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SYSTEMATIC REVIEW PROTOCOL[1,2]

The effectiveness of micro-insurance in helping small-holders manage weather-related risks

Shawn Cole, Gautam Bastian, Xavier Giné, Justin Oliver,
Sangita Vyas, Carina Wendel

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[1] This protocol was developed in cooperation with the team answering DFID Systematic Review Question 45 entitled "The effectiveness of micro-insurance in helping small-holders manage weather-related risks?" and hence bears many similarities. Specifically we acknowledge the contributions of Sangita Vyas and Carina Wendel. This review is made possible through a grant from the Department for International Development (DFID), UK Government. We would also like to thank the EPPI Centre and the International Initiative for Impact Evaluation for their help and guidance in the preparation of this Systematic Review.

[2] This document is intended to be a description of how we intend to go about conducting this systematic review. References to the literature and background information are provided only to the extent that they help explain the motivation for certain methodological decisions we have taken. This is not intended as an authoritative review of the literature, and should not be read as such.

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1. Background

1.1. Rationale, definitions and concepts

The risk of unfavourable weather conditions is the single most important risk faced by hundreds of millions of poor rural households around the world. Governments have implemented a range of programs to address these risks, most notably crop insurance programs and disaster relief aid. Programs which tie payments to individual farmer's experience may suffer from two serious problems: *moral hazard*, whereby farmers may not exert as much effort to avoid risk or its consequences; and *adverse selection*, whereby farmers with higher risk are more likely to take up such products. Contracting innovations have de-linked indemnification from individual production by basing insurance against losses arising from poor weather on an observable index (e.g. local rainfall or aggregate local crop yields) which is not directly linked to individual production. Such "index-based" micro-insurance products promise to offer a financially sustainable mechanism to reduce the risk faced by agricultural households. While there are some examples of success, by and large farmers have been reluctant to hedge substantial amounts of risk with these instruments. It is therefore of central importance to understand the determinants of demand for these products, and quantify their ability to affect household's economic decisions and improve well-being. This review will synthesize the emerging body of evidence surrounding two specific types of index-based insurance: (1) weather insurance and (2) area-yield based crop insurance. The review will concentrate on the various issues associated with these forms of insurance, provide the best synthesis possible using existing evidence, and suggest priorities for future research.

The importance of this question is evident in light of the significant body of evidence that rural households around the world face fluctuating consumption, and engage in costly risk-coping strategies. Studies show that vulnerable agricultural households diversify income and reduce risk by relying on off-farm employment for substantial portions of total income (Skees et al., 2002). Although migration provides a stream of remittance income, which is not correlated with local agricultural production, this form of self-insurance is often incomplete.

Other studies document the efficiency cost households pay to self-insure against weather risk. Agricultural households may over supply labour (relative to a profit maximizing choice) or reduce input provision to limit the downside in the event of a poor harvest (Bliss and Stern, 1982). They may also plant particular crops, which have reliable yields, or delay planting until more complete information about the season's weather arrives (Morduch, 1995). By employing these devices, vulnerable households effectively insure themselves against extreme duress in the event of a crop failure. This insurance, however, comes at a cost. Morduch suggests that the safer crops favoured by risk prone households generate lower yields than other varieties and have lower expected returns. Similarly, delaying planting or reducing inputs can diminish expected returns. An analysis of the

economic impact of weather insurance therefore must include an analysis of changes in household investment decisions and well-being.

For index insurance products to be useful, their payouts must be closely (negatively) correlated with agricultural yields, particularly in catastrophic states of the world. A key feature of weather risk is that it is local: while individual governments and domestic financial institutions may view weather shocks as systemic, by and large local weather shocks are unrelated to global economic fluctuations. In theory, global capital markets should be willing to insure this risk at close to risk-free rates.

Our review will utilise a realist review methodology to evaluate whether these theoretical reasons for effectiveness actually pan out when the programs are implemented in the field. Example papers include Giné, Townsend and Vickery, (2007) and Miranda and Vedenov (2001), and Cole et al. (2010).

1.2. Policy, practice and research background

As formal weather insurance products have only recently begun to spread through developing countries, and the lag time in publishing, the body of published, peer-reviewed literature on the impacts and issues associated with these products is quite limited.

Indeed, an important contribution of the systematic review will be to serve as a guide for the research community, helping to identify the research agenda. Our review will also include a discussion of this work; covering topics such as contract design for weather insurance (Clarke and Macchiavello, in progress), and the effect of financial literacy training, knowledge and institutional trust on insurance take up (Cole, Gaurav, and Tobacman; de Janvry et al.; Wahhaj and Outes-Leon, in progress). While credible evidence on the effects of weather insurance, in particular evidence based on randomized trials, remains at an early stage, we feel that a systematic literature review related to this issue would be constructive at this time; to compile the evidence which has been gathered in disparate studies and to provide directions for future research.

We are aware that Ralf Radermacher at the MicroInsurance Academy in Delhi is leading a systematic review of microinsurance. However, to our knowledge, no systematic review of high-quality evidence focusing on index-based micro insurance, weather insurance or crop insurance has been attempted so far. Gine, Menand, Townsend and Vickery (Forthcoming) have written a book chapter describing India's experience with weather insurance.

1.3. Objectives

Our objectives should be understood in the context of the following three points. Firstly, this will be one of the first systematic reviews of the literature relating to weather insurance. Secondly, the causal relationship between such financial products and economic outcomes is not straightforward or well understood. Lastly, the experimental

and quasi-experimental evidence available is scarce. In light of this, our intention is to create a sufficient context from which future academic work can be facilitated by compiling what is empirically known and theoretically accepted, and contrasting it with the areas where there is no empirical or theoretical agreement.

In this review we will examine the effectiveness of weather insurance and area-yield based crop insurance in helping small holders manage weather-related risk in low and middle-income countries. We will primarily attempt to answer the following questions through this review:

1. Where index-insurance products are available, do small-scale farmers take them up and, if not, what barriers exist?
2. What factors affect the decision to purchase insurance?
3. What effect, if any, does holding insurance have on economic behaviour, specifically on investment decisions and well-being?

We specifically exclude government relief programs from our definition of risk-management. We will examine the heterogeneity of effects based on household wealth, education and gender.

