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The Role of Health Systems and Policy in Producing Behavior and Social Change to Enhance Child Survival and Development in Low- and Middle-Income Countries: An Examination of the Evidence

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Evidence-based behavior change interventions addressing health systems must be identified and disseminated to improve child health outcomes. Studies of the efficacy of such interventions were identified from systematic searches of the published literature. Two hundred twenty-nine of the initially identified references were judged to be relevant and were further reviewed for the quality and strength of the evidence. Studies were eligible if an intervention addressed policy or health systems interventions, measured relevant behavioral or health outcomes (e.g., nutrition, childhood immunization, malaria prevention and treatment), used at least a moderate quality research design, and were implemented in low- or middle-income countries. Policy or systems interventions able to produce behavior change reviewed included media (e.g., mass media, social media), community mobilization, educational programs (for caregivers, communities, or providers), social marketing, opinion leadership, economic incentives (for both caregiver and provider), health systems strengthening/policy/legislation, and others. Recommendations for policy, practice, and research are given based on fairly strong data across the areas of health service delivery, health workforce, health financing, governance and leadership, and research.

In June 2013, USAID and UNICEF convened an Evidence Summit on Enhancing Child Survival and Development in Lower- and Middle-Income Countries by Achieving Population-Level Behavior Change. For the Summit, evidence review teams examined published peer-reviewed and gray literature across a wide range of social and behavior change dimensions impacting child survival and development. The purpose was to identify effective, proven interventions that could contribute to the goal of reducing child mortality and ensuring healthy child survival and development (Fox & Obregón, 2014). One of those dimensions is the subject of this

article—social and behavior changes that are facilitated by interventions targeting health systems and health policies. Other dimensions included in other reviews in this issue of the journal are changes produced by caregivers (Elder et al., 2014) and communities (Farnsworth et al., 2014), and changes that are affected by cross cutting forces such as gender (Kraft, Wilkins, Morales, Widyono, & Middlestadt, 2014), and stigma and discrimination (Nayar, Stangl, de Zaldondo, & Brady, 2014). The important role of health care systems in low- and middle-income countries (LMICs) is gaining greater attention in global health discussions (Mills, 2014). This article attempts to analyze the evidence for the role of health systems in effective behavior change through the lens of the World Health Organization's health systems building blocks (service delivery, health workforce, information, medical products, vaccines and technology, financing, leadership, and governance).

Health policies can be related to any of these building blocks. The quality of service delivery and health workforce development are the most visible aspects of the health system that affect behavior—for example, the quality of service delivery can influence the behavior of the client or patient. Likewise, the health workforce, especially the knowledge, attitudes, and behaviors of providers, has an impact on the behaviors of the clients or patients. The impact of the other building blocks are less obvious, but also can be important, for example the way information is processed and shared and the ways medical products, vaccines and technologies are priced, regulated, distributed or promoted. Health financing and performance based incentives have a clear impact on patient or client behavior since cost of services (e.g., price or subsidies) affects their demand and use. Leadership and governance can also affect behaviors, for instance in the way program delivery is negotiated and implemented based on the characteristics and needs of the community or on policies determined by international funders or at the ministerial level.

Where appropriate, and where information is available, these building blocks are applied to the review of the evidence across the main areas of child health and development: healthy timing and spacing of pregnancy, antenatal care, prevention of mother-to-child transmission (PMTCT) of HIV, neonatal survival and health, and early child development (nutrition/micronutrients, prevention and treatment of diarrhea/pneumonia/acute respiratory infections, malaria prevention and treatment, and childhood immunization). An earlier Evidence Summit considered the role of both user and provider financial incentives on maternal health care, which also affects infant survival and development. The results of that Evidence Summit can be found in a special journal issue (Stanton, Higgs, & Koblinky, 2013) but will not be reviewed again here.

The method for identifying the evidence is described in more detail in a separate article in this supplement (Balster, Levy, & Stammer, 2014). The process involved a wide search and screening of articles on multiple databases, and a call for evidence. An emphasis was placed on finding studies conducted in LMICs. The authors of this article conducted an initial relevance review on the identified papers related to health systems and policy. Of the initially identified references, 229 were further reviewed for the quality and strength of the evidence. When available, recommendations and consensus reports from international agencies and professional associations were also considered. The identified references were distributed among the members of the evidence review team by health topic, with an effort to match it to their expertise.

Healthy Child Survival and Development

Healthy Timing and Spacing of Pregnancy

Healthy timing and spacing of pregnancy helps women and families make informed decisions by delaying the first pregnancy and spacing or limiting subsequent

pregnancies to ensure the health of newborns and mothers. The World Health Organization recommends four key behaviors to increase healthy outcomes: prevent pregnancy occurring (a) before 18 years of age, (b) less than 24 months after a live birth, (c) less than 6 months after an induced abortion or miscarriage, (d) after 34 years of age. The authors examine the evidence on effective interventions at the health system level to achieve any of these behaviors.

Preventing Pregnancy Before 18 Years of Age

The role of service delivery in preventing pregnancy before 18 years of age was highlighted in a review of 73 studies by Kirby (2002), who analyzed effective approaches to reduce adolescent unprotected sex, pregnancy and childbearing. Among the programs that had positive effects were four health clinic studies that (a) gave clear messages on sexual and contraceptive behaviors and (b) included one-on-one counseling between a medical provider and a teenage patient. In the same year, DiCenso, Guyatt, Willan, and Griffith (2002) published a review of 26 randomized control trials to reduce unintended pregnancies. The authors found that, although primary prevention strategies did not reduce the number of pregnancies in young women, there were significantly fewer pregnancies in young women who received multifaceted intervention programs rather than a single intervention. A review by Oringanje and colleagues (2009) found that combining education and improving use skills and access to contraceptives lowered the rate of unintended pregnancy among adolescents. In the area of financing, a World Bank publication on the use of conditional cash transfers in Pakistan found that adolescent girls who received stipends were more likely to delay marriage and pregnancy (Independent Evaluation Group, 2011). Another intervention focused on the effectiveness of unconditional and conditional cash transfers on marriage and pregnancy in adolescent Malawian girls. At the end of a 2-year intervention, results showed that unconditional cash transfers, relative to conditional transfers, decreased the likelihood of adolescent girls being married or pregnant by about one fourth and one half, respectively. In Nicaragua, adolescent girls who received vouchers at schools had a significantly higher use of modern contraceptives than did nonreceivers of vouchers, and those receiving vouchers in their neighborhoods had higher use of condoms during their most recent sexual contact (Meuwissen, Gorter, & Knottnerus, 2006).

Spacing of Pregnancy

The role of health systems to promote spacing after a live birth was studied in India as part of a program that included well-organized formative research for a health promotion campaign, and as part of the reorganization of service delivery, training and monitoring of community health workers (CHWs). Sixteen focus groups and 30 in-depth interviews were held with newly married men and women or first time parents to identify key messages and barriers to contraception. On the basis of this formative research, different educational campaigns were developed for young women, husbands, and mother-in-laws, as well as for supervisors of CHWs. The CHWs visited villages to introduce birth spacing as a health intervention. The educational campaign resulted in higher use of contraceptives for spacing among pregnant women in the experimental area compared with the control area (Sebastian, Khan, & Roychowdhury, 2010).

Six additional journal articles and three unpublished papers were identified through the evidence search process. The six articles reviewed included standard-days method of contraception (Gribble, Lundgre, Velasquez, & Anastasi, 2008); community-based maternity care (Kumar et al., 2008; Kwast, 1995); adolescent postabortion care (McCarragher et al., 2010); and maternal, neonatal, and postnatal care (Colbourn, Lewycka, Nambiar, Phoya, & Mhango, 2012; Warren, Mwangi, Oweya,

Kamunya, & Koskei, 2009). Two of the articles focused on improving the supply of health care services, and four articles describe implementation of an integrated ecological approach, focusing on both the supply and demand side. The research method varied across studies: two pre/post designs, two descriptive studies, a client-centered efficacy evaluation, and a cluster-randomized controlled efficacy trial. The interventions in the six articles focused on three strategies: strengthening health services, promoting healthy behaviors, and implementing policy interventions. In general, the effective interventions focused on community mobilization; educational programs for caregivers, communities and providers; working with opinion leaders; and strengthening health systems.

