

Title Registration for a Systematic Review:

Access to Electricity for Improving Health, Education and Welfare in Low- and Middle-Income Countries: A Systematic Review

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TITLE OF THE REVIEW

Access to Electricity for Improving Health, Education and Welfare in Low- and Middle-Income Countries: A Systematic Review

BACKGROUND

As of 2013, about 1.2 billion people or about one-sixth of the world's population and mostly poor, lack access to electricity.¹ The majority of people without access to electricity are concentrated in rural areas (about 83%).² The global population without access to electricity is concentrated in Sub-Saharan Africa, South Asia, and to a lesser extent in East Asia and the Pacific. In addition to the population that does not have access to electricity, up to a billion people, especially in developing countries, are subject to unreliable and low quality of power supply resulting in outages and brownouts and therefore, reduced benefits from electricity use. Even where electricity is within reach, inability to pay for an electricity connection and ongoing consumption is a significant barrier for many. Low connection rates are particularly prevalent among poorer households.

The case for energy as a key driver of economic activities is well documented in available literature (Khandker, Barnes, & Samad, 2012). Energy services are considered important for productivity, income, health, education, potable water and communication services (United Nations Development Programme [UNDP], 2005).

The World Bank Group made a first attempt at investigating the welfare gains associated with electricity access in 2008 (IEG, 2008). This study proposes to update and expand the knowledge on the topic through a systematic review of impact evaluations that have addressed the linkage between access to electricity and health, education and welfare outcomes.

OBJECTIVES

The primary objective of this review is to critically analyse the existing evidence along the causal chain framework, linking key policy interventions with intermediate outcomes and final impacts. It will achieve this by answering the following questions:

Review question no. 1: What is the impact of electricity access on health, education and welfare in low- and middle-income countries?

¹ Sustainable Energy For All (SE4ALL) Global Tracking Framework. See: http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2013/05/28/000112742_20130528084417/Rendered/PDF/778890GTF0full0report.pdf

² Of the 1.2 billion people, 0.99 billion are in the rural areas.

Review question no. 2: Is the impact of electricity access equitable across different populations? If not, what are the factors moderating the impact?

A secondary objective is to refine the framework for describing the range of potential changes arising from access to electricity.

EXISTING REVIEWS

There are three existing systematic reviews related to the topic under consideration:

1. Knox, J., Daccache, A., & Hess, T. (2013). *What is the Impact of Infrastructural Investments in Roads, Electricity and Irrigation on Agricultural Productivity?*

This systematic review summarized the impact of roads, electricity and irrigation on agricultural productivity. Regarding electricity, the review focussed on rural electricity supplies (consumption and expenditure) and its impact on agricultural productivity (irrigation, storage, cooling/refrigeration), product price, labour wages and rural GDP. The authors report that a narrative synthesis was used, supported by quantitative analysis based on an aggregation of reported observations.

The review proposed here will overlap to some extent with this review by Knox and colleagues; however, it will focus only on electricity and will not be limited to the agricultural sector.

2. Farrington, D., & Welsh, B. (2002). *Effects of Improved Street Lighting on Crime: A Systematic Review*. London: Home Office.

This systematic review covers street lighting and reduction in crime. A meta-analysis of the eligible studies was conducted however, all studies included in this systematic review were conducted in the United States and the United Kingdom. (NB: the authors do not explicitly state that all geographical settings were within scope.)

Crime *per se* is not the focus of this systematic review. The review will explore the impact of street lighting on enhancing individual and community safety.

3. Thillairajan, A., Mahalingam, A., & Deep, A. (2013). *Impact of private-sector involvement on access and quality of service in electricity, telecom, and water supply sectors: a systematic review of the evidence in developing countries*.

This systematic review addressed one of the drivers of performance towards universal electricity access: a supportive policy framework, including provision for private sector participation. Multiple synthesis methods were used, including meta-regression and textual narration. The review proposed here has limited overlap with this review as the outcomes of

interest are different. Thillairajan and colleagues are concerned with access and quality of services, and do not examine impacts on health, education or welfare outcomes. However, some of the included studies do have this focus and are therefore likely to be eligible for the review proposed here.

INTERVENTION

This review will examine the impact of access to electricity by residential/household customers. The review will also include community connections such as electricity access for schools, health clinics and so on. The type of delivery mechanism may be private or public.

More specifically, the types of interventions that we plan to examine are:

- Expansion of coverage area through grid extension or off-grid solution as well as new energy sources (such as through Solar Home Systems, mini and micro hydro power).
- Improvements in adequacy to meet consumer demand.
- Improvement in affordability through rational tariffs and subsidy policies.
- Improvements in the reliability of electricity supply of transmission and distribution. These include reduction in system losses, reduction in the duration of power outages, schedules versus unscheduled outages, advance notification about service interruptions and service restoration times, and post installation maintenance.
- Improvements in quality in terms of voltage and frequency variations within specified standards of service.

Comparison conditions: No access to electricity, or access that differs in terms of coverage, adequacy, affordability, reliability or quality.

