of an outcome occurring in any given case ...". Following on from Mahoney, in terms of the intervention causal package, I suggest the term *likely necessary* to describe the supporting factors that are usually, or almost always have to be, present for the outcome to occur. And I suggest *likely sufficient* to describe the sufficiency of the intervention causal package, meaning that, in this case, the causal package most likely produced the observed result. For an intervention being evaluated, these are more realistic interpretations of the necessary and sufficient conditions as discussed earlier.

With these perspectives on causality, the key causal questions related to an intervention are:

1. Is it likely that the intervention has made a difference?
  - Is it likely that the intervention was a contributory cause of the result?
  - What role did the intervention play in the causal package?
2. How and why has the intervention made a difference?
  - How did the causal factors combine to bring about the result?
  - What context was relevant and which mechanisms were at work?
  - Has the intervention resulted in any unintended effects?

### Fish farming as an example of a causal package

Consider a specific example of an NRMR-type intervention. This Australian Centre for International Agricultural Research (ACIAR)-World Vision intervention seeks to improve the diet, food security and income of low income farmers in northern Thailand by encouraging and helping them adopt freshwater fishing (Harris, 2010). It involves NRMR issues of improving land and water management. Selected farmers participated in the research, developing low cost fish food from local materials. They were provided with initial funds for equipment and for young fingerlings, and gave and provided advice on fish farming methods to the researchers and their peers. In addition to improving their own lives, others were expected to adopt fish farming by example.

The initiative's components were:

- Participatory research on low cost fish food
- Start-up funding
- Advice on improved fish farming methods

Other supporting factors mentioned in the report were:

- An adequate number of initial farmers convinced to try fish farming
- An adequate market for the fish superfluous to the families' requirements
- An adequate supply of affordable healthy fingerlings
- Support from the farmer's family for the additional work involved
- Improvement in the lives of adopters over time, which was visible to neighbours
- Availability of adequate cash to buy fish food and other supplies

The intervention causal package is this set of components of the initiative and the other supporting factors. Clearly the intervention is not sufficient on its own, and neither is it necessary; an alternative approach to achieving the intended results would be, for example, to provide set-up funds and training for the farmers' households to start cottage weaving businesses, or to provide resources and training to increase yields of existing food and cash crops.

The initiative made a difference if (1) the expected results were achieved as a result of the initiative and its supporting factors and (2) the initiative was an essential component of the causal package.

If the expected results did not occur then one would want to try to understand why. Did some of the supporting factors fail to occur? Were there other factors that now appear to have been needed, but which did not occur? Were the initiative activities poorly implemented, inadequate or unsound? Was the causal model sound? And if there were unexpected results – either positive or negative – we would also try to understand why they occurred.

### Demonstrating contributory causes

How then to go about demonstrating that an intervention is a contributory cause? One approach is to connect causal packages to theories of change, and adopt a generative or mechanistic approach to causality.

#### Theories of change incorporate causal packages

A well-developed theory of change is embedded in the context of the intervention. The theory of change would be developed using the perspectives of the key stakeholders and beneficiaries, and would be informed by existing relevant research. The theory of change would include:

- A results (causal) chain showing the basic logic of the intervention
- The underlying assumptions behind the links in the results chain
- The risks attendant upon each link occurring
- Identification of unintended effects
- Identification of plausible, alternative, rival explanations.

Thus, *theories of change are models of causal sufficiency* – they set out a model of how the intervention is expected to contribute to the desired results. Hence, theories of change not only incorporate causal packages, but also set out the expected relationships between the intervention and the supporting factors (assumptions), as well as identify the risks (the confounding factors). "A theory of change is a model of how the intervention is expected to act as a contributing cause" (Mayne, 2012a: 7).

#### Approaches to demonstrating causality

The literature on causality discusses several alternative perspectives on how to interpret and think about causality. There are at least four ways of conceptualising and addressing causality:

- *Regularity frameworks* that depend on the frequency of association between cause and effect – the basis for statistical approaches making causal claims
- *Counterfactual frameworks* that depend on the difference between two otherwise identical cases – the basis for experimental and quasi-experimental approaches to making causal claims
- *Comparative frameworks* that depend on combinations of causes that lead to an effect – the basis for 'configurational' approaches to making causal claims, such as qualitative comparative analysis
- *Generative frameworks* that depend on identifying the causal links and mechanisms that explain effects – the basis for theory-based and realist approaches to making causal claims (adapted from Stern et al., 2012: 16-17).