2. Systematic Review Methodology

2.1. User involvement: Approach and rationale

We intend this review to be used by individuals and organizations interested in seriously evaluating the current evidence base. While we will produce a four-page "executive summary" accessible to policy-makers, the review will not shy away from the evaluation of important, and technical, details, such as the quality of the identification strategy.

The primary user for this review will be DFID, however we are seeking journal publication and also plan on disseminating the systematic review to the international development community through the Harvard Business School (HBS), The Jameel Poverty Action Lab (JPAL) at MIT amongst other development policy institutions. We will also make an effort to make this review available to developing country policymakers through organizations such as the Centre for Micro Finance, Chennai, India.

We are currently planning to establish a weather insurance portal web site, possibly in coordination with the MicroInsurance Academy in Delhi, where this systematic review will also be made available, with links to all relevant papers. This web portal will be maintained and updated by the Center for Micro Finance.

The systematic review will also be disseminated through the International Initiative for Impact Evaluation (3ie), who is organizing an independent peer review of this protocol and the draft review. The draft version will be circulated to a select group of users, both

academic and policy-oriented, whose feedback and comments will be incorporated in the final published version.

The timeline for this study is provided in Appendix 2.1.

2.2. Describing and identifying studies

We will conduct a thorough review of qualitative and quantitative studies that contain credible evidence on the impacts of weather insurance on investment decisions (land cultivated, inputs used, type of crops planted, technology adoption, etc.) and household well-being (per capita consumption, health indicators, food security, ability to cope with economic shocks, etc.), focusing on evidence from developing countries.

We will also discuss qualitative research based on data collected from randomized evaluations (such as papers considering the determinants of 'take up' of insurance products). In selecting qualitative studies to review, we will only include those studies judged to have a credible research design. Similarly, for randomized evaluations, we will include those studies in the final review that meet our detailed inclusion and exclusion criteria. In addition to the above, the review will also consider evidence from administrative records and experimental games (such as those designed to measure risk aversion).

We will follow a realist review methodology. We do not intend to apply quantitative methods to the data derived from the studies considered. Rather, we will focus on contrasting and synthesizing these studies, using the context and results of one to inform those of another. We will seek to draw out generalizable lessons from the disparate studies considered, while taking into account and highlighting important differences between them, and discussing how context and causal mechanisms influence the results.

2.2.1. Defining relevant studies: inclusion and exclusion criteria

In this section we explicitly state the inclusion and exclusion criteria that we will apply to the studies available.

2.2.1.1 Inclusion Criteria: Methodology/Study Design

We will include both qualitative and quantitative studies in the review. There is a dearth of good quality studies on this subject that use experimental and quasi-experimental approaches, so we do not expect to find many randomized controlled trials. However we expect to find some high-quality studies using quasi-experimental or econometric methods. We will also look for qualitative studies that examine those parts of the causal mechanism that cannot be easily quantified and measured.

For quantitative studies we will restrict inclusion in the final synthesis to those studies that propose causal evidence using the following three research designs:

1. Randomized controlled designs,
2. Quasi-experimental designs (e.g. Regression Discontinuity, Instrumental Variables, Interrupted Time Series, non-randomized controlled trial, controlled before and after study, and statistical matching such as propensity score matching) and
3. Regression-based approaches, with greater weight given to studies with well-understood sources of variation and stronger empirical bases. We intend to include only those that use acceptable methods to control for selection bias and exclude those studies without a comparison group.

We will use macro evidence to motivate our review, but for analysis we will only consider micro studies that use relevant outcome variables for appropriate samples. We will also consider lab experiments, if they meet all our other inclusion and exclusion criteria and mimic index-based agricultural insurance.

2.2.1.2 Inclusion Criteria: Time & Place

We will only include studies done in low and middle-income countries as defined by the World Bank at the time the data were collected (the complete list is provided in Appendix 2.2). We will also restrict our review to studies conducted since 1990, as we do not believe we will find many studies prior to that date. We omit earlier work to ensure the SR is as relevant as possible to current policy. Special attention will be given to identifying studies produced by domestic research bodies in low-income countries, including but not limited to central banks, agricultural and financial research agencies of developing countries.

2.2.1.3 Inclusion Criteria: Intervention & Natural Experiments

Since we are interested in narrowing the scope of this study to ensure that our review objectives are met, and that there is a degree of comparability in the studies that are included, we plan to focus on interventions and natural experiments that fall in the following criteria:

- Studies that analyze the impact of index-based insurance products, that fall in the broad category of weather insurance and area-yield indexed crop insurance.
- Studies that assess the impact on household investment decisions, household wellbeing, take-up or consumption smoothing.

Further we will limit our attention to index-based insurance programs run by the following types of agencies:

1. Government-led programs (except government relief programs)
2. Formal private and public financial services firms (including but not limited to insurance and reinsurance companies),
3. Microfinance institutions,
4. Non-Profit Organizations, and

5. International Aid Agencies.

2.2.1.4 Inclusion Criteria: Study Participants

Our review will concentrate on low-income households in general, and we will not restrict ourselves to studies that focus on a specific gender, profession, location or insurable asset. We will however identify and categorize reported effects by gender, occupation, insurable asset and location of the study (urban/rural) where information is available.

2.2.1.5 Inclusion Criteria: Outcomes

We are interested in synthesizing results relating to investment decisions (crop selection, input usage), general measures of household wellbeing, consumption smoothing as well as take-up.

The measures to be considered fall into several broad classes. Firstly, in light of previous evidence suggesting that insurance may affect *investment decisions*, we will consider a broad variety of investment measures, including those pertaining to agricultural investment (land cultivated, inputs used, type of crop planted, technology adoption, etc.) and other investments undertaken by rural households (such as off farm labour or small-scale non-agricultural household enterprises). Furthermore, since insurance may allow households to take on more risk and undertake higher expected return investments, we will consider *general measures of household wellbeing* (per capita consumption, food security, ability to cope with economic shocks, etc.). Third, we will evaluate the efficacy of weather insurance as a *consumption-smoothing* tool. Finally, given that the *take up of insurance products* has emerged as a central issue in this literature, we will consider a wide variety of studies concerned with this outcome, including surveys, qualitative studies or administrative records.

2.2.1.6 Inclusion Criteria: Publication Type

We will not restrict our search to peer reviewed published papers, as there are many projects currently underway whose results are only available as working papers. We will include these studies in our review while applying our criteria for methodological clarity and research design.