The evidence for strengthening health services by improving service delivery, health workforce, information delivery, and access to essential medical products and technology suggests that well-functioning and humane health facilities will attract clients even if they have to pay. Linking community, public health, and hospital systems through standing relationships enhances service delivery, thus improving referral and use of facilities, as well as integrating HIV and family-planning services (Zimba et al., 2012). Increasing the reach and skill level of government health workers and involving community-based reproductive health workers enhances the capacity of the health workforce by providing primary health services, increasing community knowledge, and offering immediate access to reproductive health services and HIV/AIDS prevention and care (Creanga, Bradley, Kidanu, Melkamu, & Tsui, 2007; McCarraher et al., 2010).

The evidence also suggests that training in knowledge and skills, as well as supervising health providers to improve how they provide health care and counsel clients about healthy timing and spacing of pregnancy increases the effectiveness of providers. Equipping providers with prepackaged messages may facilitate such interaction (Warren et al., 2009). Family-planning counseling during postnatal visits provides optimum opportunities for this type of counseling (Colbourn et al., 2012; Zimba et al., 2012). There is strong evidence in support of involving CHWs in rural or suburban areas in the promotion of family planning, along with meeting other primary care community needs such as breastfeeding, immunization, sanitation, home-based neonatal care, vitamin A, infant feeding, handwashing, antiretroviral therapy for pregnant HIV-positive women, clean delivery, water treatment, and safe storage (Naimoli, Frymus, Quain, & Roseman, 2012). Providing effective and efficient obstetric services in the community affects both service supply and demand illustrating how well-planned use of information and facilitated access to essential medical products and technology are necessary to build successful community obstetric care, although the process is complex.

Overall, there has been demonstrated success with financial incentives, such as stipends and unconditional cash transfers, to keep girls in school and thus delay marriage and pregnancy. Regarding the spacing of pregnancy, there is strong evidence to support the involvement of CHWs in health promotion activities in rural and suburban activities.

Preventing PMTCT of HIV

PMTCT of HIV is an important way to halt a leading cause of childhood mortality. In 2011, 330,000 infants were infected with HIV through mother-to-child transmission, and only 57% of the estimated 1.5 million women infected with HIV who were pregnant that year received effective antiretroviral therapy to prevent transmission to their fetuses and infants (Joint United Nations Programme on HIV/AIDS, 2012). Antiretroviral therapy can prevent more than 95% of transmission during pregnancy (World Health Organization, 2010). Twenty-six articles were reviewed

for the quality of evidence. Of these, only nine articles included evidence of health outcomes and/or behavior change related to PMTCT, plus we found a more recent article published since the literature search.

An important study in Kenya identified system issues as even more obstructive than stigma in preventing access and uptake of PMTCT services (Kinuthia et al., 2011). Systems issues included service delivery (not providing opt-out testing, unavailability of services as a result of lack of care provided in the community, cost, and poor follow-up for facility-based deliveries of women found to be infected with HIV) and unconstrained access to essential medical products. A nationwide PMTCT strategy addressing most of the World Health Organization's six building blocks, with buy-in at all administrative and service-delivery levels of the health system, and consistent provision of laboratory tests was critical to Jamaica's success improving testing and adherence to treatment in pregnant women, and thereby reducing mother-to-child transmission rates to less than 2% (Christie & Pierre, 2012). National managers developed policies and strategies that included strong leadership; training; strengthened health services for PMTCT, women, and children; research; and multiple collaborations with local, national, and international partners.

Thailand's national PMTCT program, which began in 1998—the first-ever program implemented in a resource-poor country—was successful largely because of good information about systems performance, including early, strong and consistent monitoring of the program, as well as strong data management (Kanshana & Simonds, 2002). In addition, to promote maternal-to-child prevention behaviors, women received HIV tests, and special funds were available to pay for the test should any woman not be able to afford it, thus eliminating the cost hurdle.

In order to motivate as many women as possible, and facilitate their enrollment into effective PMTCT programs, it is important to ensure that HIV testing is available and accessible through antenatal care as well as in general health care services. The 2007 Ethiopian national PMTCT guidelines, which included opt-out or provider-initiated testing and counseling during antenatal care, exemplifies the importance of strategic policy frameworks. However, lack of effective oversight may have prevented it from being widely implemented. Recent research found that provider-initiated testing and counseling during antenatal care greatly increased rates of testing (Malaju & Alene, 2012).

Stigma and gender issues related to HIV are recognized barriers to people being tested for HIV (Kraft et al., 2014; Nayer et al., 2014). Another significant bottleneck to adequate service is the lack of knowledge among key health staff. To help address these problems, China, in 2003, created a comprehensive HIV prevention, care and treatment program geographically focused on rural, resource-poor, and ethnic minority areas. The program set norms and standards at both national and local levels using a strategic policy framework, impacting provider behaviors and service delivery (Han et al., 2010). Program activities were developed on the basis of local needs and using multisectoral collaboration among various ministries, including health, security, and the Food and Drug Administration.

Along with ensuring that women have the widest access possible to HIV testing, enrolling and retaining women with HIV into treatment programs is also critical. Many low-income countries face difficulties getting women into treatment based on older treatment protocols which had problems in obtaining CD4 counts, used vertical programs that locate antenatal and HIV care in different clinics (often far apart), long wait times for both types of care, and high transportation costs (Chi et al., 2012). A new treatment protocol, Option B+ (Schouten et al., 2011; World Health Organization, 2012), developed in 2011 and adopted by the World Health Organization in 2012, helps reduce these barriers to enrollment by beginning lifelong triple antiretroviral therapy for all women infected with HIV who are breastfeeding

or pregnant. In Malawi, implementing Option B+ led to a 748% increase in pregnant or breastfeeding women enrolling in treatment programs and 77% adhering to the treatment 1 year later, similar to the rate for adults who were previously enrolled (Centers for Disease Control and Prevention, 2013). This remarkable improvement in PMTCT behaviors was achieved through key health system and policy changes, including decentralizing antiretroviral therapy provision to health centers where antenatal care is provided (access to services), training health center staff on HIV treatment, adding Efavirenz to nearly all treatment regimens (access to essential medical products), sustaining quarterly visits by Ministry of Health staff to clinics to monitor the program, and data collection to monitor and evaluate the program (Centers for Disease Control and Prevention, 2013).

Neonatal Survival and Health

Although the neonatal mortality rate in low- and middle-income countries has declined since 2000, in 2010 more than 3 million newborns died in the first month of life (World Health Organization, 2011). Significant improvements have been made in Asia and Latin America, but in Sub-Saharan Africa progress has been slower. We reviewed more than 40 articles specifically related to neonatal survival and health published in peer-reviewed journals, 26 of which met the quality review criteria. The evidence supports three types of policy and health system interventions, mostly focused on systems delivery and personnel training, to promote healthy behaviors. The two types of evidence-supported interventions are improving access through integration within and among services, and having an effective and responsive workforce that includes training and monitoring health care workers.

Improving Access Through Integration Within and Among Services

Primary care systems that are integrated and organized to provide services at different levels of complexity, with free or low cost, a strong community component, education and technical support for ground workers (volunteer or paid), and triaging systems to detect and transfer higher risk cases to a health center of higher complexity have been shown to be effective in increasing antenatal care, immunization rates, postnatal birth control, and malnutrition. An example of these systems is presented by Abel (1992) in a study of the Rural Unit for Health and Social Affairs in Vellore, India. The program achieved immunization coverage between 80% and 90%, antenatal coverage of 85%, and 55% postnatal contraception.

