

Integration of global health and other development sectors

A REVIEW OF THE EVIDENCE



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Albert Siemens championed the idea of examining the evidence base for integrated development and provided the initial guidance which led to this project. Peter Lamptey conceptualized the overall approach, oversaw its implementation and contributed to the research findings. Tricia Petruney determined the project's scope, designed the review methodology, performed the manual literature searches and article screening, interpreted the data and was the primary author of the report. Timothy Mastro and Ward Cates provided scientific and technical guidance for the evidence review and contributed to this document.

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Executive Summary

The demand for evidence-based human development solutions is growing. At the same time, experts are considering whether and when integrated and multi-sector approaches work best to achieve some of the broader global development goals. Accordingly, FHI 360 is committed to designing and delivering effective integrated human development solutions. We conducted a literature review to synthesize the current evidence base for integrated development interventions.



Why focus on evidence-based integrated development?

How do we know whether our efforts to improve global health and well-being have substantial impact? Unfortunately, to date, a surprising proportion of development interventions across all sectors appear to have been influenced more by hopeful intuition rather than credible evidence of effectiveness. Some experts point to signs that many indicators for development success (e.g., standards of living and quality of life) have demonstrably improved in recent decades. Yet amidst the acknowledgement that *in general* things are improving, many economists, funders, researchers, and program staff remain frustrated by the lack of clarity around the impact and contributions of *specific* development aid efforts. Public and private funders want to see clear returns on investments. Recipient countries are demanding that programs implemented for their benefit result in actual progress toward stated goals. Development practitioners and researchers want to be assured that their work is making a difference.

To address this growing demand for evidence-based development solutions, evaluation methodologies continue to evolve, with emphasis moving from standard process and outcome evaluations toward the use of more rigorous impact evaluations. Unlike the former (descriptive) evaluation approaches, the latter requires comparison groups to reveal important information about cause-and-effect relationships, and allows for more credible attribution of project impact.

Simultaneously, important questions emerge about which types of development programs best meet the often complex and multi-faceted needs of the people they are intended to serve. The concept of 'integrated development' is not new; at a minimum, it dates back to strategies for rural integrated development programs popular in the 1970s and 1980s. Yet particularly within the evolving discussions about the post-2015 development agenda, integrated or multi-disciplinary strategies have experienced a renewed vigor from funders and implementers alike. In some instances a strong case can be made for single sector programs as being the most efficient and effective to improve global health (e.g., the smallpox eradication campaign). Likewise, multi-faceted programs within a single development sector like health can effectively address closely related needs (e.g., integrated HIV and family planning). At the same time, experts are considering whether and when integrated multi-sectoral approaches may be better to achieve some of the broader development goals.

What do we know about why or how well integrated programs work? The underlying rationale for cross-sector approaches is supported by extensive data which demonstrate strong linkages between fundamental determinants of well-being (e.g., better education can lead to better health outcomes and vice versa). Much less clear, however, is how to achieve improved outcomes through strategically integrated programs, deliberately designed to leverage those connections. **FHI 360 conducted a literature review to synthesize the current evidence base for interventions which integrate global health and other key human development sectors. From our findings, we offer recommendations for future multi-sector development policies, programs, and research.**

Review methodology and scope

We conducted a hybrid of conventional systematic and narrative reviews to produce a summary of the literature. Given the rising priority of rigorous research designs for development and the ambiguity of results from less robust studies, we agreed to set a high bar for what we considered adequate evidence for promising integrated interventions. Studies were eligible for the review only if they used comparison groups to evaluate program impact, or if their conclusions were based on rigorous research syntheses. We employed database and manual searches to identify relevant evidence from both peer-reviewed and grey literature published in the English language. We focused on articles that evaluated interventions in low- or middle-income countries, published during the years 2000-2012.¹

Due to the ambitious nature of identifying evidence across all development sectors and in every combination, we prioritized the following specific sectors and sector combinations:

- Health & Education
- Health & Economic Development
- Health, Education, & Economic Development
- Health & Nutrition
- Health & Environment

Sub-topic areas of focus within those sectors are:

- Health = HIV, TB, MNCH, SRH, malaria, NCD, immunization/vaccine
- Nutrition = micronutrients, food fortification, malnutrition, feeding programs
- Education = early education, primary and secondary school
- Economic Development = income, livelihood, cash transfers, microfinance
- Environment = WASH, environmental management, conservation, climate change

Which development interventions are considered 'integrated' will vary depending on who is asked and which context is operative. For this review, we categorized development interventions as integrated if they:

- Delivered a single-sector activity to intentionally achieve outcomes in more than one sector (e.g., *offering de-worming to children to improve both health and education outcomes*);
- Delivered multi-sector activities to achieve single-sector outcomes (e.g., *integrating family planning and microfinance projects to improve reproductive health indicators*); or
- Delivered multi-sector activities to intentionally achieve outcomes in more than one sector (e.g., *supporting joint health and water projects to improve health behaviors and water supply or quality*)

Results

Over 8,000 resources were identified aggregately from both the database and manual searches. The database searches returned 3,166 results. Though we cannot quantify the precise number searched in the manual process (as no denominator exists for the total number of resources and publications posted on organization websites or online repositories), we project over 5,000 resources at a minimum. After a three-step screening and review process, 59 articles were included for critical analysis. The majority of excluded articles were screened out for four main reasons: topic irrelevance, lack of comparison group, incomplete research, or duplication. Forty-seven of the 59 were individual articles, and 12 were research syntheses. Within the 12 research syntheses, an aggregate of 256 articles were reviewed. Therefore our review of 59 articles reflects evidence from a total of 303 articles.

Given the diversity of program models evaluated, we assigned the studies to a sector combination (e.g., health and education) and an intervention type within that combination (e.g., sexual and reproductive health in school). The results represent 25 distinct intervention types across the five sector combinations. Though important distinctions occur between interventions in each category with regard to program design or location, within each group the interventions are similar enough to warrant this general categorization. **Of the 25 program types, 13 produced mostly positive findings; 9 produced mostly mixed findings; and 3 suggest a neutral or unknown effect.**

¹ One limitation with this methodology is that our bundling of such diverse studies belies the important differences in their sample sizes, statistical power, contexts, strengths, and weaknesses. The conclusions drawn from a review of multi-sectoral interventions spanning dozens of distinct outcomes should not be considered on par with an extensive systematic review targeting only one intervention type.