These different perspectives seek, primarily, to answer different types of causal questions. Regularity and counterfactual approaches address questions of the form: to what extent can a specific (net) impact be attributed to the intervention? The CGIAR impact assessment is exclusively focussed on making causal claims using the counterfactual approach. Indeed, it defines impact assessment in those terms (Science Council Secretariat, 2006). Singular thinking that causality can only be addressed through counterfactual approaches is quite common in many quarters. Comparative frameworks can address questions of the form, has the intervention made a difference? Generative frameworks can also address this causal question as well as questions about how and why the results were brought about.

Of most interest for our discussion are the generative perspectives on causality, which, indeed, are how, in every day life, causality is often seen

and interpreted. If one is trying to find the cause of an event, it is typical to trace back what happened prior to the event to see what 'caused' it.

#### Theory of change approaches to showing a contributory cause

One application of this thinking is the use of impact pathways (Douthwaite et al., 2008) – and related theory of change approaches – that are developed to trace out how it is expected that the intervention will lead to the anticipated impacts. Showing that each step along the pathway was caused by the preceding one is using a generative view of causation to get at the causal link between the intervention and the impact. Theory based approaches to evaluation (Weiss, 1997; Stame, 2004; Rogers, 2007; White, 2009; Funnell and Rogers, 2011), such as contribution analysis (Mayne, 2008; Mayne, 2011), use these models of causation to make causal claims.

In particular, contribution analysis can be used to demonstrate if an intervention is a contributory cause. In a recent Special Issue of the journal *Evaluation*, several authors discuss the practice and concepts around contribution analysis (Mayne, 2012b). Contribution analysis confirms whether:

- The expected result occurred
- The causal package is sufficient:
  - The supporting factors – the assumptions for each link in the theory of change – have occurred and together provide a reasonable explanation for the occurrence of the results
  - Any other identified supporting factor that occurred has been included in the causal package, revising the theory of change as needed
  - Important plausible, rival explanations have been accounted for.
- The intervention is a necessary part of the causal package:
  - Without the activities and outputs of the intervention, the supporting factors alone are not sufficient to bring about the results.

It was noted earlier that the assumptions may only be likely necessary conditions. Thus, in a specific case not all the assumptions in a theory of change may have occurred, in which case an assessment is needed whether the collection of actual supporting factors (assumptions) provides a reasonable explanation for the occurrence of the observed result. This analysis, plus the assessment of plausible, rival explanations, allows for the causal inference to be made whether the intervention causal package (for the link) was a contributory cause. If it was, and all the other links in the causal chain are also confirmed, then the theory of change itself has been confirmed.

Data and evidence for the contribution analysis would come from applying logic, critical thinking and prior research, and asking relevant stakeholders about each link, whether they believe there were other causal factors beyond the package at work. If there were, one would need to ask about evidence for their belief. Note that the links in a theory of change should comprise relatively proximate cause and effect, thereby making judgement and the use of logic and critical thinking easier.

Consider the fish farming intervention described earlier. How could we explore whether the intervention was a contributory cause and, hence, made a difference? We would first need to observe whether or not the key expected results occurred, in particular in terms of initial adopters maintaining their fish farms over time, and whether neighbours started fish farms and maintained them. If this did happen, then we would like to confirm that setting up the initial adopters was a contributory cause. If not, then why did the theory of change not work as intended – at what point did theory break down? In either case, one would want to explore if the supporting factors came about and whether other factors, not in the causal package, played a role and, in particular, if there were other rival explanations for the observed results. The possibilities might include a general rise in interest in fish farming, or a significant rise in the price for commercial fish accounting for an increase in fish farming. Conversely, if the initiative did not work, which supporting factors were not being realised?