Amaouzou, Habi, Bensaid, and Niger Countdown Case Study Working Group (2012) also showed the effect of ecological approaches for neonatal survival in a study assessing the effect of government policies supporting universal access, provision of free health care for pregnant women and children, and decentralized nutrition programs in Niger. Similarly, Baqui and colleagues (2008) showed a 34% lower neonatal mortality after postnatal home visits, with 75% of the reduction seen in homes visited within the first 3 days of birth, as part of a large-scale community-based integrated nutrition and health program in northern India. Strong results have been also documented for programs in rural West Java (Alisjahbaba et al., 1995) and India (Al-Rafay & Al-Sharkawy, 2012), which provide training of informal and formal health care workers, making services more accessible, and promoting community health education.

Having an Effective and Responsive Workforce: Training and Monitoring Health Care Delivery Workers

Training personnel to apply evidence-based protocols to improve health care delivery has been shown to produce a strong impact on neonatal survival and health.

Al-Rafay and Al-Sharkawy (2012) used a quasi-experimental design to assess an intervention to improve neonatal intensive care unit nursing care, significantly improving nurses' knowledge and practices. The most significant components of this program were comprehensive guidelines for neonatal intensive care unit nursing care and checklists to verify the implementation of such guidelines. Berglund, Lefevre-Cholay, Bacci, Blyumina, and Lindmark (2010) also reported significant improvement in maternal and infant outcome when staff were trained on the evidence-based guidelines of the World Health Organization Effective Perinatal Care package to decrease induction and augmentation during labor, and reduce hypothermia in the infants. Allen and Jeffrey (2006) reported that an evidence-based teaching program for service providers in rural Nepal consisting of four short lectures and interactive skills stations produced a 100% increase in the measurement of infant length and head circumference, charting percentiles, and documentation of structured history and examination. They also found a 71% increase in administration of vitamin K at birth, and a 94% increase in assessment of hypoglycemia. With an educational intervention with physicians in Bangladesh, Akter, Heller, Smith, and Milly (2009) also found significant improvement in the appropriate use of antimicrobials in pediatric services.

There is also strong evidence supporting the implementation of the World Health Organization Essential Newborn Care course among traditional birth attendants, nurses, and doctors in Guatemala, India, and Sri Lanka (Garcés et al., 2012; Goudar et al., 2012; Kumar et al., 2008; Senarath, Fernando, & Rodrigo, 2007; Thomas et al., 2009). Essential Newborn Care has also been used successfully with other health care personnel training interventions including a nurse training program in Cairo (Berglund et al., 2010), a training program in 14 hospitals in India to improve management of birth asphyxia (Deorari, Paul, Singh, & Vidyasagar, 2001), a 10-month intensive training for doctors and nurses in Macedonia (Jeffery et al., 2004), intensive education for traditional birth attendants to reduce neonatal tetanus in Thailand (Chongsuvivatwong, Bujakom, Kanpoy, & Treerong, 1993), and training CHWs and traditional birth attendants to safely manage uncomplicated cases of neonatal pneumonia in India (Bang, Morankar, Sontakke, & Solanki, 1993).

Training personnel and establishing and monitoring the use of evidence-based practices to control nosocomial infections are particularly relevant in the reduction of neonatal mortality. Calil, Marba, Von Nowakonski, and Tresoldi (2001) documented the efficacy of measures to control colonization and nosocomial infection by multidrug resistant bacteria. The entire health care team was trained to help to reduce cross-colonization and rationalize the use of antibiotics. A similar intervention educating pediatricians on antibiotic prescribing, applying an antimicrobial spectrum chart and using guideline-based antibiotic prescribing at the Beijing Children's Hospital found a significant increase in rational use of broad-spectrum antibiotic and reduction in bacterial resistance (Ding et al., 2008). Darmstadt and colleagues (2005) evaluated a low-cost comprehensive infection control program emphasizing staff and caregiver education about measures to decrease risk of contamination, particularly through the use of handwashing, proper disposal of infectious waste, strict asepsis during procedures, and prudent use of antibiotics, finding a decline of 61% in culture-proven sepsis and 50% in deaths. Other evidence supporting training for the control of nosocomial infections include a parent education program in Argentina (De Gentile et al., 2001), a surveillance and targeted interventions program in Algeria (Atif et al., 2009), staff education and implementation of evidence-based infection control measures in Lithuania (Gurskis et al., 2009), education, reinforcing hand hygiene, antibiotic restriction, and infection control measures in Turkey (Hosoglu, Hascuhadar, Yasar, Uslu, & Aldudak, 2012), and stepwise introduction of an evidence-based intervention and intensive

and continuous education of neonatal intensive care workers to reduce catheter-associated bloodstream infections in Brazil (Resende, Brito, Abdallah, & Gontijo Filho, 2011). Overall, there is strong evidence supporting the implementation of the World Health Organization Essential Newborn Care course and infection control measures.

Early Childhood Development

Child development is traditionally seen as including the related developmental components of social-emotional, sensory-motor and cognitive skills (Grantham-McGregor et al., 2007; Shonkoff, Richter, van der Gaag, & Bhutta, 2012; Walker, et al., 2007; Walker et al., 2011). Healthy child development is closely linked with the common problems of poverty and malnutrition. Although precise estimates for rates of healthy child development in developing countries is lacking, and the only available data for development is in the cognitive realm, Grantham-McGregor and colleagues (2007) have conservatively estimated that more than 200 million children younger than the age of 5 years are failing to reach their cognitive potential. Although these findings paint a bleak picture for the millions of children developing in these environments, research with humans and animals has highlighted the plasticity of the brain and improvements in functioning that can be achieved with early intervention.

In the developed world, attention to the use of the health system and policies has become well established for addressing issues of optimal child development (Garner, Shonkoff, & Committee on Psychosocial Aspects of Child and Family Health Committee on Early Childhood Adoption and Dependent Care, 2012; Independent Evaluation Group, 2011). Current best practices encourage health care providers to promote early development, as well as use systems for early identification and management of developmental delays and disabilities. In addition, policy efforts, such as the United States' Early Intervention system, are designed to change provider and caregiver behaviors and provide community supports and services for the identification and treatment of delays and disabilities that allow children to reach their full developmental potential. These programs have been initiated because of the understanding that, for most of the world, the health care system is the only institutional venue that has the potential to reach all young children (Independent Evaluation Group, 2011), and that the longer remediation is delayed, the more costly it becomes (Baird, 2011; Heckman, 2008).

Research on interventions to improve health care systems and implement policy efforts in LMIC to support child development is in its infancy. Research in this area falls into one of three areas: assessment, treatment, or policy. After review, 40 papers were selected to provide support for this section, with findings in each of these areas are subsequently described.

Assessment and Identification of Developmental Delays

At present, there are no globally accepted indicators of child development (Engle et al., 2007; Oringanje et al., 2009), which has stymied efforts to monitor progress and provide accountability in assessments of child development. Even without globally recognized measures, there is evidence that health care providers are aware of the importance of early childhood developmental assessment. Although awareness is a first step toward changing provider behaviors, training is necessary to translate it into accurate problem identification (Ertem et al., 2009; Lejarraga et al., 1997; Scherzer, 2009). These findings have led to efforts to train health care providers to identify healthy and abnormal child development and positive effects have been

found for provider knowledge of child development and confidence in assessment (Meuwissen et al., 2006; Sebastian et al., 2010). Challenges to sustaining these assessments were the lack of provider time and a referral system for children who were found to have delays (Meuwissen et al., 2006).