Summary of findings per intervention type

■ Includes findings from a research synthesis
 ■ Findings from 3+ studies
 ■ Findings from 1-2 studies

INTERVENTION TYPE	MOSTLY POSITIVE FINDINGS	MOSTLY MIXED FINDINGS	MOSTLY NEUTRAL OR UNKNOWN FINDINGS
Health and Education			
School feeding and nutrition			
School deworming			
School feeding, nutrition, and deworming			
SRH in school			
Integrated early childhood development			
Vision support in school			
Obesity interventions in school			
Malaria prevention and treatment in school			
Improved sanitary and menstruation provisions for girls in school			
Health and Economic Development			
Cash transfers and health			
Microfinance and health integration			
Livelihood and health skills-building for vulnerable youth			
Health, Economic Development, and Education			
Cash transfers for health and education			
Non-cash transfer economic subsidy, health, and education			
Health and Nutrition			
TB and micronutrients			
Maternal and child health and nutrition			
Maternal and child health, nutrition, and IMCI			
Maternal and child health, nutrition, and psychosocial support			
HIV and food assistance			
HIV and micronutrients			
HIV and child nutrition			
Health and Environment			
WASH and diarrhea			
WASH and maternal and child health			
Improved cookstoves and health			
Reproductive health and environmental management			

What the evidence on integrated development tells us

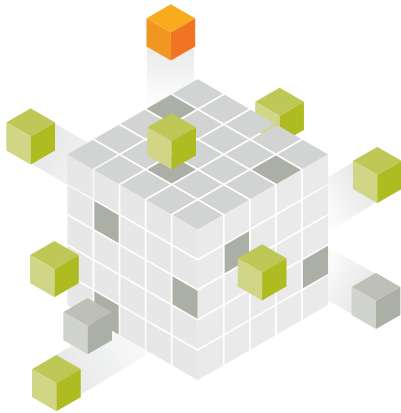
In this evidence review we identify, synthesize, and analyze existing evidence on interventions that link health with several other development sectors. Our findings suggest integrated approaches can have positive impact in certain circumstances. We also found a lack of convincing evidence around some programs largely assumed in the development community to be effective.

Our analysis of the available evidence base produced three major recommendations for future integrated multi-sector development efforts:

- **Systematic Evaluation Design:** The review revealed that although many integrated development programs are being designed and deployed globally, the vast majority are implemented without adequate evaluation of impact. Though not unique to integrated development interventions, program 'impact' is usually assessed by using data from process evaluations or pre- or post-intervention outcome measures. This type of information is not sufficient to draw sound conclusions about an intervention's effectiveness, and hinders attribution of any changes directly to the program. Experimenting with innovative approaches is a crucial part of advancing global development. Yet innovation without rigorous evaluation limits the return on investment, and today the potential benefit of integrated designs still remains an unproven hypothesis. To properly assess the impact of multi-sector models, a strong evaluation blueprint needs to be nested into the entire intervention design. Adequate resources need to be included to assure the protocol is followed and the evaluation is interpretable.

- **Nuanced Outcome Measurement:** The lack of effectiveness or impact suggested by some of the research findings raises important questions about the potential inadequacy of measuring conventional or sector-focused outcomes when examining integrated development interventions. Multi-sector interventions are complex and the pathways to causality even more so. Simply combining standardized indicators typically used for evaluation in each relevant sector may not be sufficient. These complex, multi-layered models for development may require more nuanced and sophisticated measurement tools than have been relied on in the past.
- **Better Comparison Groups:** Most experimental evaluations of complex interventions have used comparison groups who receive no intervention at all, rather than groups benefiting from traditional single-sector approaches. This methodology makes it impossible to determine if similar results could be achieved by simultaneously deploying standard single-sector programs, or if any observed effect is truly attributable specifically to the integrated or multi-sectoral nature of a program.

The global scientific, political, and funding climate has created a paradigm shift toward more holistic approaches for global development. A strong theoretical basis exists for more comprehensive, integrated multi-sectoral approaches to development. However, decisions about the post-2015 global development agenda need to be driven by the evidence for what works rather than by assumptions about the amplified results of 'doing more'. To date, high quality evidence on key integrated multi-sector development interventions is inadequate. In the future, funders, researchers, policymakers, and implementers should commit to rigorously evaluating the impact of these promising development approaches to identify what strategies work well when combined, which do not, and which are most cost-effective.



Full description of literature review results

FINDINGS PER INTERVENTION TYPE

Given the diversity of program models evaluated, we assigned the studies to a sector combination (e.g., health and education) and an intervention type (e.g., sexual and reproductive health in school). Within each group the interventions are similar enough to warrant this general categorization. However, important distinctions occur between interventions in each category with regard to program design or location. An overview of the number and types of studies found for each intervention category and their general effectiveness (cascading from mostly positive to mixed to neutral findings) begins on page 6.

ADDITIONAL STUDY INFORMATION

A table with additional information for each study, including the intervention design, location, if delivered by a government or non-government program, and impact per outcome can be found on page 11.

REFERENCES

Full references for each study can be found on page 20.



Intervention types with mostly positive findings

Combined school feeding, nutrition, and deworming: Two RCTs examined integrated school-based feeding, nutrition, and deworming programs (Nga et al. 2011; Bobonis, Miguel, and Puri-Sharma 2006). One assessed impact on student cognitive function, growth, and parasite load (Nga et al. 2011) and the other student attendance and child weight (Bobonis, Miguel, and Puri-Sharma 2006). Both studies suggest a positive effect and improved all five intended outcomes. Despite mixed results from the two stand-alone programs for deworming or school feeding (both described in further detail in the following section), these studies suggest that combining meal or micronutrient support with deworming is an effective integrated intervention.