2.2.1.7 Exclusion Criteria

To emphasize our focus and in light of the limitations of resources that are available to us in terms of time, skills and budget, we will explicitly exclude studies with the following characteristics from the review:

- *Studies that are not published in the English language*. We do not have the capacity within our team to examine literature published in languages other than English. Given the available time frame and resources we do not believe we will

be able to properly search and synthesize the non-English literature. Although we realize that this may lead to some papers being overlooked, it is our strong belief that virtually all papers with credible research design would be available in English. We hope that stating our assumptions clearly will ensure that any interpretation of our results will consider these limitations. We will contact the Inter-American Development Bank to ask them to identify any high quality studies that would merit inclusion in our review, and if appropriate, will include them by hiring a Spanish-speaking Research Assistant to assist with the coding.

- *Studies that do not attempt to measure the microeconomic impact* of access and use of index-based micro-insurance.
- *General discussion papers* not presenting data on impacts.
- Studies that discuss *risk management* but do not explicitly address the issue of index-insurance.
- Studies that have poor or unexplained identification strategies, studies without a control group, or impact evaluations that compare individuals who purchased insurance to those who did not purchase insurance.
- Studies based on government relief programs.
- We also emphasize that the products we are examining in review are only risk management tools, therefore excluding studies that address risk-mitigating mechanisms. Risk mitigation mechanisms would include policies or phenomena such as access to irrigation or diversification away from agriculture.

2.2.2. Screening Studies: Applying inclusion and exclusion criteria

2.2.2.1 Stages of screening

We will follow a two-stage screening algorithm:

1) In the *first stage* we will apply the inclusion and exclusion criteria to the title and abstracts.
   a) If the study does not violate our exclusion criteria and fulfils our inclusion criteria, it will be included in the review set.
   b) If the study violates our exclusion criteria or fails to meet our inclusion criteria, it will be excluded from the review set.
   c) If it is unclear from this basic information if the study should be included or excluded, we will include the study in the review set.
2) In the *second stage* we will apply the criteria to the full report of studies screened from the first stage.

Studies that do not use rigorous methods, as defined in Section 2.2.1.1 will be excluded from the analysis; though they will be included in the comprehensive database of research made available to researchers. Included and excluded studies will be clearly marked.

2.2.2.2 Double-coding of studies

In order to minimize bias and maximize the reliability of the coded data, the reviewers will cross-code 15-25% of the studies included after the second screening stage. We will compare the reviews and if there is a conflict the reviewers will meet to resolve the differences by discussion and consensus. If no agreement can be reached or in a case where the interpretation is unclear, we will first defer to the internal reviewer, Xavier Gine, and if no consensus can still be reached, we will report such studies in an appendix of the final report but not include them in the report.

2.2.3. Characterizing Included and Excluded Studies

2.2.3.1. Examples of included studies

Studies such as those cited above (in Section 1.2) document the various ways in which weather insurance might be expected to change household behaviour and impact welfare. We intend to conduct a thorough literature review of studies, which offer credible evidence on the impacts of weather insurance. Our main focus will be on the growing body of evidence from studies based in developing countries over the past decade. Examples of this work include high-quality, randomized evaluations such as Cole et al. (2009), who study a weather index-based crop insurance product in India and Giné and Yang (2007), which evaluates a linked credit-weather insurance product in Malawi.

2.2.3.2. Examples of excluded studies

We will exclude studies that do not mention index-based insurance even if they deal with the broader area of risk management. For instance Yang and Choi (2007), which examines remittances as a mechanism for managing rainfall related risk in the Phillipines. We will not include studies such as Gine, Townsend and Vickery (2007) which are general in nature, and do not provide a specific, detailed evaluation of index-based insurance. Advocacy articles or policy papers such as Ahuja & Guha-Khasnobis (2005),Barnett, Skees and Varangis (2002), and Sennholz (2009). We will also avoid studies such as Zeng (2000) that explore the conceptual issues behind insurance products but do not evaluate determinants of take-up or impact. To be clear, we will also exclude studies related to social insurance programs such as India's National Rural Employment Guarantee (NREGA) scheme, since they cannot be classified as micro-insurance or index-based insurance.

2.2.4 Identification of potential studies: Search strategy

We will conduct database searches of published studies and use online search engines to search for published and unpublished studies as well as manual hand searching of books and journals. We will also search other online resources, particularly the websites of federal, national and international development and policy institutions, both governmental and multi-lateral as well as databases of doctoral theses. We will use citation tracking to search for evidence referenced by, or those citing the studies and reviews of, studies that we identify. In addition, we will contact other experts to identify

additional unpublished studies to the extent possible. We provide a list of electronic and non-electronic sources as well as examples of keywords used in the search in Appendix 2.3. A flowchart of the search process is included in Appendix 2.4. The flowchart outlines in detail the different stages of the searching and coding processes, including information on double-coding strategies and citation tracking.

Titles and abstracts of studies to be considered for retrieval will be recorded using the EPPI Reviewer Software, along with details of where the reference was found. Inclusion/exclusion decisions will be recorded on that platform and retrieved studies will be filed according to inclusion/exclusion decisions.

2.2.4.1 Keyword strategies for bibliographic databases

Keyword searches will vary slightly from one database to another, based on the focus and classification codes. The appendices of the final review will detail the specific search strategies used for each database.

We will maintain a detailed search log, with details of the keywords searched, the names of the databases consulted and search results to which the selection will be applied.

2.2.4.2 Consulting Domain Experts

An informal panel of expert contacts will be formed from people with a specialist interest in banking and financial services for the poor. These experts will be asked to provide information on ongoing research and to ensure that our search comprehensively covers all the studies that meet our criteria. Conditional on their consent we will provide a list of the experts we consulted in the final review.

2.2.4.3 Handling multiple reports on the same experiment

Although we do not expect to find many such studies, if we do encounter multiple studies we will take the appropriate methodological steps necessary to ensure that the review is not compromised by multiple effect sizes from the same study. We will treat each study, and not each scholarly article, as the unit of analysis. Additionally, we will contact authors to identify discrepancies between papers, if necessary.