Access to Treatment

Behavioral interventions to improve parental behaviors that enhance child development must address a number of dynamic and interrelated health, nutrition, and developmental factors that extend well beyond traditional health care settings. The majority of child development interventions from health systems target intellectual and physical stimulation, often paired with nutritional assistance. Most of this research has taken place in Bangladesh or Jamaica and has generally been delivered in the home by CHWs with limited educational attainment who are given additional training before beginning the intervention and then supervised by a child development professional (Eickmann et al., 2003; Grantham-McGregor, Powell, Walker, Chang, & Fletcher, 1994; Grantham-McGregor, Schofield, & Powell, 1987). Behaviors targeted in these interventions included stimulation and interaction through play activities and enriching verbal interactions (talking and singing) between the caregiver (usually the mother) and child. Target children were either malnourished (Nahar et al., 2009; Powell, 2004; Powell et al., 2004), stunted (Grantham-McGregor, Powell, Walker, & Himes, 1991; Grantham-McGregor, Walker, Chang, & Powell, 1997), low birth weight (Meeks Gardner, Walker, Powell, & Grantham-McGregor, 2003), or poor (Powell & Grantham-McGregor, 1989). Effects for the interventions on child development, especially in the cognitive realm were significant across studies and populations, with the only exception being children from families whose home visits were only monthly (no effect observed). Children began receiving the interventions between the ages of 6 and 24 months with no effect found for age at enrollment (Walker, Chang, Powell, & Grantham-McGregor, 2004).

Additional research in China (Jin et al., 2007), South Africa (Potterton, Stewart, Cooper, & Becker, 2010) and India (Nair et al., 2009) has focused on providing support for caregiver behaviors that promote child development during health care visits. Similar to home-visit programs, caregivers were taught to stimulate their children through counseling and demonstrations. Interventions were delivered by trained health care professionals. The effects on cognitive development in all three trials were significant, although one trial was limited by a lack of blinding in the assessment (Joint United Nations Programme on HIV/AIDS, 2012).

Policy Frameworks

One of the more recent policy strategies to enhance childhood development is the adoption of preschools, both formal and community based (Oringanje et al., 2009). Preschools generally include formal and informal support for all three major components of healthy child development, as well as including nutritional supplementation. Although the research is clear that early childhood education is not just a downward extension of primary education, and that critical caregiver behaviors that provide high quality stimulation and interactions through play are essential for enhancing early childhood development (Hindin, Christiansen, & Ferguson, 2013), few trials of these preschools have been done in LMICs. Nonetheless a large scale example from Bolivia highlights the potential for this work. Behrman, Cheng, and Todd (2004) found that enrollment before 24 months in the program was related to increased motor development, language skills, and psychosocial interaction after 13–18 months of participation, with benefits decreasing as children enrolled at older ages.

Policies supporting financial incentives, in the form of conditional cash transfers, have also been offered by multiple countries as a mechanism for promoting caregiver behaviors that enhance child development (Glassman et al., 2013). More specifically, conditional cash transfers have been used with low-income families around the world to encourage caregivers to use preventive care visits, seek vaccinations, and attend educational programs. Although these programs have many documented outcomes, including reductions in household poverty, increased child attendance in school, and utilization of well child visits to health care, the evidence for an effect on child development has been limited (Lagarde, Haines, & Palmer, 2007). According to Gertler (2004), work in Mexico suggests that the effects have been strongest for children who were poorest when entering the program.

Prevention of Pneumonia, Acute Respiratory Infection, and Diarrhea

A central reason hindering the achievement of the millennium development goal of reducing deaths in children is the persistence of pneumonia and diarrhea as the largest causes of morbidity and mortality from infectious diseases, with an estimated 1.3 million and 700,000 child deaths respectively in 2011 (Chopra et al., 2013). Forty-one articles that met relevance and quality review criteria for inclusion in the analysis were reviewed. The evidence was synthesized by outcomes, themes and subtopics, thus is limited and its strength is moderate, mainly the result of the lack of rigorous evaluations for the behavioral change interventions implemented.

Interventions for the Prevention and Treatment of Diarrhea

A recently published systematic review of the evidence (Bhutta et al., 2013) in *The Lancet* showed the effectiveness of various potential preventive and therapeutic interventions against childhood diarrhea and pneumonia, along with relevant delivery strategies. The Lives Saved Tool model was used to organize service delivery and assess the effect on mortality when these interventions are applied to a scale of at least 80%. Assuming that immunization rates reach at least 90%, the authors estimate that 95% of diarrhea deaths and 67% of pneumonia deaths in children younger than 5 years could be eliminated by 2025, at a cost of US\$6.7 billion. It is important to note that new delivery platforms and expanded community platforms can help reach this result in an equitable fashion.

On the basis of the evidence, numerous caregiver and health provider behaviors have been effective for the treatment of diarrhea (Bhutta et al., 2013; Chopra et al., 2013; Pariyo, Gouws, Bryce, & Bumham, 2005). Health promotion interventions to increase the use oral rehydration salts and home fluids are recommended, as their use demonstrated reduced diarrhea mortality by 69%.

Interventions for the Prevention and Treatment of Pneumonia

Bhutta and colleagues (2013) estimated potential cost-effectiveness of targeting the same set of interventions to address neonatal and child mortality within wealth quintiles for Bangladesh, Ethiopia, and Pakistan. The effect of various evidence-based interventions is greatest in the poorest quintiles. The authors also examined the effect of reaching the poorest individuals by promoting prevention and early treatment behaviors through community-based platforms, and focused on three strategies: breastfeeding promotion, scale up of zinc or oral rehydration salt interventions, and case management of pneumonia by deploying community health workers in these strata. The model showed that if 90% coverage were achieved for these three interventions, 64% of diarrhea deaths and 74% of pneumonia deaths could be averted in the poorest quintiles in the three countries assessed.

Acute Respiratory Infections

Reduction of indoor smoke exposure has the potential to reduce lower respiratory tract infections in children younger than 6 years of age. Although no clear estimates exist about the morbidity and mortality caused by smoke from wood or coal burning, exposure to environmental tobacco smoke increases the risk of acute lower respiratory disease in young children by 1.5- to 2-fold (Chen, 1989, 1994; Chen, Li, Yu, & Qian, 1988). Evidence from developed countries suggest that strict smoke-free policies in the community increase adult quit rates, and reduce children's exposure to environmental tobacco smoke as measured by cotinine levels in saliva, though not among children whose parents smoke inside their homes (Akhtar, Currie, Currie, & Haw, 2007; Akhtar, Haw, Currie, Zachary, & Currie, 2009; Task Force on Community Preventive Services, 2001). The Framework Convention on Tobacco Control identifies several highly effective health system and policy based interventions to reduce smoking prevalence (World Health Organization, 2003).

Improving Coordination

There is some evidence that implementation of the World Health Organization Integrated Management of Childhood Illness approach, focusing on health worker training, health systems improvements, and health promotion through family and community activities, can result in increased care-seeking behaviors for illness, more children younger than 6 months of age being exclusively breastfed, and reduced prevalence of stunting (Arifeen et al., 2009). Similarly, there are data demonstrating the effectiveness of training health care workers on ARI case management, using interactive techniques and ensuring continuous medical equipment and drug supply, coupled with community educational and snowballing approaches (Anh et al., 2000).

Training and Educating Providers

The reviewed evidence suggests that the most effective health interventions include education programs for communities and families, specialized training for health workers, and ongoing supervision and resources (e.g., medications and supplies) that support first-level health workers (Callaghan-Koru et al., 2013; Pariyo et al., 2005). Some limited evidence suggests positive effects of *Collaborative Quality Improvement* programs to increase compliance with standards (Franco & Marquez, 2011). There is also some evidence that behavior change efforts that use multiple strategies—such as handwashing promotion strategies that provide instruction, modeling, social support, and soap—have greater impact than more limited behavior change approaches (Briscoe & Aboud, 2012).