Integrated early childhood development: One 2007 research synthesis (Engle et al. 2007) and one additional randomized impact evaluation (Martinez, Naudeau, and Pereira 2012) assess the effects of integrated early childhood care and education programs on indicators for child health and development. Programs in these studies were considered 'integrated' as they addressed health and nutrition in addition to the standard educational and cognitive elements in early childhood settings. The randomized evaluation suggests that addressing health and nutrition in an early childhood care setting positively impacted enrollment in pre-school and the cognitive, motor, and emotional development of children. Unanticipated but positive effects were also observed on older siblings and adult caretakers. The effect on child growth and health was mixed, and neutral for language and communication skills (Martinez, Naudeau, and Pereira 2012). The findings of the research review are largely consistent with the evaluation's findings and suggested that the most effective interventions are comprehensive programs for younger and disadvantaged children and families that are of adequate duration, intensity, quality, and are integrated with health and nutrition services (Engle et al. 2007). Taken together the review and the evaluation suggest positive effects of integrated early childhood programs on several outcomes, but given the mixed or unknown effects for some, suggest that more evidence is needed to determine their effectiveness on select growth, health, and nutritional indicators.

Vision support in school: One RCT evaluated an innovative intervention to improve student performance in China by providing free eyeglasses to children with poor vision (Glewwe, Park, and Zhao 2006). Students needing the glasses who opted to wear them greatly improved their test scores over the period of one year. Identifying and correcting poor vision among students may be a promising school-based health intervention that improves both health and education outcomes.

Obesity interventions in school: One 2012 systematic review synthesized the evidence on school-based obesity interventions in developing countries (Verstraeten et al. 2012). The review analyzed 22 studies. The vast majority of the studies detected an improvement in dietary and physical behavior, although a smaller number suggested a desirable change in BMI, which suggests that improvements in the delivery of interventions may be needed for them to reach their full potential in addressing the growing problem of adolescent obesity in developing countries.

Malaria prevention and treatment in school: Although the benefits of reducing malaria prevalence in endemic areas is often cited as having positive effects on education performance or labor participation, only one study provided adequate evidence on a deliberately integrated intervention (Simwaka, Simwaka, and Bello 2009). It analyzed the impact of a program designed to offer malaria prevention and treatment within a school setting. This retrospective impact evaluation suggests that the program was successful in reducing student absenteeism and grade repetition. It also showed a positive cost-benefit ratio for the program.

Cash transfers and health: One 2012 critical review of programs using conditional cash transfers (CCTs) to reduce poverty and enhance health status was assessed (Ranganathan and Lagarde 2012). After reviewing 13 program evaluations, the authors found largely positive effects on the uptake of some health services and nutritional and health outcomes, and more mixed evidence for the impact specifically on immunization coverage and health-related behavior change. They conclude that CCTs can be valuable tools to address some of the obstacles faced by populations in poorer countries to access health care services but that they should be combined with supply-side interventions to maximize effects.

Microfinance and health integration: One 2012 evidence review summarizes the majority of the evidence on microfinance programs with integrated health components (Leatherman et al. 2012), and one additional RCT (Hamad, Fernald, and Karlan 2011) examined the effects of microfinance and health integration. Despite the mixed results of the RCT on the intended outcomes (improvement in parental health knowledge but neutral or unknown effects on child health), the authors of the review conclude that virtually all of the outcomes assessed benefited from intentional integration of microfinance and health activities. Microfinance client knowledge, health behavior, use of health services, and client health outcomes all benefited from the integrated programs. Furthermore, the following health outcomes showed improvement: reproductive health, prevention and primary care for children, child nutrition and breastfeeding, child diarrhea, HIV prevention, domestic abuse/gender-based violence, tuberculosis, and sexually transmitted infections.

Cash transfers for health and education: Five studies examined the use of cash transfers to improve both health and education behaviors and outcomes: one RCT (Baird et al. 2012) and four impact evaluations (Levy and Ohls 2010; Soares, Ribas, and Hirata 2010; Miller, Tsoka, and Reichert 2008; Schady and Paxson 2007). The RCT assessed the efficacy of a cash transfer program for schooling support to reduce the risk of sexually transmitted infections in young



women, and the results suggest that the intervention reduced HIV and HSV-2 infections in adolescent schoolgirls in low-income settings (Baird et al. 2012). The three evaluations that assessed school attendance all showed a positive effect (Levy and Ohls 2010; Soares, Ribas, and Hirata 2010; Miller, Tsoka, and Reichert 2008). Two evaluations examined learning outcomes, with one showing a positive improvement (Schady and Paxson 2007) and one a neutral or unknown effect (Levy and Ohls 2010). All four evaluations demonstrated an impact on health behaviors (such as health clinic visits) but the results for health status outcomes were more mixed. One evaluation was unable to detect an impact on health status (Levy and Ohls 2010), but two others demonstrated positive improvements for the health of both children and adults (Miller, Tsoka, and Reichert 2008; Schady and Paxson 2007). Two of the four evaluations included outcomes on economic or livelihoods. Both showed positive improvements in several areas related to financial health, such as investment in agriculture, savings, and the possession of an identification card (Soares, Ribas, and Hirata 2010) and asset ownership, housing quality, household expenditures, household shocks,



and financial decisions (Miller, Tsoka, and Reichert 2008). However, one demonstrated positive changes in food consumption (Miller, Tsoka, and Reichert 2008) while the other did not, nor did it detect an effect for improving access to credit (Soares, Ribas, and Hirata 2010). One evaluation noted that targeted cash transfers in a community negatively impacted feelings of jealousy and conflict among community members and families (Miller, Tsoka, and Reichert 2008).

MCH and nutrition: Two studies assessed interventions aimed at simultaneously improving maternal or child health and nutrition: one 2008 critical review (Bhutta et al. 2008) and one RCT (Mangani et al. 2012). The review concluded that several effective interventions are available to improve child health (particularly counselling about breastfeeding and fortification or supplementation with vitamin A and zinc) and maternal health (supplements of iron folate, multiple micronutrients, calcium, and balanced energy and protein), though the latter require additional research on a larger scale. They also note that to achieve their potential to significantly reduce DALYs in the longer-term, the interventions will require sustained investments to improve the education, economic status, and empowerment of women (Bhutta et al. 2008). The RCT studied the effects of long-term fortified complementary feeding via its impact on weight, growth, haemoglobin gain, stunting, days with symptoms of common childhood illness, and mortality. In rural Malawi, 12 months of complementary feeding of infants with milk-LNS, but not two other types of feeding supplements, reduced the incidence of very severe stunting and reduced growth faltering between 6 and 12 months (though not linear growth) (Mangani et al. 2012).