2.3. Methods for synthesis

2.3.1. Assessing Quality of Studies

A draft of the coding tool is provided in Appendix 2.5. It will provide the basis of our quality assessment for each study we decide to include in the review and will also allow us to extract data and information from the papers. The tool is based on the inclusion and exclusion criteria outlined in section 2.2.1. We will use an electronic version of this coding tool on the EPPI-Reviewer platform.

We will assess quality and rigor of the studies taking into account the following:

1. Population
    a. Relevance of the sample used to the question addressed
    b. Who are the subjects that are tracked to determine the outcome?
2. Intervention
    a. What inputs does the intervention actually provide to participants?
3. Comparison
    a. How does the evaluator estimate the counterfactual?
    b. How does the evaluator estimate what the effects of the program would have been on participants in the program?
    c. Are there systematic differences between program participants and non-participants that would cloud this comparison?
4. Outcomes
    a. Which dimensions are identified for measuring the effect of the program?
    b. How are the effects along these dimensions measured?
    c. What is the estimated effect of the program?
5. Process
    a. What resources are actually in place?
    b. How well do those resources function?
    c. How intensively do participants utilize the available resources?
    d. Clarity of the description of methods and research design
    e. Rationale and appropriateness of methods used for sampling, data collection and analysis
6. Context
    a. Where are the results of the evaluation situated in the context of other research and policy questions?
    b. Internal and external validity of the results
7. Interpretation
    a. Relevance of the findings to the research questions
    b. What is the policy question under consideration? And what do these results suggest about the appropriate course of action?
    c. What do the results suggest about our understanding of the theoretical issues?

2.3.2 Methodology for synthesizing data: Realist synthesis

We will employ the *realist synthesis* methodology to conduct our systematic review. This process-oriented methodology examines the mechanisms that drive changes in outcomes within the framework of the context of the studies. Our results will be analyzed and presented using the realist synthesis framework of Context-Mechanisms-Outcomes (CMO). A Flowchart of the proposed causal mechanism is included in Appendix 2.6.

The *realist synthesis* approach is of special interest to policymakers because of its focus on the mechanisms of change and the context of programs. While meta-analysis focuses on the statistical synthesis of outcomes, this methodology also examines the context of

the studies and mechanisms at work to evaluate the underlying theory of change (Greenhalgh, Kristjansson and Robinson, 2007). Ideally, the policymaker will better understand how to use different mechanisms of change in different contexts to build successful programs (Pawson et al, 2004).

From a research perspective, the *realist synthesis* can give insights into the specific channels through which access to and take-up of index-insurance affect smallholders' ability to manage weather related risks. The CMO model will also enable researchers to analyze which contexts weaken these causal mechanisms and make interventions less effective.

Recent research has combined methods that focus primarily on internal validity, such as the Campbell standards, with methods that focus more on external validity such as realist reviews (Van der Knapp et al, 2008). We will attempt to follow this example by applying strict methodology/study design criteria during our coding phases alongside the careful tracking and analysis of context and mechanisms.

2.3.2.1 Realist synthesis methodology: Addressing the context

The context of the studies included in the review will be recorded in the data extraction phase. Coding of standard context variables like urban/rural, gender and existing insurance options will be supplemented by textual summaries of important contextual information. We will focus on collecting information about contextual aspects that carry the potential to influence the effectiveness of the causal mechanisms. Examples include the management and credibility of the insurers, social and economic characteristics of the target group as well as market failures and social norms.

2.3.2.2 Realist synthesis methodology: Focus on mechanisms

The mechanisms assumed to be at play were carefully mapped before the data extraction phase and will be tracked, where possible, in the coding process for each paper. Some of the key mechanisms that we are interested in include take up/willingness to pay and investment in both agricultural production and household wellbeing. Where papers don't explicitly state the assumed causal mechanisms, we will try to reconstruct CMO configurations based on the context and outcome variables addressed, which was the method followed in Van der Knapp et al (2008). The synthesis of this information will allow us to gage the importance and direction of the causal channels as well as identify channels where an evidence gap exists.

2.3.2.3 Realist synthesis methodology: Analyzing outcomes

The main outcomes will be classified and compared in two groups, both linked to the final goal of higher household incomes. They are 1) Higher productivity of agriculture and 2) Improved household wellbeing (e.g education and health levels). Impacts on Take-up and Consumption smoothing will also be classified and compared. Tables comparing the sizes, directions and significance will be analyzed in light of the context and

mechanisms at work. We will provide a tabulation of the directionality, magnitude and statistical significance of the results of the experimental and quasi-experimental studies including indicators for heterogeneous treatment effects. Where available, we will present the effect sizes for dichotomous variables as Odds Ratios or Relative Ratios and the continuous variables as standardized mean differences; which should provide some basis for comparability of results across studies.

2.4 Division of Labour

Prof. Shawn Cole will guide this review, provide internal peer review and ensure the maintenance of the highest academic standards. Gautam Bastian will be responsible for coordinating the review study. Gautam Bastian, Carina Wendel and Sangita Vyas will carry out the bulk of the activities associated with the review, including article search, coding, extraction and synthesis. Xavier Giné and Justin Oliver will provide inputs about the index-based insurance literature. Xavier Giné will play the role of internal referee. EPPI-Centre and 3ie will provide support for methodological issues including the software for the database and support for the search. The detailed background of each of the team members is provided in Appendix 1.1.

2.5 Updating of protocol and review

This protocol will be updated at the end of the review to reflect any changes that might arise in the practice of the review. While we have not budgeted for resources necessary to update the review in the future, the technical report we submit at the end of the review will describe the steps taken in the synthesis of the review carefully so as to give enough information to a research team interested in updating the review. Though not funded by this review, the Center for Microfinance will continue to update the web portal, adding and discussing additional studies as they become available.

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APPENDICES

APPENDIX 1.1: AUTHORSHIP OF THIS REPORT

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Shawn Cole is an associate professor in the Finance Unit at Harvard Business School, where he teaches a second-year elective course "Business at the Base of the Pyramid."

His research examines corporate and household finance in emerging markets, with a focus on banking, microfinance, insurance, and the relationship between financial development and economic growth. He has worked in India, the Philippines, Indonesia, Vietnam, and South Africa. He is an affiliate of MIT's Jameel Poverty Action Lab, and the Bureau for Research and Economic Analysis of Development.