Providers must be trained in prevention and treatment protocols to improve their knowledge and skills and eliminate improper behaviors such as automatic prescription of antibiotics for watery diarrhea. Employing interactive training methodologies (Aker, Heller, Amith, & Milly, 2009; Gutierrez et al., 1994), job aids (Elder et al., 1992) and posttraining dialogue and support have demonstrated promise as effective behavior change strategies. Educational programs for neonatal intensive care unit staff on hand hygiene can contribute to reductions of nosocomial pneumonia, and systematic use of surveillance data with staff feedback loops can improve compliance rates (Atif et al., 2009). Improving case management and supportive supervision are also shown to help. In contrast, creative strategies including handwashing songs, artistic posters and promotion of key phrases through music and art have not shown to be effective means of increasing adherence to handwashing protocols among health care workers in a newborn intensive care setting (Neves et al., 2006).

Nutrition, Including Micronutrients and Breastfeeding

Interventions to mitigate against the adverse effects of malnutrition have implications for both short- and long-term health promotion and disease prevention, and can facilitate economic development through improved work and productivity (Belli, Bustreo, & Preker, 2005; Victora et al., 2008).

Interventions That Target the Most at Risk: Children Younger Than 5 Years of Age and Pregnant and Lactating Women

A primary focus of the global research, program, and policy agenda on infant and child nutrition has been on strategies to promote essential behaviors such as initiation and duration of exclusive breastfeeding and the use of nutritionally adequate and complementary feeding practices. While issues affecting a mother's feeding choice for an infant remain complex, a review of programs to improve exclusive breastfeeding behaviors for the first six months of life indicate that success is dependent on community support, trained personnel, an evaluation feedback information system, and defined program strategies (Bhandari, Kabir, & Salam, 2008). Structured policy frameworks, such as the Baby Friendly Hospital Initiative, along with contact before and immediately after giving birth, increase the rates of early initiation of breastfeeding and exclusive breastfeeding for six months, as recommended by the World Health Organization (Beake, Pellowe, Dykes, Schmied, & Bick, 2012; Dyson, McCormick, & Renfrew, 2005; Feed the Future, 2013; World Health Organization, 2003).

Proper complementary feeding practices are dependent on dietary diversity ensuring that children 6 to 24 months old consume nutrient-dense foods and age-appropriate quantities of macro- (calories, fat, carbohydrates and proteins) and micro- (vitamins and minerals) nutrients. These food-based approaches are more effective and sustainable than targeting individual nutrients (Prasad, Chakraborty, Yadav, & Bhatia, 2013; Pridmore & Carr-Hill, 2011). Mainstream approaches, such as building and expanding infrastructure, are less effective than comprehensive, multisystems approaches that address the physical, sociocultural, economic, and political environment at improving diet (Carrera et al., 2012; Dyson et al., 2005). Effective interventions engage participants through a variety of evidence-based techniques, such as prompt recall, social support, and materials and media messages (Aboud & Signla, 2012; Gupta, Goel, Shah, & Misra, 2012). A key component to sustained health systems strengthening is an effective monitoring and evaluation system with valid and robust nutrition indicators to identify areas for improvement and assess the nutritional status of the population at large (Labadarios, Steyn, Mgiijima, & Daldla, 2005).

Interventions That Address the Effective Interaction and Integrations Among Systems

Research suggests that the nutritional context is more complex than previously thought and, most prominently, the emergence of the “dual burden” of over- and undernutrition in individuals and populations present a particular challenge (Ihab et al., 2013). The ability to address this dual burden requires a systems approach that is inclusive of all agencies/stakeholders throughout the chain including effective and integrated interactions among health, agricultural, and economic systems (Beake et al., 2012; Pearson & Ljungqvist, 2011; United Nations Summit, 2010a). A comprehensive health systems approach builds technical and health care delivery capacity and improves access to disease prevention strategies and evidence-based standards of care and treatment (Aboud & Signla, 2012; World Health Organization, 2010). Strong health systems also incorporate robust monitoring and evaluation activities

that track population-level nutrition needs, detect services that are ineffective, and identify implementation concerns (Wuehler & Ouedraogo, 2011).

The coexistence of both over- and underweight populations targeted for interventions to improve nutrition presents a significant conundrum. Increasing evidence shows that as obesity-related problems become more predominant in resource-constrained settings around the world, due consideration must be given to the potential of reducing undernutrition in some populations while inadvertently exacerbating issues linked to overnutrition in others (Garmendia, Corvalan, & Uauay, 2013; Gupta et al., 2012; Victora et al., 2008). Additional research examining the intersection between these two issues could help strengthen health systems and improve nutrition globally. Due consideration should also be given to the potential interactions among food insecurity, malnutrition, noncommunicable and infectious diseases, all of which may coexist within a given individual or population. Moreover, implementation research is needed to more fully appreciate both the opportunities and barriers to scaling up effective, cost-efficient interventions and to gauge their long-term impact (Leroy et al., 2010; UNICEF, 2009). Data garnered from such efforts will inform and strengthen health systems and reduce the burden of malnutrition thereby improving the health of women, infants, and children.

Interventions That Scale Up Evidence-Based Approaches

Sound principles in nutritional assessment and evidence-based interventions such as food fortification, single/multiple micronutrient supplementation, and improved dietary diversity are examples of the public health toolkit for addressing malnutrition. These approaches can prevent and reduce nutrient deficiencies and track potential safety concerns (Bhutta, 2008; Bruyeron, Denizeau, Berger, & Treche, 2010; Yang & Huffman, 2011). They are also cost-effective and, where appropriate, easily incorporated into existing health systems (Bhutta, 2008; Bruyeron et al., 2010; Mannar & Sankar, 2004; Population Services International, 2011; World Health Organization, 2010b; Wuehler & Ouedraogo, 2011). Iodine-fortified salt exemplifies the potential value of an effective and successfully implemented policy and health system nutrition intervention. Salt iodization has been instrumental in ameliorating the effect of iodine deficiency on cognitive development through its use in nearly every country in the world (Anderson, de Benoist, & Rogers, 2010; Wu, Liu, Li, & Clar, 2002). Incorporating fortification, supplementation, and dietary diversity activities into health systems can reduce malnutrition as long as they are safe, account for the needs of the population (e.g., areas with high rates of malaria or non-communicable diseases), are evidence-based, and have strategies for monitoring and evaluation that include relevant health outcomes (Bruyeron et al., 2010; Wirth et al., 2012; Yang & Huffman, 2011).

Economic incentives, such as conditional cash transfer programs, have been increasingly popular as a way to alleviate poverty and incentivize parents to invest in their child's long-term health and well-being (Fernald, Gertler, & Neufeld, 2009; Glassman et al., 2013). These programs, when integrated into existing health services, have been shown to improve linear growth, reduce anemia, and increase dietary diversity and consumption of nutrient-dense foods especially among low-income infants and children (Leroy, Gadsden, Rodriguez-Ramirez, & de Cossio, 2010; Leroy et al., 2008; Rivera, Sores-Alvarez, Habicht, Shamah, & Villalpando, 2004). However, design differences among various programs make it difficult to compare them (Lagarde, Haines, & Palmer, 2007; Paes-Sousa, Santos, & Miazaki, 2011). Because of these variations, there is no consensus about eligibility criteria, urban or rural targeting, and implementation guidelines (Leroy et al., 2010). To date, most conditional cash transfer programs have been implemented in middle-income countries in Latin America; more rigorous research is needed to assess what impact

these programs could have in low-income countries with less effective health care systems (Leroy et al., 2010; Glassman et al., 2013).

Immunizations

Evidence for the health impact and cost-benefit for investment in vaccination programs to reduce mortality and morbidity in children younger than 5 years of age is very strong (Akumu, English, Scott, & Griffiths, 2007; Garmendia et al., 2013; World Health Organization, UNICEF, & World Bank, 2009). Yet, despite extraordinary progress, almost one in five children remains unprotected against vaccine preventable diseases. The World Health Organization has estimated that an additional 2 million deaths a year could be prevented by 2015 among children younger than 5 years of age if all the vaccines now available against childhood diseases were widely adopted, and if countries could raise vaccine coverage to a global average of 90% (World Health Organization, 2012b). This section focuses on reviewing evidence on health system and policy-related behavior change initiatives aimed at enhancing immunization uptake (directly and as part of more complex interventions).