MCH, nutrition, and psychosocial support: One article meeting the review criteria assessed the integration of psychosocial stimulation in the treatment of malnourished children (Nahar et al. 2008). The time-lagged controlled study found a positive effect not only on weight but also on mental and psychomotor development.

HIV and child nutrition: Three articles studied the impact of providing nutritional support for children living with HIV: one RCT (Rollins et al. 2007) and two impact evaluations (Heidkamp et al. 2012; Simapore et al. 2005). All three studies showed a positive effect for child growth via weight gain, height gain, wasting, or stunting. One impact evaluation reported a positive impact on anaemia (Simapore et al. 2005). The RCT also studied the effects on CD4 count diarrheal mortality but no clear effect was detected (Rollins et al. 2007).

WASH and maternal and child health: Two impact evaluations examined the effects of WASH on broader MCH and water quality outcomes (Briere et al. 2012; Eder et al. 2012). One evaluation showed a positive impact on healthy MCH and nutrition behaviors (such as hand washing and seeking healthcare), as well as WASH infrastructure sustainability (Eder et al. 2012). The other showed a positive effect on household water treatment and hand washing (Briere et al. 2012). Furthermore, this study evaluated an intervention offered as part of immunization programs and showed no negative impact on that program due to the additional, integrated WASH component.

Reproductive health and environmental management: One impact evaluation studied the impact of integrated environmental management and reproductive health programs on outcomes in both sectors (D'Agnes et al. 2010). It found that in comparison to sector-specific designs, an integrated population, health, and environment program had a positive effect on coastal resource management, reproductive health, and food security. In addition, the authors found the program cost efficient.

Intervention types with mostly mixed findings

School feeding and nutrition: Ten articles examined school-based feeding and/or nutrition programs: a 2008 systematic review (Adelman, Gilligan, and Lehrer 2008), and nine studies conducted after the review (five impact evaluations (2011; McEwan 2010; Afridi 2010, 2011; Field, Robles, and Torero 2009) and four RCTs (Kazianga, de Walque, and Alderman 2012; Luo et al. 2012; Shi et al. 2012; Osendarp et al. 2007)). The most commonly studied outcomes were school enrollment, attendance, student performance, and nutrition. We found good evidence that in-school meal programs improve school attendance, but primarily for students who were already enrolled. Evidence was mixed that school meals can improve student performance but they may improve cognitive development; that school meals have a positive impact on nutrition outcomes; and that school feeding programs have larger impacts in areas with low school participation and on children with greater initial malnutrition (Adelman, Gilligan, and Lehrer 2008). Across all

the studies, a stronger general effect is evident on health or nutrition outcomes than educational ones (and for the latter, slightly more on participation than on learning or cognitive improvements). Several studies showed a greater effect for both health and education outcomes for girls. The review recommended directly comparing school feeding programs to other programs with similar objectives, and suggested that the impact of these programs may also be higher when combined with complementary programs to improve schools or child health (Adelman, Gilligan, and Lehrer 2008).

School-based deworming: We found one 2012 systematic review on school-based deworming (Taylor & Robinson et al. 2012). It assessed 41 studies and included several models of deworming programs (screen-and-treat, blanket or routine treatments, single-dose, multiple-dose). The review concluded that the evidence of deworming's benefit on nutrition, haemoglobin, school attendance, or school performance is inconsistent.

School-based sexual and reproductive health

interventions: Four studies evaluated the impact of school-based sexual and reproductive health interventions: one 2008 systematic review (Paul-Ebhohimhen, Poobalan, and van Teijlingen 2008), and three studies conducted after the review (one RCT (Dupas 2009) and two quasi-experimental trials (Arcand and Wouabe 2010; Michielsen et al. 2012)). Twelve articles (on ten studies) synthesized in the systematic review concluded that knowledge and attitude-related outcomes were most associated with change, and that intentions for or changes in sexual behavior were less influenced by the interventions (Paul-Ebhohimhen, Poobalan, and van Teijlingen 2008). The findings of the additional studies suggest that results of this intervention type continue to be mixed on several intended outcomes. Two studies yielded mixed or neutral results on sexual activity (Michielsen et al. 2012; Dupas 2009). Two suggested a positive effect on incidence of pregnancy and for self-reported condom use (Arcand and Wouabe 2010; Dupas 2009) but a third shows no effect on the latter (Michielsen et al. 2012). One study each detected a positive effect on abstinence (Arcand and Wouabe 2010) and HIV-related stigma reduction (Michielsen et al. 2012). Only one study analyzed costs and found the intervention to be cost-effective (Dupas 2009).

Livelihood and health skills-building for vulnerable youth:

Two impact evaluations included for review assessed the effectiveness of joint livelihood, social, and health interventions for improving key outcomes for vulnerable youth (Sebastian, Grant, and Mensch 2004; Hallman 2011). One showed positive improvements in most of the health, social, and financial outcomes assessed, although important gender differentials

occurred (Hallman 2011). The other suggested positive effects on health and social objectives, but more neutral or unknown effects for other social and financial outcomes (Sebastian, Grant, and Mensch 2004).

Non-cash transfer economic subsidy, health, and

education: One study evaluated a program with an education cost subsidy component rather than direct cash transfers. A randomized impact evaluation assessed the health and education effects of school uniform subsidies and/or exposure to a school-based HIV prevention curriculum (Duflo, Dupas, and Kremer 2011). The findings were mixed per outcome (schooling, marriage, fertility, STI/HIV rates) and the varying effectiveness depended on the particular combination of interventions present. When implemented alone, the uniform subsidy program significantly reduced pregnancy rates but not herpes infections. The HIV/AIDS education program alone did not have a significant impact on either the teenage fertility rate or the risk of HSV2 infection. In combination, moderate protection from both outcomes occurred.