Before joining the Harvard Business School, Professor Cole worked at the Federal Reserve Bank of New York in the economic research department. He has also served as chair of the Endowment Management Committee of the Telluride Association, a non-profit educational organization. He received a Ph.D. in economics from the Massachusetts Institute of Technology in 2005, where he was an NSF and Javits Fellow, and an A.B. in Economics and German Literature from Cornell University.

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Xavier Giné is a Senior Economist in the Finance and Private Sector Development Team of the Development Research Group. Since joining the Bank as a Young Economist in 2002, his research has focused on access to financial services and rural financial markets. In recent papers he investigated the macroeconomic effects of credit liberalization; the relationship between formal and informal sources of credit in rural credit markets; indigenous interlinked credit contracts in the fishing industry and the impact of weather insurance. Prior to joining the Bank he was a postdoctoral fellow and lecturer at the Economic Growth Center at Yale University. He holds an MA and a Ph.D. in Economics from the University of Chicago.

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Gautam Bastian is currently working as a Research Manager to Prof. Shawn Cole at Harvard Business School, where he manages a broad portfolio of research projects focused on financial innovation and policy.

Before joining Harvard Business School, Gautam worked at the Azim Premji Foundation on a large-scale randomized evaluation of school health and education policy alternatives in Andhra Pradesh, India. He has also worked at the Centre for Civil Society, New Delhi where he designed evaluations of school choice programs. He received a Master of Public Administration degree concentrating in Advanced Policy and Economic Analysis from the School of International and Public Affairs, Columbia University in 2010 where he was a Global Fund, Humane Studies and Cummins Fellow. He received BA in Economics from St. Xavier's College, Mumbai.

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Justin Oliver is the Executive Director of the Centre for Micro Finance. As Executive Director, Justin oversees more than 30 researchers working on more than 40 projects across India, in partnership with a wide range of MFIs and other development organizations, international academics and donors. Justin joined the Centre for Micro Finance in July 2008. He was previously the Ghana Country Director for Innovations for Poverty Action, overseeing research projects related to microfinance, community development and education. Prior to this, he worked at the Brookings Institution as a Foreign Policy Research Analyst and at Ernst & Young Investor Group Services. He also spent two years in Mauritania as a small enterprise development specialist for the United States Peace Corps. Justin has a Masters of Public Policy from the Harvard University Kennedy School of Government, and undergraduate degrees in Anthropology and English Literature.

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Sangita Vyas is a Research Associate for the Centre for Microfinance. She has considerable experience working in India, conducting research on financial issues, and performing quantitative analysis. Sangita has spent the last seven months as the lead manager for a randomized evaluation of rainfall insurance in Gujarat. In this capacity, she manages the relationship with the partner organization, oversees yearly surveying of over 2,000 households, plans and implements a marketing strategy for the insurance policy, and provides quantitative analysis of the data collected. Prior to this, Sangita worked with a small NGO in Gujarat creating and implementing a system for improved data collection and analysis. Her other development experience includes completing an internship with ACCION International, providing strategic research for the organization. She holds a B.S. in Economics with a concentration in Finance from the Wharton School at the University of Pennsylvania.

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Carina Wendel is a Research Consultant for the Centre for Microfinance. She has considerable experience in applied development economics and policy analysis. She has worked as an economist for the Ministry of Finance in Uganda and as a loan officer with the European Investment Bank. She specializes in agricultural economics and her Masters thesis analysed the efficiency of informal risk sharing mechanisms in the face of drought for rural smallholders in Andhra Pradesh, India. She holds a B.Sc. in Economics and Economic History from LSE and an MSc in Economics for Development from Oxford University.

APPENDIX 2.1: TIMEFRAME

This is the timeline beyond the submission of this protocol to DFID for review on 15th July 2010.

ACTIVITY	START DATE	END DATE
DFID and External Review of protocol	July 15, 2010	August Sept 11, 2010
Study search [Note: We will also incorporate studies we find beyond this search period, and apply the subsequent stages of the process as and when feasible while keeping to the major deliverable commitments. We may also omit less important keywords from the search given the time frame.]	September 14, 2010	October 14, 2010
Assessment of study relevance	October 4, 2010	November 5, 2010
Extraction of data	October 14, 2010	November 15, 2010
Synthesis and/or statistical analysis	October 14, 2010	November 15, 2010
Preparation of draft report *[Deliverable to DFID]*	October 14, 2010	December 3, 2010
DFID review of draft report	December 3, 2010	December 15, 2010
Dissemination of draft report	November 15, 2010	January 10, 2011
Revision of draft report *[Deliverable to DFID]*	December 15, 2010	January 12, 2010
External review of draft report	January 12, 2010	February 12, 2011
Revision *[Deliverable to DFID]*	*February 12, 2010*	*February 25, 2011*
Communication and Dissemination of Final Report	January 25, 2011 onwards	

NOTE: The Timeline has been amended in response to the comments of reviewer 2.

APPENDIX 2.2: CATEGORIZATION OF COUNTRIES

The following list has been retrieved from the World Bank (http://data.worldbank.org/about/country-classifications). This is a representative list for 2010, but we will utilize the relevant lists depending on the year in which the study was conducted.

Low-income economies ($995 or less)		Lower-middle-income economies ($996 to $3,945)	
1. Afghanistan	21. Tajikistan	41. Angola	69. Moldova
2. Guinea	22. Chad	42. India	70. Tunisia
3. Nepal	23. Liberia	43. São Tomé and Principe	71. Djibouti
4. Bangladesh	24. Tanzania	44. Armenia	72. Mongolia
5. Guinea-Bisau	25. Comoros	45. Iraq	73. Turkmenistan
6. Niger	26. Madagascar	46. Senegal	74. Ecuador
7. Benin	27. Togo	47. Belize	75. Morocco
8. Haiti	28. Congo, Dem. Rep	48. Jordan	76. Tuvalu
9. Rwanda	29. Malawi	49. Sri Lanka	77. Egypt, Arab Rep.
10. Burkina Faso	30. Uganda	50. Bhutan	78. Nicaragua
11. Kenya	31. Eritrea	51. Kiribati	79. Ukraine
12. Sierra Leone	32. Mali	52. Sudan	80. El Salvador
13. Burundi	33. Zambia	53. Bolivia	81. Nigeria
14. Korea, Dem Rep.	34. Ethiopia	54. Kosovo	82. Uzbekistan
15. Solomon Islands	35. Mauritania	55. Swaziland	83. Georgia
16. Cambodia	36. Zimbabwe	56. Cameroon	84. Pakistan
17. Kyrgyz Republic	37. Gambia, The	57. Lesotho	85. Vanuatu
18. Somalia	38. Mozambique	58. Syrian Arab Republic	86. Guatemala
19. Central African Republic	39. Ghana	59. Cape Verde	87. Papua New Guinea
20. Lao PDR	40. Myanmar	60. Maldives	88. Vietnam
		61. Thailand	89. Guyana
		62. China	90. Paraguay
		63. Marshall Islands	91. West Bank and Gaza
		64. Timor-Leste	92. Honduras
		65. Congo, Rep.	93. Philippines
		66. Micronesia, Fed. Sts.	94. Yemen, Rep.
		67. Tonga	95. Indonesia
		68. Côte d'Ivoire	96. Samoa