POPULATION

The review will include residential/household customers living in low- and middle-income countries, where low and middle income is defined in accordance with the current World Bank classification.³ Both rural and urban households will be considered.

OUTCOMES

The primary outcomes of interest, which are also included in the title of this systematic review, are:

- (a) Health - mortality and morbidity
- (b) Education - educational achievement
- (c) Welfare - human rights, livelihoods and security

³ Fiscal year 2013-2014, ending on June 30 2014; see <http://data.worldbank.org/about/country-classifications/country-and-lending-groups>

Studies will be eligible for review if they address outcomes in one or more of the following domains. The table below provides some examples of primary outcomes.

Health	Education	Welfare
<p>Reduced mortality and morbidity through:</p> <ul style="list-style-type: none"> • Control of ambient temperature • Reduced physical workload • Safer food through refrigeration and piped water • Reduced infectious disease through better hygiene (education & clean water) • Cleaner air from cleaner fuel for cooking, heating and lighting • Reduced injuries from accidents and crime through better lighting • Improved health through access to better health services (e.g. vaccines and medicines conserved through refrigeration) 	<p>Time and resources for education, educational achievement through:</p> <ul style="list-style-type: none"> • More time spent studying through longer days and reduced workload • Greater access to knowledge and learning through ICT • Better use of services through education and access to information 	<p><i>Human rights</i></p> <p>Enhanced self-determination through:</p> <ul style="list-style-type: none"> • Individual access to news, political debate and voting • Collective participation in political debate <p><i>Livelihood</i></p> <ul style="list-style-type: none"> • Raised productivity through mechanisation/ electrification • Increased working hours through electrical lighting • Home enterprise through electrical technology <p><i>Security</i></p> <ul style="list-style-type: none"> • Reduced crime through better street lighting

STUDY DESIGNS

Review questions numbers 1 and 2: The review will examine impact evaluations that use an experimental or robust quasi-experimental design. Eligible research designs include those in which the authors use a control or comparison group, and in which: (i) participants are randomly assigned (using a process of random allocation, such as a random number generation); (ii) a quasi-random method of assignment has been used and pre-treatment equivalence information is available regarding the nature of the group differences; (iii) participants are non-randomly assigned but matched on pre-tests and/or relevant demographic characteristics (using observables, or propensity scores) and/or according to a cut-off on an ordinal or continuous variable (regression discontinuity design); or (iv) participants are non-randomly assigned, but statistical methods have been used to control for differences between groups (for example, using multiple regression analysis, including difference-in-difference, cross-sectional (single differences), or instrumental variables regression). Single group before-and-after studies are not eligible.

REVIEW AUTHORS

Lead review author: The lead author is the person who develops and co-ordinates the review team, discusses and assigns roles for individual members of the review team, liaises with the editorial base and takes responsibility for the on-going updates of the review.

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ROLES AND RESPONSIBILITIES

- **Content:** Varadarajan Atur, Kavita Mathur. Varadan Atur is one of the energy sector experts in the World Bank. Kavita Mathur is an experienced evaluation researcher. She has performed portfolio review and analysis for large infrastructure evaluations in the World Bank. She has attended Campbell systematic review training.
- **Systematic review methods:** Sandy Oliver, Janice Tripney, and Marie Gaarder. All three team members are experts in systematic reviews. Sandy Oliver has published a book on introduction to systematic reviews (Gough, Oliver, & Thomas, 2012). Janice Tripney is an experienced reviewer who has led a number of systematic reviews, including one recently published by the Campbell Collaboration (<http://campbellcollaboration.org/lib/project/227/>). Marie Gaarder has carried out a systematic review for the International Initiative for Impact Evaluation (<http://www.3ieimpact.org/en/evidence/systematic-reviews/details/122/>).
- **Statistical analysis:** Janice Tripney. Jan has considerable experience gained from previous systematic reviews.
- **Information retrieval:** Kavita Mathur will be guided by Sandy Oliver and Jan in designing and carrying out the search strategy and coding the studies.

POTENTIAL CONFLICTS OF INTEREST

The authors are not aware of any conflict of interest, financial or otherwise, that may influence the objectivity of the review.

FUNDING

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PRELIMINARY TIMEFRAME

- Date planning to submit a draft protocol: 30 April 2014
- Date planning to submit a draft review: 30 January 2015

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DECLARATION

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By completing this form, you accept responsibility for preparing, maintaining, and updating the review in accordance with Campbell Collaboration policy. The Coordinating Group will provide as much support as possible to assist with the preparation of the review.

A draft protocol must be submitted to the Coordinating Group within one year of title acceptance. If drafts are not submitted before the agreed deadlines, or if we are unable to contact you for an extended period, the Coordinating Group has the right to de-register the title or transfer the title to alternative authors. The Coordinating Group also has the right to de-register or transfer the title if it does not meet the standards of the Coordinating Group and/or the Campbell Collaboration.

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Form completed by: Kavita Mathur, Sandy Oliver, Date: 27 January 2014. and Janice Tripney.