Tuberculosis (TB) and micronutrients: Two clinical trials (one non-randomized (Karyadi et al. 2002) and one randomized (Wejse et al. 2009)) examined the effects of micronutrient supplementation for patients with TB. Taken together the results vary and depend on the micronutrient being provided. The former offered vitamin A and zinc, and found positive effects for improvements in clinical response to TB treatment, nutritional status, resolution of radiologic signs, and conversion of sputum smears to negative (Karyadi et al. 2002). The latter found that offering vitamin D supplements did not improve clinical outcome among patients with TB, nor had an overall effect on mortality in these patients (Wejse et al. 2009).

MCH, nutrition, and Integrated Management of Childhood

Diseases (IMCI): One RCT was eligible for the review that analyzed the overlapping effect of IMCI on childhood mortality and nutrition (Arifeen et al. 2009), and had mixed results. The intervention had a positive effect on rates of exclusive breastfeeding, stunting, and care-seeking practices. However no significant effects were detected for influencing rates of wasting or child mortality.

HIV and micronutrients: One 2010 systematic review synthesized the evidence behind offering micronutrient support for improvements in HIV progression (Hummelen, Hemsforth, and Reid 2010). The review suggests significant differences in impact on HIV progression depending on the micronutrient being offered. The authors suggest that vitamin B, C, E, and folic acid have been shown to delay the progression of HIV. Supplementation with selenium,

N-acetyl cysteine, probiotics, and prebiotics has considerable potential, but the evidence needs to be further substantiated. Furthermore, vitamin A, iron, and zinc have been associated with adverse effects and caution is warranted for their use.

WASH and diarrhea: The effects on rates and diarrheal outcomes achieved through addressing water supply, water quality, hygiene, and sanitation are addressed in four articles: one 2009 systematic review (Waddington and Snilstveit 2009), two RCTs (Jain et al. 2010; Kremer et al. 2011), and one impact evaluation (Fan and Mahal 2011). Across all the studies, including the review, the impact of water supply or quality efforts or of sanitation-based WASH interventions on the rates of diarrhea are mixed. The sizeable systematic review included an analysis of 65 impact evaluations conducted in 35 low- or middle-income countries. The authors note that while some 'hardware' interventions are highly effective for reducing diarrheal morbidity, they also concluded that there are issues around longer-term compliance and sustainability, and describe a research gap in longer-term evaluations, calling for more multiple-treatment arm evaluations of water treatment technologies and of sanitation provision (Waddington and Snilstveit 2009). Water quality, an outcome not covered in the systematic review, was positively affected in both RCTs.

Intervention types with mostly neutral or unknown findings

Improved sanitary and menstruation provisions for girls in school: Two studies focused on providing facilities at school to meet the sanitary health needs of adolescent girl students: one 2011 systematic review (Birdthistle et al. 2011) and one subsequent RCT (Oster and Thornton 2011). Both articles reinforce the rationale for providing special sanitary considerations for girls at school (either girls-only toilets or menstruation products) but neither provides sufficient evidence that these programs have a direct or positive impact on attendance, enrollment, performance, or health. Rather than suggesting negative findings, the systematic review reveals the general lack of high quality evidence available about the provision of separate girls-only toilets (Birdthistle et al. 2011). The RCT did not show any effect on school attendance for girls by providing them with sanitary products (Oster and Thornton 2011).

HIV and food assistance: One 2011 systematic review (Tirivayi and Groot 2011), a cross sectional survey (Oketch et

al. 2011), and a quasi-experimental impact evaluation (Serrano et al. 2010) examined the integration of food assistance for people living with HIV. The systematic review included an analysis of five studies, and strove to identify impacts of integrated food and HIV support on labor participation, consumption, weight and nutrition status, HIV disease progression, HIV viral load, immune response, survival/mortality, and anti-retroviral therapy (ART) adherence. The results of all five studies yielded largely neutral or unknown effects on most outcomes, but showed mostly positive results for short-term (not long-term) weight gain and ARV adherence. The authors concluded that there is limited evidence on how the duration of AIDS treatment, and the targeting, composition, and duration of food assistance predict improvements in outcomes (Tirivayi and Groot 2011). The two additional studies show a mix of positive or neutral effects. One (Oketch et al. 2011) suggested a neutral effect on all studied outcomes—nutritional vulnerability, risk of malnutrition, nutritional status, and quality of life. The second study, however, showed a neutral effect on BMI but positive effects on survival/mortality, CD4+ cell count, and adherence to treatment (Serrano et al. 2010).

Improved cookstoves and health: Four RCTs evaluated improved cookstove technology for better environmental and health outcomes (Levine and Beltramo 2011; Smith et al. 2009; Burwen and Levine 2012; Hanna, Duflo, and Greenstone 2012). In laboratory settings, improved cookstoves have been proven to decrease toxic emissions and reduce air pollution. However, taken together the findings from the RCTs reporting impacts of cookstoves in real-world settings are mixed, with most reporting little to no impact on intended environmental or health outcomes. The first found no effect on any of the outcomes examined—stove usage, wood usage, time spent collecting wood, carbon monoxide exposure, or respiratory illness symptoms (Levine and Beltramo 2011). The second found a positive effect on indoor pollution exposure, but no clear effect on emission reduction (Smith et al. 2009). The third reported a mixed effect for actual use of the stoves (vs traditional stoves), no effect on fuel use or exposure to smoke, and a positive effect on time spent gathering wood for fuel and self-reported health status (Burwen and Levine 2012). The final study initially detected a decrease in smoke inhalation but this effect vanished after the first year. The study found low stove usage and no effect on any of the environmental or health outcomes analyzed (Hanna, Duflo, and Greenstone 2012).