Global Policies and Initiatives That Shape National Immunization System Investments, Design, and Behaviors

Global policies aimed at achieving universal immunization for all children were first agreed on in 1977 as an essential element of the World Health Organization strategy Health For All by 2000. The Expanded Program on Immunization was established as the mechanism to achieve universal access to all relevant vaccines for all people at risk. The Expanded Program on Immunization and its related policies have catalyzed, supported, and shaped all national vaccination systems (www.who.int/immunization/policy/en/index.html). Most recently, global goals and milestones have been established through the Global Immunization Vision and Strategy 2006–2015 and the Global Vaccine Action Plan 2011–2020 and other international agreements. All of these policies and plans include expert-generated peer-reviewed recommendations for communication and advocacy activities related to behavior change (World Health Organization, UNICEF, & World Bank, 2009).

Global initiatives and “tools” developed to help countries overcome barriers to expanded immunization include the Reaching Every District strategy (Vandelaer, Bilous, & Nshimirimana, 2008; World Health Organization, 2014) and the Integrated Management of Childhood Illness strategy (http://www.who.int/maternal_child_adolescent/topics/child/imci/en). Reaching Every District was an intervention designed specifically to improve key components of immunization services including planning, outreach, community mobilization, supervision, and monitoring in select districts. The Integrated Management of Childhood Illness is a broader initiative and has three components: improving case management practices (behaviors) of health workers (especially in outpatient health facilities), strengthening health systems, and promoting (behavioral change related to) community and family health practices.

Several significant controlled studies have looked at the effect of both Reaching Every District and Integrated Management of Childhood Illness programs in different LMICs (Ryman et al., 2011). In a 2-year evaluation of the Reaching Every District intervention in Assam, India, while vaccination uptake data in intervention districts showed no difference from controls, process data indicated significant improvements in program quality in the intervention districts. Integrated Management of Childhood Illness initiatives (for providers and community groups) have

also undergone extensive evaluations. In controlled studies related to the provider training components in Benin and different States in India (Rowe et al., 2009), the Integrated Management of Childhood Illness training was found to consistently enhance knowledge and performance of providers. However, there is concern about sustainability of these strategies since they require continuing supportive supervision, adequate essential supplies and regular monitoring.

National Initiatives—Primary Health Care Surveillance

There is evidence that strengthening primary health services can lead to increased vaccination uptake (Rocha & Soares, 2010). Since the mid-1900s, for example, Brazil has initiated a Family Health Program (a family doctor, a nurse, an assistant nurse, and six community health agents) to bring primary health care into communities. This has resulted in a drop in infant mortality from 48 per 1000 to 17 per 1000. Vaccine coverage for diphtheria, pertussis, and tetanus vaccine has also increased to more than 95% coverage for children less than one year old in selected municipalities (Harris & Haines, 2010).

Surveillance systems are essential for monitoring (e.g., disease prevalence, outbreaks, adverse effects) of immunization programs in both normal (John, Samuel, Balraj, & John, 1998) and refugee camp settings. In the latter, data can be used to direct community based public health interventions to control common infectious diseases and reduce high mortality rates among refugees while placing a minimal burden on health workers (Marfin et al., 1994).

Shaping Provider Capacity to Promote and Deliver Vaccination Services (Supply) and Consumer Demand

A recent review by the UNICEF India Country Office and the Population Council concluded that adherence to childhood immunization schedules depends on demand generation, and supply of services. Each component alone cannot make significant impact to increase complete immunization coverage therefore, no single strategy can be found which is effective in isolation (UNICEF, 2013). Comprehensive interventions that address both suppliers and demanders appear to work best. What follows is a sampling of evidence-based interventions targeting both side of the supply and demand equation.

Supply Side: Training Primary Health Care Workers and Understanding Patient Perceptions. A pretraining and posttraining study in Turkey (Uskun, Uskun, Uysalgenc, & Yagiz, 2008) found that continuing education of primary health care workers related to vaccination issues can lead to increased vaccination coverage. The training included information about vaccines, national vaccination schedule, cold chain and management, planning and regulation of immunization, tracking the trends and increase in vaccination coverage, and immunization recording. Key findings showed that duration of the training program, where it is held and how well the trainers perform affect the post-workshop test scores of the trainees.

In a controlled study in Thailand (Chongsuvivatwong, Bujakorn, Kanpoy, & Treerong, 1993), training traditional birth attendants in sterile techniques for umbilical cord cutting and the correct method of dressing the umbilical stump was as effective as two doses of tetanus vaccination in reducing incidence of neonatal tetanus. Training CHWs and peer educators, using Integrated Management of Childhood Illness curricula and other tools, has been shown to have a positive impact on knowledge, attitudes, and practices in diverse settings (Thompson & Harutyunyan, 2009). In a randomized control trial in Sudan (Loevinsoh & Gareaballah, 1992), a simple system (re)design (i.e., moving vaccination service very close to general practitioners' consultation rooms), or having the doctor write

a prescription recommending vaccination, increased vaccination uptake by 55% amongst unvaccinated children seeking curative care.

A variety of studies have focused on helping health care workers to better understand and support parents of children who have incomplete or no vaccinations. An essential element for informing this understanding is the gaining of insight into people's perceptions. A variety of studies (Favin, Steinglass, Fields, Banerjee, & Sawhney, 2012; Streefland, Chowdhury, & Ramos-Jimenez, 1999) support identifying and addressing system/provider and consumer barriers such as health staff attitudes and practices, reliability of services, false contraindications, parents' beliefs and knowledge, fear of side effects, and conflicting priorities.

Demand Side. Social mobilization and public education initiatives (Zhang et al., 2011) as part of a comprehensive education and information package including the training of doctors and Expanded Program on Immunization staff can lead to a significant increase in public and provider knowledge, attitudes and practices and support smooth integration of a new vaccine into the Expanded Program on Immunization. In addition, the use of a home-based medical record has been shown to be positively correlated with increased tetanus toxoid immunization in pregnant women in an eight-country World Health Organization collaborative study (Shah et al., 1993).

Vaccination campaigns have been shown to be highly effective. In Uganda they led to a 93% decline in measles morbidity, interrupted indigenous measles virus transmission and benefited routine immunization (Mbabazi et al., 2009). A unique feature of this campaign was the inclusion of supplemental products including vitamin A and albendazole for deworming. In selected districts, additional interventions included supplemental tetanus immunization for girls and women of childbearing age and/or praziquantel for schistosomiasis. Involvement of political, religious and traditional leaders in mobilization activities for the campaigns, and the resulting rapid reduction in measles cases, helped to build public confidence in immunization services and in health services in general. Similar findings are reported for a nationwide rubella-measles immunization campaign in Haiti (Lacapère et al., 2011).

A special campaign in the Bihar State in India, called Muskaan Ek Abhiyan (The Smile Campaign; Goel et al., 2012), led to a 16–26% greater vaccination uptake than in the control areas. The main strategies of the Muskaan campaign were increasing access to immunization sessions, enhanced inter-sectoral coordination between the Departments of Health, and Women and Child Development, training of trainers, with alternate vaccinators to counter the shortages, community women group involvement in awareness generation, strengthening of monitoring and supervision mechanisms, and provision of performance-based incentives to service providers.

Malaria

Despite evidence for reductions in malaria deaths worldwide, the disease is still far from being eradicated and, in malaria-endemic countries, a large proportion of child deaths are directly or indirectly attributable to this infection. After malaria eradication programs were abandoned 50 years ago, the disease resurged as a worldwide epidemic with the emergence of insecticide resistant and drug resistant parasite strains and vectors. This resurgence was in great part associated with poverty, political instability, and poor health systems, infrastructure, and equipment. Twelve malaria articles that met the evidence review team relevance and quality review criteria for inclusion in the analysis were reviewed. Evidence of the outcomes has been synthesized by four themes and subtopics subsequently shown. The evidence

is limited and its strength is moderate, mainly as a result of the lack of rigorous evaluations for the behavior change interventions implemented. From the articles explored, however, we have adequate insight into interventions that are effective in promoting behavior changes for malaria prevention and treatment in different countries across Africa.