Upper-middle-income economies ($3,946 to $12,195)			
97. Albania	109. Argentina	121. Botswana	133. Colombia
98. Dominican Republic	110. Iran, Islamic Rep.	122. Libya	134. Mauritius
99. Namibia	111. Romania	123. South Africa	135. Suriname
100. Algeria	112. Azerbaijan	124. Brazil	136. Costa Rica
101. Fiji	113. Jamaica	125. Lithuania	137. Mayotte
102. Palau	114. Russian Federation	126. St. Kitts and Nevis	138. Turkey
103. American Samoa	115. Belarus	127. Bulgaria	139. Cuba
104. Gabon	116. Kazakhstan	128. Macedonia, FYR	140. Mexico
105. Panama	117. Serbia	129. St. Lucia	141. Uruguay
106. Antigua and Barbuda	118. Bosnia and Herzegovina	130. Chile	142. Dominica
107. Grenada	119. Lebanon	131. Malaysia	143. Montenegro
108. Peru	120. Seychelles	132. St. Vincent and the Grenadines	144. Venezuela, RB

APPENDIX 2.3: SEARCH SOURCES AND KEYWORDS

Appendix 2.3.1 List of Bibliographic Databases and Other Sources

Source	Source Type	Search Strategy
AgEcon Search, University of Minnesota	Electronic Database	Keyword
Agricola	Electronic Database	Keyword
British Library of Development Studies	Electronic Database	Keyword
EBSCO Business Source Premier	Electronic Database	Keyword
Econlit	Electronic Database	Keyword
Econpapers	Electronic Database	Keyword
Google, Google Books, and Google Scholar	Electronic Database	Keyword
Handbooks in Economics	Electronic Database	Keyword
JSTOR	Electronic Database	Keyword
SpringerLink	Electronic Database	Keyword
Oxford Scholarship Online	Electronic Database	Keyword
ProQuest	Electronic Database	Keyword
Social Science Research Network (SSRN)	Electronic Database	Keyword
Wiley Interscience	Electronic Database	Keyword
World Bank and IMF's Joint Libraries Information System (JOLIS)	Electronic Database	Keyword
World Bank e-Library	Electronic Database	Keyword
American Journal of Agricultural Economics	Journals/Working Papers	Through EBSCO and JSTOR
Agricultural Finance Review	Journals/Working Papers	Keyword
Agricultural Economics	Journals/Working Papers	Keyword
American Economic Review	Journals/Working Papers	Keyword
Journal of Agricultural and Resource Economics	Journals/Working Papers	Keyword
Journal of Agricultural Economics	Journals/Working Papers	Keyword
Journal of Development Economics	Journals/Working Papers	Keyword
Journal of Development Studies	Journals/Working Papers	Keyword
Journal of Finance	Journals/Working Papers	Keyword
NBER Working Papers	Journals/Working Papers	Keyword
Oxford Review of Economic Policy	Journals/Working	Keyword

	Papers	
Reserve Bank of India	Journals/Working Papers	Manual
Review of Financial Studies	Journals/Working Papers	Keyword
United Nations Development Programme (UNDP)	Journals/Working Papers	Manual
World Bank Economic Review	Journals/Working Papers	Keyword
World Bank Research Observer	Journals/Working Papers	Manual
African Development Bank (AfDB)	Other	Manual
Asian Development Bank (ADB)	Other	Manual
Australian Agricultural and Resource Economics Society	Other	Keyword
Australian International Development Agency	Other	Keyword
Bill & Melinda Gates Foundation	Other	Keyword
Center of Evaluation for Global Action, University of California, Berkeley	Other	Manual
China Economic Network	Other	Manual
CCER Finance Database	Other	Manual
Commodity Risk Management Group at Consultative Group to Assist the Poor (CGAP)	Other	Keyword
European Review of Agricultural Economists	Other	Keyword
Innovations for Poverty Action (IPA)	Other	Manual
Inter-American Development Bank (IADB)	Other	Keyword
International Food Policy Research Institute (IFPRI)	Other	Manual
International Labour Organization's Micro insurance Innovation Facility	Other	Manual
Jameel Poverty Action Lab (JPAL)	Other	Manual
Micro-Insurance Centre	Other	Manual
Micro-Insurance Network	Other	Manual
Munich Climate Insurance Initiative (MCII)	Other	Manual
National Insurance Academy, Pune, India	Other	Manual
Organization for Economic Cooperation and Development (OECD)	Other	Manual
UKAID – Department for International Development	Other	Manual
USAID Microlinks	Other	Manual

Annual Bank Conference on Dev. Econ proceedings	Other	Manual

Appendix 2.3.2 Examples of keywords

Example 1: Boolean keyword search

(insurance OR risk) AND ((crop AND ((area?yield) OR (area?based)) OR weather OR climat* OR precipitation OR index OR index?based OR rain*))

Example 2: Targeted keyword search

For search engines where Boolean search strategies are not feasible or successful, one or several of shorter search strings like these will be used.