STUDY INFORMATION, INCLUDING THE INTERVENTION DESIGN, LOCATION, IF DELIVERED BY A GOVERNMENT OR NON-GOVERNMENT PROGRAM, AND IMPACT PER OUTCOME

CITATION (abbreviated)	STUDY DESIGN	LOCATION; INTERVENTION	OUTCOMES EXAMINED	EFFICACY PER OUTCOME
HEALTH AND EDUCATION				
School feeding and nutrition				
Adelman et al, 2008	Research synthesis: critical review	Various	Enrollment Attendance Grade repetition Dropout rates Learning/cognitive outcomes Nutrition	Mixed Mixed Neutral/Unknown Neutral/Unknown Mixed Positive
Afridi et al, 2010	Impact evaluation: observational	INDIA; On-site feeding versus take-home rations (government program)	Nutrition	Positive
Afridi et al, 2011	Impact evaluation: difference-in-differences estimation	INDIA; On-site feeding versus take-home rations (government program)	Enrollment Attendance	Neutral/Unknown Mixed (significantly positive for girls; positive but insignificant for boys)
Buttenheim et al, 2011	Impact evaluation: difference-in-differences estimation and propensity score weighting	LAOS; On-site feeding versus take-home rations (non-government program)	Enrollment Nutrition	Neutral/Unknown Neutral/Unknown
Field et al, 2009	Impact evaluation: retrospective observational	TANZANIA; In-utero iodine supplementation (government program)	Years of schooling	Positive
Kazianga et al, 2012	RCT (cluster)	BURKINA FASO; On-site feeding versus take-home rations (non-government program)	Enrollment Attendance Younger sibling nutrition Learning/cognitive outcomes	Positive Mixed Mixed Mixed
Luo et al, 2012	RCT (cluster)	CHINA; Multivitamin and mineral supplements for students versus providing parents with health information (non-government program)	Anemia Learning outcomes Cost-benefit	Positive Positive Positive
McEwan et al, 2012	Impact evaluation: regression discontinuity design	CHILE; Comparison of in-school meal rations with varying caloric makeups (government program)	Enrollment Attendance Grade repetition Learning/cognitive outcomes	Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown
Osendarp et al, 2007	RCT (cluster)	INDONESIA AND AUSTRALIA; Single and combined effects of meal supplementation with selected multiple micronutrients and fatty acids (non-government program)	Nutrition Cognitive outcomes	Positive Mixed
Shi et al, 2012	RCT (cluster)	CHINA; Providing students' parents with health information (non-government program)	Anemia	Mixed

CITATION (abbreviated)	STUDY DESIGN	LOCATION; INTERVENTION	OUTCOMES EXAMINED	EFFICACY PER OUTCOME
HEALTH AND EDUCATION (cont.)				
School feeding, nutrition, and deworming				
Bobonis et al, 2006	RCT (cluster)	INDIA; Iron supplementation and Vitamin A combined with deworming (non-government program)	Weight Attendance	Positive Positive
Nga et al, 2011	RCT	VIETNAM; Comparison of multimicronutrient fortified biscuits offered with or without de-worming (non-government program)	Growth Cognitive function Parasite load	Positive Positive Positive
School deworming				
Taylor, Robinson et al, 2012	Research synthesis: systematic review	Various	Weight Haemoglobin Cognition School attendance School performance Mortality	Mixed Mixed Mixed Mixed Mixed Neutral/Unknown
Sexual and reproductive health in school				
Paul-Ebhohimhen et al, 2008	Research synthesis: systematic review	Various	Knowledge and attitudes Intended behavior Behavior change	Positive Mixed Mixed
Arcand et al, 2010	Impact evaluation: regression discontinuity design	CAMEROON; School-based training for teachers on HIV/AIDS (government program)	Pregnancy Condom use Abstinence	Positive Positive Positive
Dupas et al, 2009	RCT (cluster)	KENYA; Information provided to students on the relative risk of HIV infection: HIV prevalence disaggregated by gender and age groups (government and non-government collaboration)	Sexual activity Condom use Pregnancy Cost-effectiveness	Mixed Positive Positive Positive
Michielsen et al, 2012	Non-randomized longitudinal controlled trial	RWANDA; School-based HIV peer education program (government and non-government collaboration)	Sexual activity Condom use Knowledge/attitude/behavior Stigma	Neutral/Unknown Neutral/Unknown Neutral/Unknown Positive
Integrated early childhood development				
Engle et al, 2007	Research synthesis	Various	Motor and mental development School performance Gross and fine motor; language; auditory; and psychosocial skills Cognitive development Parenting practices Nutritional status	Positive Positive Positive Neutral/Unknown Positive Mixed

CITATION (abbreviated)	STUDY DESIGN	LOCATION; INTERVENTION	OUTCOMES EXAMINED	EFFICACY PER OUTCOME
HEALTH AND EDUCATION (cont.)				
Integrated early childhood development (cont.)				
Martinez et al, 2012	Impact evaluation: randomized cluster	MOZAMBIQUE; Center-based community pre-school program (non-government program)	Primary school and time use Cognitive, motor, and emotional development Language and communication Child growth and health Impact on older siblings Impact on adult caregivers	Positive Positive Neutral/Unknown Mixed Positive Positive
Vision support in school				
Glewwe et al, 2006	RCT (cluster)	CHINA; Free eyeglasses offered to vision-impaired students (non-government program)	Learning outcomes	Positive
Obesity interventions in school				
Verstraeten et al, 2012	Research synthesis: systematic review	Various	Dietary behavior Physical activity BMI	Positive Positive Positive
Malaria prevention and treatment in school				
Simwaka et al, 2009	Retrospective impact evaluation: propensity score matching	MALAWI; School-based malaria screening and treatment for students (non-government program)	Attendance Grade repetition Cost benefit	Positive Positive Positive
Improved sanitary and menstruation provisions for girls in school				
Birdthistle et al, 2011	Research synthesis: systematic review	Various	Girls' attendance Enrollment Completion Education outcomes Health (from broader WASH interventions)	Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown
Oster et al, 2011	RCT	NEPAL; Provision of free sanitary products to girl students (non-government program)	Attendance	Neutral/Unknown