Improvement of Provider Behavior to Optimize Patient-Provider Interactions and Increase Provider Compliance and Performance

A systematic follow-up reminder to health workers after on-the-job professional training can help change and sustain malaria care provider's behavior, operating at the action and maintenance stages of behavior change. A cluster-randomized controlled trial of an intervention to improve health worker malaria case management was implemented in Kenya. Health workers were trained and were subsequently sent text messages with reminder information about malaria medication. These considerations resulted in sending two messages per day for five working days. The findings showed significant improvements in correct medication management, which included correct dosing and counseling, both immediately after the intervention and 6 months later as compared with baseline data (Jones et al., 2012). Health workers said being kept up to date was an important factor influencing practice.

A similar study in Tanzania to evaluate short-term effects of a one-to-one educational intervention approach aimed at improving the private sector's practices, compliance, and performance in using the national treatment guidelines for malaria and other common childhood illnesses showed a significant impact on prescribing and dispensing practices of drug stores for some common childhood illnesses. About 90% of shops prescribed to clients the approved first-line anti-malarial drug for uncomplicated malaria, as compared with only 55% of the control shops (Nsimba, 2007).

Similarly, a low-cost outreach educational program in Kenya to improve the private sector's compliance with malaria guidelines by training and providing job aid to district's wholesalers showed that 32% of shops receiving job aids prescribed sulfadoxine-pyremethamine, as compared with only 3% of the control shops (Tavrow, Shabahang, & Makama, 2003).

Raising Awareness and Knowledge of Different Methods to Improve Malaria Prevention and Treatment

Community interpersonal communication is effective in increasing the uptake of malaria prevention and treatment. A study in Burkina Faso involved training a core group of mothers and supplying CHWs with antimalarial drugs specially packed in age-specific bags and containing a full dose of treatment (Pagnoni, Convelbo, Tiendrebeogo, Cousens, & Esposito, 1997). The proportion of mothers seeking help from anyone in the village (primarily a CHW) for their child's malaria episode increased from 21% at baseline to 54% at the end of the study. In addition, use of chloroquine and paracetamol for treatment rose from 25% to 46%. In another study in Burkina Faso, four health centers were assigned to community promotion in addition to intermittent preventive treatment of malaria in pregnancy using sulfadoxine-pyrimethamine (IPTp-SP) and eight were randomly allocated to either IPTp-SP (intervention) or weekly chloroquine (control). The promotional campaign resulted in a major increase in IPTp coverage, with two thirds of women at delivery having received more than two doses of SP. The proportion of women having received at least two doses was significantly higher in the arm with the promotion (70%) compared with the arm without (49%; Gies et al., 2008).

Promotion of Care-Seeking and Use of Health Services

Improving referral advice in the community can be a powerful complement to other malaria case management strategies. A Tanzanian study compared the clinical course of illness and time taken to reach a hospital from a concurrently conducted study that emphasized rapid referral to a group of pediatric patients admitted to the same hospital whose parents followed routine behavior (Gomes et al., 2010). The intervention group had a prereferral treatment of artesunate and received messages from health professionals that stressed the importance of rapid referral. The most relevant findings were that parents of sick children from the intervention study transferred their children to the hospital following the advice they were given, but only somewhat faster than the control group. It is critical to address barriers to compliance as a central focus of health promotion communication interventions. Strategies for an intervention tested in Malawi evolved from community-based formative research undertaken to learn about the local concepts of malaria and issues surrounding malaria prevention and treatment during pregnancy (Helitzer-Allen, Macheso, Wirima, & Kendall, 1994). The formative research found that many women complained about the taste of chloroquine, therefore the intervention compared distributing a sugar-coated chloroquine tablet, changing the health education message during antenatal sessions, and combining the two strategies. The change in use of chloroquine, from the baseline percentages in Weeks 1 and 2 was 64% when the product was changed and 45% when the health education message was improved.

Conclusions and Recommendations

We next summarize the conclusions from each topic area (pneumonia/diarrhea, neonatal survival, nutrition, PMTCT, malaria, healthy pregnancies, and immunizations) classified by the World Health Organization Health System Building Blocks of health system delivery, health workforce and health financing, leadership, and governance. They contain topic specific and general conclusions.

Health Service Delivery

Organizing and integrating primary care systems to provide services at different levels of complexity is a health service delivery policy strongly supported for virtually every one of the topics reviewed. The evidence reviewed supports the importance of integrating and/or linking services to improve triaging systems to detect and transfer higher risk cases to a health center of higher complexity and to improve the efficacy of service delivery appeared particularly critical for the promotion of healthy timing and spacing of pregnancy, PMTCT, neonatal survival and health, prevention and treatment of acute respiratory infections and diarrhea, immunizations, and malaria prevention and treatment. The evidence also supports policies and system changes that expand free or low cost access to health care and that foster strong community involvement in the delivery of health services, including volunteer or paid community health workers in these activities.

The evidence also suggests that particular service delivery policies might further accelerate improvement in child survival. For example, some HIV studies show that expanding opt-out or provider initiated testing and counseling or eliminating the voluntary feature of the counseling and testing may lead both to greater numbers of at-risk individuals being tested and infected individuals seeking treatment, as well as improved survival rates for the vulnerable infants of these parents. Similarly, the first “1,000 days” strategies, including structured programs and contact before and immediately after giving birth to improve the initiation and duration of exclusive

breastfeeding and use of complementary feeding practices should also increase child survival rates.

In general, there is sufficient evidence from LMICs supporting service delivery policies that accelerate improvement in child survival and development by implementing a comprehensive health systems approach with (a) defined strategies aligned with treatment protocols, (b) structured community support, (c) trained personnel, and (d) an evaluation feedback system.

Recommendation 1

Research has shown that evidence-based policies and well-organized health systems can contribute to positive health and development outcomes for children younger than 5 years of age when (a) health services are offered at different levels of complexity (e.g., early detection, triage, and linkage to the appropriate service), (b) access is free or low cost, (c) a strong community component is included, and (d) education and technical support is provided for CHWs (volunteer or paid).

Health Workforce

The evidence suggests that providing the necessary personnel to implement programs and training these personnel to apply evidence-based protocols will contribute significantly toward improving health care delivery and child survival. At the same time, research shows that training is most effective when paired with the following accelerating strategies: (a) evaluations that assess the behavior changes that occur after these trainings, (b) regular follow-ups and reinforcements, (c) monitoring the use of the evidence-based protocols, (d) supervising providers—including CHWs—to guide them on how best to provide health care and counsel clients. The evidence is particularly strong in support of training and monitoring of health personnel to control nosocomial infections in neonatal intensive care units, the prevention and treatment of acute respiratory infections and diarrhea, and the early detection and treatment of malaria. A significant number of studies reviewed relied on trained CHWs to deliver health interventions. These studies demonstrate that CHWs can be effectively used in outreach and delivery programs if they are provided with adequate education, support, monitoring, and connections to health professionals. Because CHWs are often trusted sources in prevention activities, providing early disease detection, dispensing prudent and essential medications, and triaging patients requiring more intensive medical care. Research on approaches to enhancing CHW performance was the topic of another recent evidence summit (Naimoli, Frymus, Quain, & Roseman, 2012).

Recommendation 2

The studies strongly support the provision of training, technical support and monitoring for health professionals, paid CHWs and volunteers towards improving caregiver behavior related to antenatal care, immunization rates, postnatal birth control, malnutrition, and the prevention, detection of warning signs, basic early treatment, and timely and appropriate referral in cases of acute respiratory infection, diarrhea, and malaria.