Finally, in this case, the intervention would appear to have played a triggering role. The early adopters did so as a direct result of the intervention activities, starting the causal chain.

### Concluding comments

This Brief suggests a new way of thinking about interventions and their causal links to the results realised. Most development interventions of any size are neither necessary nor sufficient causes of the intended results, but, rather, should be thought of as contributory causes. That is, we expect that the intervention, along with a set of necessary supporting factors, was sufficient to bring about the intended outcomes and impacts, and that the intervention was a necessary component of this causal package.

From this perspective, the kinds of possible causal claims that make sense answer the questions:

- Has the intervention likely made a difference?
- How and why has the intervention made a difference?

These issues can be addressed using a generative perspective on causality and employing theory-based approaches in the evaluation.

### References

- Cartwright, N. and Hardie, J. 2012. Evidence-based policy: doing it better. A practical guide to predicting if a policy will work for you. Oxford, UK: Oxford University Press.
- Douthwaite, B., Alvarez, S., Thiele, G. and Mackay, R. 2008. Participatory impact pathways analysis: A practical method for project planning and evaluation. ILAC Brief 17. Rome, Italy: Institutional Learning and Change Initiative (ILAC). [http://www.cgiar-ilac.org/files/publications/briefs/ILAC\\_Brief17\\_PIPA.pdf](http://www.cgiar-ilac.org/files/publications/briefs/ILAC_Brief17_PIPA.pdf).
- Funnell, S. and Rogers, P. 2011. Purposeful program theory: effective use of theories of change and logic models. San Francisco, CA: Jossey-Bass.
- Harris, D.N. 2010. Extending low-cost fish farming in Thailand: an ACIAR-World Vision collaborative program. ACIAR Impact Assessment Series, 66. Canberra, Australia: Australian Centre for International Agricultural Research (ACIAR).
- Keating, B. 2011. NRM Research in the CGIAR – some reflections from the outside looking in. Canberra, Australia: Commonwealth Scientific and Industrial Research Organisation (CSIRO).
- Mackie, J.L. 1974. The cement of the universe: a study of causation. Oxford, UK: Oxford University Press.
- Mahoney, J. 2008. Toward a unified theory of causality. Comparative Political Studies 41(4/5): 412-436.
- Mayne, J. 2008. Contribution analysis: An approach to exploring cause and effect, ILAC Brief No. 16: Institutional Learning And Change Initiative (ILAC). <http://www.cgiar-ilac.org/files/>

- publications/briefs/ILAC\_Brief16\_Contribution Analysis.pdf.
- Mayne, J. 2011. Contribution analysis: addressing cause and effect. In: Forss, K., Marra, M. and Schwatz, R. (eds.) Evaluating the complex. Piscataway, NJ: Transaction Publishers. pp. 53-96.
- Mayne, J. 2012a. Contribution analysis: coming of age? Evaluation 18(3): 270-280.
- Mayne, J., (ed.) 2012b. Contribution analysis. Evaluation 18(3).
- Rogers, P. 2007. Theory-based evaluations: reflections ten years on. New Directions for Evaluation 114: 63-67.
- Science Council Secretariat. 2006. Natural resources management research impacts: evidence from the CGIAR. Rome, Italy: CGIAR Science Council standing committee on impact assessment.
- Stame, N. 2004. Theory-based evaluation and varieties of complexity. Evaluation 10(1): 58-76.
- Stern, E., Stame, N., Mayne, J. Forss, K., Davies, R. and Befani, B. 2012. Broadening the range of designs and methods for impact evaluations. DFID Working Paper, 38. London, UK: Department for International Development. <http://www.dfid.gov.uk/R4D/Output/189575/Default.aspx>.
- Weiss, C.H. 1997. Theory-based evaluation: past, present, and future. New Directions for Evaluation 76(Winter): 41-55.
- White, H. 2009. Theory-based impact evaluation: principles and practice. Working Paper 3: Delhi, India: International Initiative for Impact Evaluation [http://www.3ieimpact.org/admin/pdfs\\_papers/48.pdf](http://www.3ieimpact.org/admin/pdfs_papers/48.pdf).

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