CITATION (abbreviated)	STUDY DESIGN	LOCATION; INTERVENTION	OUTCOMES EXAMINED	EFFICACY PER OUTCOME
HEALTH AND ECONOMIC DEVELOPMENT				
Cash transfers and health				
Ranganathan et al, 2011	Research synthesis: critical review	Various	Uptake of health services Immunization coverage Nutritional and health outcomes Health-related behavior change	Positive Mixed Positive Mixed
Microfinance and health				
Leatherman et al, 2012	Research synthesis: evidence review	Various	Client knowledge Health behavior Use of health services Client health outcomes Improving health services Specific health outcomes: Reproductive health Prevention and primary care for children Child nutrition and breastfeeding Child diarrhea HIV prevention Domestic abuse/gender-based violence Tuberculosis Sexually transmitted infections	Positive Positive Positive Positive Positive Positive Positive Positive Positive Positive Positive Positive Positive Positive
Hamad et al, 2011	RCT (cluster)	PERU; Health education provided for clients of microcredit programs (non-government program)	Parental health knowledge Child health	Positive Neutral/Unknown
Livelihood and health skills-building for vulnerable youth				
Hallman K et al, 2011	Impact evaluation	SOUTH AFRICA; Basic "life orientation" training (social and health skills) versus enhanced training (social, health, and financial skills); (non-government program)	Condom knowledge Knowledge of social grants Financial skills Financial participation Self-esteem Confidence for condom negotiation Sexual activity and risk-taking Possession of ID or birth certificate Perceived social inclusion Income-generating activities	Positive Positive Positive Positive Mixed Mixed Mixed Mixed Mixed Mixed

CITATION (abbreviated)	STUDY DESIGN	LOCATION; INTERVENTION	OUTCOMES EXAMINED	EFFICACY PER OUTCOME
HEALTH AND ECONOMIC DEVELOPMENT (cont.)				
Livelihood and health skills-building for vulnerable youth				
Sebastian et al, 2004	Impact evaluation: quasi-experimental	INDIA; Livelihood activities for girls integrated into existing reproductive health programs in slum areas (non-government program)	Knowledge of reproductive health Physical mobility and contact with individuals outside the family Awareness of safe places for girls to congregate Self-esteem Social skills Work aspirations Gender role norms Time spent on domestic tasks Time spent on income-generating tasks	Positive Neutral/Unknown Positive Neutral/Unknown Positive Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown
HEALTH, EDUCATION, AND ECONOMIC DEVELOPMENT				
Cash transfers for health and education				
Baird et al, 2012	RCT (cluster)	MALAWI; Conditional, unconditional, or no cash transfers for schooling provided to students or students and parents (non-government program)	Prevalence of HIV Prevalence of HSV-2	Positive Positive
Levy et al, 2010	Impact evaluation: quasi-experimental regression discontinuity design	JAMAICA; Conditional cash transfers based on use of school and health services (government program)	School attendance Learning outcomes Preventive health visits Health status	Positive Neutral/Unknown Positive Neutral/Unknown
Miller et al, 2008	Impact evaluation: mixed method longitudinal	MALAWI; Unconditional cash transfers intended for use of school or health services (government program)	Migration Health and hygiene Education Child work and other activities Nutrition and food consumption Asset Ownership Housing quality Household expenditures and use of cash transfer Household shocks Well being and impact of cash transfer Decisions about spending cash transfers Jealousy and conflict in communities	Neutral/Unknown Positive Positive Mixed Positive Positive Positive Positive Positive Positive Positive Positive Negative

CITATION (abbreviated)	STUDY DESIGN	LOCATION; INTERVENTION	OUTCOMES EXAMINED	EFFICACY PER OUTCOME
HEALTH, EDUCATION, AND ECONOMIC DEVELOPMENT (cont.)				
Cash transfers for health and education (cont.)				
Schady et al, 2007	Impact evaluation: randomized phased introduction	ECUADOR; Unconditional cash transfers to mothers of young children (government program)	Child cognitive and behavioral measures Child health and nutrition Maternal, physical, and mental health	Positive Positive Mixed
Soares et al, 2010	Impact evaluation: propensity score matching and estimation	PARAGUAY; Conditional cash transfers based on use of school and health services (government program)	School attendance Health center visits Immunization Food consumption Investment in agriculture Savings Possession of ID card Access to credit Social participation	Positive Positive Neutral/Unknown Neutral/Unknown Positive Positive Positive Neutral/Unknown Neutral/Unknown
Non-cash transfer economic subsidy, health, and education				
Dufló et al, 2011	Impact evaluation: randomized program assignment	KENYA; Comparison of two programs delivered either in isolation or combined: 1) providing free school uniforms to partially subsidize the cost of education among upper primary students; and 2) training of primary school teachers on the national HIV/AIDS curriculum (government and non-government collaboration)	Schooling Marriage Fertility STI/HIV rates	Mixed Mixed Mixed Mixed
HEALTH AND NUTRITION				
TB and micronutrients				
Karyadi et al, 2002	Double-blind placebo-controlled trial	INDONESIA; Community-based trial of vitamin A and zinc supplementation for newly diagnosed TB patients (non-government program)	Clinical response to TB treatment Nutritional status Resolution of radiologic signs Conversion of sputum smears to negative	Positive Positive Positive Positive
Wejse et al, 2009	RCT	GUINEA-BISSAU; Community-based trial testing vitamin D supplementation for patients with TB (non-government program)	Clinical severity score Mortality	Neutral/Unknown Neutral/Unknown