insurance OR risk

insurance OR risk AND crop

insurance OR risk AND weather

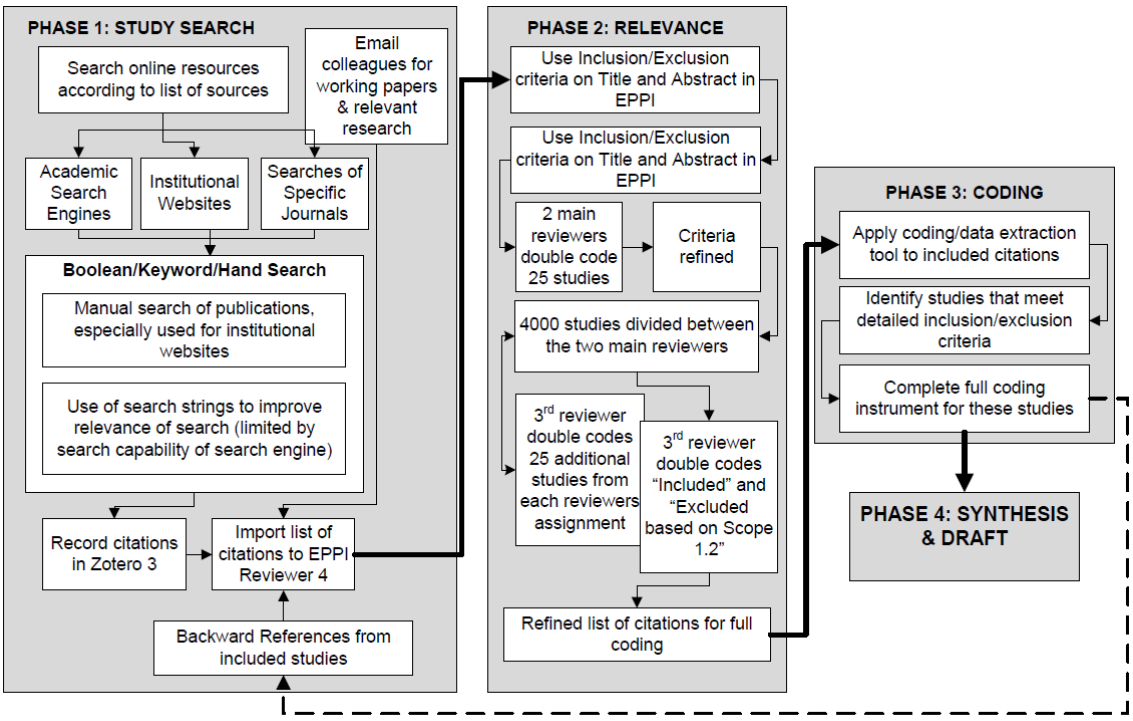
insurance OR risk AND index

insurance OR risk AND rainfall

micro?insurance

insurance NOT health

APPENDIX 2.4: FLOWCHART OF SEARCH & CODING PROCESS



APPENDIX 2.5: DRAFT VERSION OF CODING INSTRUMENT

We provide a draft of the fields we will collect, since the data will be collected electronically on EPPI Reviewer, we do not plan to prepare a properly formatted paper version. This coding instrument draws from Petrosino et al. (Undated).

SYSTEMATIC REVIEW OF INDEX BASED INSURANCE

Please take copious notes for every question.

A. EXCLUSION CRITERIA

A.1. Study should be excluded: Please give reason below:
- A.1.1. Exclude on Time
- A.1.2. Exclude on Geographical location
- A.1.3. Exclude on Scope (*Does not assess either impact, take-up or project design of 1)Weather insurance, or 2)Area-yield crop insurance*): Give specifics below:
  - A.1.3.1. Looks at non index-based crop insurance
  - A.1.3.2. Analyses the impact of lack of access to insurance
  - A.1.3.3. Other: Please describe
- A.1.4. Exclude on Study Design
  - A.1.4.1. Based on macro evidence/discussion
  - A.1.4.2. Based on Micro evidence/discussion but is a general discussion paper/review which doesn't analyse primary data on impacts
  - A.1.4.3. Based on Micro evidence/discussion but is a theoretical paper which doesn't analyse primary data on impacts
  - A.1.4.4. Does not assess outcomes that can be categorized as either a) Household Investment, b) Household Wellbeing, c) Consumption Smoothing or d) Take-up
  - A.1.4.5. Study has unclear identification strategy, e.g. no control group or impact evaluation comparing individuals who purchased insurance to those who did not: Please describe

B. RESEARCHER AND STUDY CHARACTERISTICS

B.1. What year was the primary document published?
B.2. How many documents were considered in coding this study?
B.3. What was the type of document?
- B.3.1. Journal (peer reviewed)
- B.3.2. Unpublished Working Paper
- B.3.3. Report
- B.3.4. Other: Please describe

B.4. In what country did the evaluation take place?
B.5. World Bank country classification at time data were collected
- B.5.1. Lower Income
- B.5.2. Lower Middle Income
- B.5.3. Upper Middle Income
- B.5.4. High Income

B.6. What type of index-insurance program is being studied?
- B.6.1. Weather
- B.6.2. Area Yield

B.7. What was the occupational and academic background of the team conducting the study?

C. STUDY CONTEXT

C.1. Is the report an independent evaluation (i.e the implementing and evaluating organisations are separate entities)?
C.2. Who funded the study?
C.3. Was there any information about the take-up? What explanations are provided?
- C.3.1. Liquidity
- C.3.2. Perceived risk
- C.3.3. Financial literacy

C.3.4. Trust
C.3.5. Inadequate risk-sharing mechanisms
C.3.6. Other
C.4. Was there any information about product design? What was discussed?
C.5. Was there any discussion of operational implementation? What was discussed?
C.6. Was there any information about existing insurance options (both formal and information)? What was discussed?
C.7. What other information was provided on the context for the evaluation? Please describe.

D. STUDY METHODS AND METHODOLOGICAL QUALITY

D.1. *Type of Study*

D.1.1. What type of research method is utilised?
D.1.1.1. Randomization/RCT
D.1.1.2. Quasi-Experimental
D.1.1.3. Observational/Econometric that doesn't use any random assignment
D.1.1.4. Descriptive/Qualitative Study (to inform the context of the rest of the studies for the research group)

D.2. Randomization/RCT

D.2.1. Was random assignment used to assign groups?
D.2.1.1. Yes
D.2.1.2. No
D.2.2. At what level was randomization conducted?
D.2.2.1. Individual
D.2.2.2. Village
D.2.2.3. Community organization (e.g. Self Help Group)
D.2.2.4. Other
D.2.3. Describe the process of randomization in as much detail as possible given the information in the study?
D.2.4. Were baseline outcome measurements for treatment and control groups similar?
D.2.4.1. Yes
D.2.4.2. No: Please describe
D.2.4.3. Unclear
D.2.5. Were baseline characteristics similar?
D.2.5.1. Yes
D.2.5.2. No: Please decribe
D.2.5.3. Unclear
D.2.6. Were there any randomization problems noted, including but not limited to issues such as balancing of the treatment and control groups?
D.2.6.1. Yes: Please describe
D.2.6.2. No

D.3. Quasi Experimental Study

D.3.1. Which quasi-experimental method was used to equate groups?
D.3.1.1. Regression Discontinuity
D.3.1.2. Propensity Score Matching
D.3.1.3. Interrupted Time Series
D.3.1.4. Instrumental Variables
D.3.1.5. Other: Please describe
D.3.2. Describe the criteria for selecting the comparison group.
D.3.3. Describe what is causing the variation in the data.
D.3.4. At what level was non-random assignment made?
D.3.4.1. Individual
D.3.4.2. Village
D.3.4.3. Community organization (e.g. Self Help Group)
D.3.4.4. Other
D.3.5. Were baseline outcome measurements similar?
D.3.5.1. Yes
D.3.5.2. No: Please describe
D.3.5.3. Unclear
D.3.6. Were baseline characteristics similar?

D.3.6.1. Yes
D.3.6.2. No: Please describe
D.3.6.3. Unclear
D.3.7. Were any substantive differences in pretests of group equivalence noted by authors?
D.3.7.1. Yes: Please describe
D.3.7.2. No
D.3.8. Were any substantive differences in pretests of group equivalence noted by reviewer?
D.3.8.1. Yes: Please describe
D.3.8.2. No
D.3.9. Were there any problems with the method (including instruments) or the sample noted by authors?
D.3.9.1. Yes: Please describe
D.3.9.2. No
D.3.10. Were there any problems with the method (including instruments) or the sample noted by reviewer?
D.3.10.1. Yes: Please describe
D.3.10.2. No

D.4. *Observational/Econometric [Not using any form of random assignment]*
D.4.1. Which Observational/Econometric method was used?
D.4.1.1. Cross-section
D.4.1.2. Panel
D.4.1.3. Time-Series
D.4.1.4. Other: Please describe
D.4.2. What identification strategy, if any, have the authors proposed to circumvent the observational nature of the data?

D.5. *Generic Questions applicable to both Random and Quasi Experimental Studies*
D.5.1. Describe the sampling strategy and rationale for selecting treatment and control groups.
D.5.2. Were statistical power calculations noted? If yes, record the details.
D.5.2.1. Were rates of compliance noted?
D.5.2.2. Yes: Please describe
D.5.2.3. No
D.5.3. Were there any overall attrition problems noted? (Especially the magnitude of attrition, both from original sample and differentially between treatment and control groups). If several references to attrition available, report the rate for the most recent follow-up.
D.5.3.1. Yes: Please describe
D.5.3.2. No
D.5.4. How were attrition problems dealt with by investigators?
D.5.4.1. Were intra-cluster correlation coefficients noted?
D.5.4.2. Yes: Please describe
D.5.4.3. No

D.6. Qualitative Study
D.6.1. What type of new evidence was presented?
D.6.1.1. Interviews with participating households
D.6.1.2. Interviews with on-the ground staff
D.6.1.3. Interviews with policy-makers
D.6.1.4. Other: Please describe
D.6.2. Were participants chosen randomly?
D.6.2.1. Yes
D.6.2.2. No
D.6.2.3. Unclear
D.6.3. Were any selection problems noted by author?
D.6.3.1. Yes: Please describe
D.6.3.2. No
D.6.4. Were any selection problems noted by reviewer?
D.6.4.1. Yes: Please describe
D.6.4.2. No

D.6.5. What were the characteristics of the sample? Please describe

E. CAUSAL THEORY

E.1. Did the paper address program theory or causal mechanisms?
- E.1.1.1. Yes (Please specify below if possible)
- E.1.1.2. No

E.2. The paper addressed mechanism 1 (take-up). Please describe
E.3. The paper addressed mechanism 2 (Investment decisions). Please describe
E.4. The paper addressed mechanism 3 (Investment in wellbeing). Please describe
E.5. The paper addressed other aspect of program theory or causal mechanisms. Please describe

F. INTERVENTION AND CONTROL CONDITIONS

F.1. Number of groups in the study:
F.2. List excluded study groups with brief description:
F.3. Describe the intervention, with particular attention to the "dosage" of the treatment:
F.4. What is the control or comparison condition?
- F.4.1. Zero Treatment Group
- F.4.2. Treatment as Usual Group
- F.4.3. Lesser but Innovative Treatment

F.5. Describe the control or comparison condition (including "dosage" if applicable):
F.6. How many participants were randomized to the different groups? Please describe
F.7. Were program implementation problems described by investigators?
- F.7.1. Yes: Please describe
- F.7.2. No

F.8. Detail fidelity problems below: (i.e problems relating to the construction of treatment and control groups, or their implementation, that render interpretation of treatment effects problematic)

G. PARTICIPANTS IN THE STUDY

Provide summary statistics where available.

G.1. What is the social profile
- G.1.1. Gender
- G.1.2. Age group
- G.1.3. Education level
- G.1.4. Occupation
- G.1.5. Location

G.2. Economic profile
- G.2.1. Income level
- G.2.2. Assets
- G.2.3. Insurable Assets

H. OUTCOMES

H.1. Include all data on treatment and control, including results, sample sizes used in analysis, the statistical technique, whether regression adjusted or not, (and if so, what controls were used), statistical significance and probability level.

Outcome Category	Outcome Variable	Units/Standardized	Estimated Effect	Std. Error	Method	Sample Size
Takeup						
HH Consumption						
HH Investment						

H.2. Please detail all available subgroup effects below, particularly and gender, insurable assets

Subgroup	Outcome Variable	Units/Standardized	Estimated Effect	Std. Error	Method	Sample Size
Gender						
Insurable Asset						
Income						
Age						
Education Level						
Location						

H.3. Please detail all cost/economic information below:
- H.3.1. Program Cost total
- H.3.2. Unit cost
- H.3.3. Marginal benefit

I. ADDITIONAL COMMENTS

I.1. Please record any further comments or information about the primary study here

APPENDIX 2.6: FLOWCHART OF CAUSAL MECHANISM