CITATION (abbreviated)	STUDY DESIGN	LOCATION; INTERVENTION	OUTCOMES EXAMINED	EFFICACY PER OUTCOME
HEALTH AND NUTRITION (cont.)				
Maternal and child health and nutrition				
Bhutta et al, 2008	Research synthesis: critical review	Various existing interventions that were designed to improve nutrition and prevent related disease	Child health and nutrition (stunting micronutrient deficiencies mortality) Maternal health (nutritional status and related health)	Positive Neutral/unknown
Mangani et al, 2012	RCT	MALAWI; Infants receive dietary supplementation with milk-LNS, soy-LNS, a corn-soy-flour blend (CSB), or nothing (non-government program)	Weight (short-term) Growth (short-term) Hemoglobin gain Severe stunting Days with symptoms of common childhood illness Mortality	Positive Positive Neutral/Unknown Positive Neutral/Unknown Neutral/Unknown
Maternal and child health, nutrition, and IMCI				
Arifeen et al, 2009	RCT (cluster)	BANGLADESH; Integrated Management of Childhood Illness (government and non-government collaboration)	Mortality Exclusive breastfeeding Stunting Wasting Care-seeking	Neutral/Unknown Positive Positive Neutral/Unknown Positive
Maternal and child health and nutrition and psychosocial support				
Nahar et al, 2008	Time-lagged controlled study	BANGLADESH; Psychosocial stimulation program integrated into existing hospital management of severely malnourished children (government and non-government collaboration)	Mental and psychomotor development Weight	Positive Positive
HIV and food assistance				
Tirivayi et al, 2011	Research synthesis: systematic review	Various	Labor participation Consumption Weight gain (short term) Weight gain (longer term) HIV disease progression HIV viral load Immune response Survival/mortality ART adherence	Neutral/Unknown Neutral/Unknown Positive Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown Positive
Oketch et al, 2011	Household cross sectional survey	SOUTH AFRICA; Clinical model for nutrition assessment and counseling integrated into routine clinic visits of HIV-positive adults; food supplements provided to malnourished individuals, particularly those on anti-retroviral therapy (government program)	Nutritional vulnerability Risk of malnutrition Nutritional status Quality of life	Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown
Serrano et al, 2010	Impact evaluation: quasi-experimental	NIGER; Monthly family food rations and nutrition advice for ART patients (government and non-government collaboration)	Survival/mortality CD4 count Adherence to treatment BMI	Positive Positive Positive Neutral/Unknown

CITATION (abbreviated)	STUDY DESIGN	LOCATION; INTERVENTION	OUTCOMES EXAMINED	EFFICACY PER OUTCOME
HEALTH AND NUTRITION (cont.)				
HIV and micronutrients				
Hummelen et al, 2010	Research synthesis: literature review	Various	HIV progression	Mixed
HIV and child nutrition				
Heidkamp et al, 2012	Impact evaluation: comparison of treatment to historical control group	HAITI; Clinic-based, infant feeding support intervention for HIV-exposed, non- breast-fed infants via ready-to-use fortified food supplements and behavior change education about infant feeding, hygiene, and diarrhea treatment (non- government program)	Stunting Wasting	Positive Positive
Rollins et al, 2007	RCT	SOUTH AFRICA; Enhanced calorie and protein provision to HIV-infected children presenting with prolonged diarrhoea (non-government program)	Weight gain CD4 count Diarrheal mortality	Positive Neutral/Unknown Neutral/Unknown
Simpore et al, 2005	Impact evaluation: quasi- experimental	BURKINA FASO; Spirula supplementation for undernourished HIV- negative and HIV-positive children (non-government program)	Anemia Weight gain	Positive Positive
HEALTH AND ENVIRONMENT				
WASH and diarrhea				
Waddington et al, 2009	Research synthesis: synthetic review	Various	Diarrhea morbidity Intervention compliance Sustainability	Mixed Mixed Mixed
Fan et al, 2011	Impact evaluation: quasi- experimental using three matching methods	INDIA; Water supply, sanitation and handwashing interventions (government and non-government programs)	Prevalence and type of diarrhea Dysentary	Mixed Mixed
Jain et al, 2010	RCT (cluster)	GHANA; Use of sodium dichloroisocyanurate (NaDCC) tablets for household drinking water treatment (non-government program)	Diarrhea rates Water quality	Neutral/Unknown Positive
Kremer et al, 2011	Impact evaluation: randomized program assignment	KENYA; Water source quality intervention via spring protection (non-government program)	Diarrhea rates Water quality Willingness to pay/ valuations	Positive Positive Mixed
WASH and maternal and child health				
Briere et al, 2012	Impact evaluation: quasi- experimental stratified cluster design	KENYA; Water treatment and hygiene kits provided to caregivers during infant vaccination sessions (government program)	Household water treatment Handwashing Immunization coverage	Positive Positive Positive (ie, no negative impact)

CITATION (abbreviated)	STUDY DESIGN	LOCATION; INTERVENTION	OUTCOMES EXAMINED	EFFICACY PER OUTCOME
HEALTH AND ENVIRONMENT (cont.)				
Improved cookstoves and health				
Eder et al, 2012	Impact evaluation: mixed method follow up survey	BOLIVIA; A multi-intervention package designed to improve knowledge and practices related to maternal and child health and nutrition, community water systems, and household water and sanitation facilities (non-government program)	Healthy MCH and nutrition behaviors WASH infrastructure sustainability	Positive Positive
Burwen et al, 2012	RCT (cluster)	GHANA; Training, materials, and supervision provided to households to build improved cookstoves (non-government program)	New vs traditional stove use Time gathering wood for fuel Fuel use Exposure to carbon monoxide Self-reported health	Mixed Neutral/Unknown Positive Neutral/Unknown Positive
Hanna et al, 2012	RCT	INDIA; Distribution of an inexpensive, improved cooking stove (non-government program)	Stove usage Smoke inhalation (short-term) Smoke inhalation (long term) Lung function Infant birth weight Infant mortality Probability of cough Blood pressure Probability of any illness in past 30 days Fuel consumption Time spent cooking	Mixed Positive Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown
Levine et al, 2011	RCT (cluster)	SENEGAL; Distribution of solar ovens (non-government program)	Stove usage Wood usage Time spent collecting wood Carbon monoxide exposure Respiratory illness symptoms	Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown Neutral/Unknown
Smith et al, 2009	RCT (cluster)	GUATEMALA; Introduction of an improved chimney woodstove in households using open woodfires for cooking (non-government program)	Indoor pollution exposure to carbon monoxide Emission reduction (not intended indirect confirmation)	Positive Negative
Reproductive health and environmental management				
D'Agnes et al, 2010	Impact evaluation: quasi-experimental	PHILIPPINES; Comparison of standalone or integrated coastal management and reproductive health programs (non-government program)	Coastal resource management* Reproductive health* Food security Cost efficiency *Composites of several proxy indicators	Positive Positive Positive Positive Positive

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