Recommendation 3

Training personnel to apply evidence-based protocols, paired with follow-up (e.g., using text messages), and monitoring the use of such protocols effectively promote behaviors that improve child survival and healthy development.

Health System Financing and Leadership and Governance

The evidence directly addressing how to improve the financing and governance of health systems was weak or not available. Health system policies that focus only on voluntary HIV counseling and testing may limit utilization of these services and thereby program effectiveness. Other studies have found that conditional cash transfers are effective in promoting behaviors that improve the nutritional status and healthy development of young children. In addition, there is evidence that systematic quality management at district, facility and community levels using more holistic models of health systems support have a positive impact on behaviors that can further reduce acute respiratory infections and diarrhea in young children. Other well-structured and effective global health initiatives that include leadership and governance components include the first “1,000 days” strategies (www.thousanddays.org) such as the World Health Organization Essential Newborn Care training program, “Child Friendly Hospitals” program, Lives Saved Tool, Reaching Every District strategy, and the Integrated Management of Childhood Illnesses strategy.

Recommendation 4

The data show that systematic quality management has important effects at district, facility and community levels. Using more holistic models of health systems support is recommended for accelerating behavior change at the different levels.

Recommendations for Research

- Most existing research has examined the effectiveness for particular health interventions, with scant description of the health systems and policy supports required. In addition, there is little research on factors needed to sustain effective programs. To address this gap, researchers may need to translate evidence-based interventions into constituent health systems supports and required policies, using a health systems model such as the World Health Organization Building Blocks, or another conceptual or theory-of-change model.
- Additional research is needed to identify health systems supports and policies required to sustain behavior change at a population level that lead to improved public health outcomes.
- There is a need to evaluate national programs based on behavior change outcomes, and not just knowledge-based outcomes.
- Implementation research is needed to more fully appreciate both the opportunities and barriers to scaling up effective, cost-efficient interventions and to gauge their long-term impact.

Limitations

On the basis of the evidence gathering method used for this review, the findings reported here have important limitations. For example, the publications reviewed did not yield evidence of structural interventions, overall system reforms or programs implemented by other systems (e.g., financing, agricultural) with demonstrated specific effects on behaviors related to the eight issues and health practices and diseases previously described. Neither were there publications of studies on sustainability, scaling, and replicability that advanced to the final steps. The structure of the evidence review did not favor the inclusion of qualitative research, which may have contributed to the exclusion of relevant studies. Last, health systems and policy interventions used in high income countries were not included.

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References

- Abel, R. (1992). RUHSA: A model primary health care programme. *Journal of Tropical Pediatrics*, 38, 270–273.
- Aboud, F., & Signla, D. (2012). Challenges to changing health behaviors in developing countries: A critical overview. *Social Science & Medicine*, 75, 589–594.
- Akhtar, P. C., Currie, D. B., Currie, C. E., & Haw, S. J. (2007). Changes in Child Exposure to Environmental Tobacco Smoke (CHETS) study after implementation of smoke-free legislation in Scotland: National cross-sectional survey. *BMJ*, 335, 545.
- Akhtar, P. C., Haw, S. J., Currie, D. B., Zachary, R., & Currie, C. E. (2009). Smoking restrictions in the home and secondhand smoke exposure among primary schoolchildren before and after introduction of the Scottish smoke-free legislation. *Tobacco Control*, 18, 409–415.
- Akter, S. F. U., Heller, R. D., Smith, A. J., & Milly, A. F. (2009). Impact of a training intervention on use of antimicrobials in teaching hospitals. *Journal of Infection in Developing Countries*, 3, 447–451.
- Akumu, A. O., English, M., Scott, J. A. G., & Griffiths, U. K. (2007). Economic evaluation of delivering haemophilus influenzae type b vaccine in routine immunization services in Kenya. *Bulletin of the World Health Organization*, 85, 511–518.
- Alisjahbana, A., Williams, C., Dharmayanti, R., Hermawan, D., Kwast, B. E., & Koblinsky, M. (1995). An integrated village maternity service to improve referral patterns in a rural area in West-Java. *International Journal of Gynecology and Obstetrics*, 48(Suppl), S83–S94.
- Allen, C. W., & Jeffery, H. (2006). Implementation and evaluation of a neonatal educational program in rural Nepal. *Journal of Tropical Pediatrics*, 52, 218–222.
- Al-Rafay, S. S., & Al-Sharkawy, S. S. (2012). Educational outcomes associated with providing a comprehensive guidelines program about nursing care of preterm neonates receiving Total Parenteral Nutrition. *Clinical Nursing Research*, 21, 142–158.
- Amouzou, A., Habi, O., Bensaid, K., & Niger Countdown Case Study Working Group. (2012). Reduction in child mortality in Niger: A Countdown to 2015 country case study. *The Lancet*, 380, 1169–1178.
- Andersson, M., de Benoist, B., & Rogers, L. (2010). Epidemiology of iodine deficiency: Salt iodisation and iodine status. *Best Practice & Research Clinical Endocrinology & Metabolism*, 24(1), 1–11.

- Anh, N. T., Tram, T. T., Tri, L., Huu, T. N., Pedersen, F. K., Mogensen, K., & Andersen, E. (2000). Development of ARI case management at primary and secondary level in southern Vietnam. *Southeast Asian Journal of Tropical Medicine and Public Health*, *31*, 674–678.
- Arifeen, S. E., Hoque, D. E., Akter, T., Rahman, M., Hoque, M. E., Begum, K., . . . Black, R. E. (2009). Effect of the Integrated Management of Childhood Illness strategy on childhood mortality and nutrition in a rural area in Bangladesh: A cluster randomised trial. *The Lancet*, *37*, 393–403.
- Ashley, D., & McCaw-Binns, A. (1998). Informing Maternal and Child Health (MCH) policy through research. *West Indian Medical Journal*, *47*(Suppl 4), 16–19.
- Atif, M. L., Sadaoui, F., Bezzaoucha, A., Kaddache, C. A., Boukari, R., Djelato, S., & Boubechou, N. (2009). Reduction of nosocomial pneumonia using surveillance and targeted interventions in an Algerian neonatal intensive care unit. *Infection Control and Hospital Epidemiology*, *30*, 712–713.
- Balster, R. L., Levy, S., & Stammer, E. (2014). Evidence acquisition and evaluation for evidence summit on population-level behavior change to enhance child survival and development in low- and middle-income countries. *Journal of Health Communication*, *19*(Suppl 1), 10–24.
- Bang, A. T., Bang, R. A., Morankar, V. P., Sontakke, P. G., & Solanki, J. M. (1993). Pneumonia in neonates: Can it be managed in the community? *Archives of disease in childhood*, *68*, 550–556.
- Baqui, A., Williams, E. K., Rosecrans, A. M., Agrawal, P. K., Ahmed, S., Darmstadt, G. L., . . . Santosham, M. (2008). Impact of an integrated nutrition and health programme on neonatal mortality in rural northern India. *Bulletin of the World Health Organization*, *86*, 796–804.
- Beake, S., Pellowe, C., Dykes, F., Schmied, V., & Bick, D. (2012). A systematic review of structured compared with non-structured breastfeeding programmes to support the initiation and duration of exclusive and any breastfeeding in acute and primary health care settings. *Maternal and Child Nutrition*, *8*, 141–161.
- Behrman, J. R., Cheng, Y., & Todd, P. E. (2004). Evaluating preschool programs when length of exposure to the program varies: A nonparametric approach. *Review of Economics and Statistics*, *86*, 108–132.
- Belli, P. C., Bustreo, F., & Preker, A. (2005). Investing in children's health: What are the economic benefits? *Bulletin of the World Health Organization*, *83*, 777–784.
- Berglund, A., Lefevre-Cholay, H., Bacci, A., Blyumina, A., & Lindmark, G. (2010). Successful implementation of evidence-based routines in Ukrainian maternities. *Acta Obstetrica et Gynecologica Scandinavica*, *89*, 230–237.
- Bhandari, N., Kabir, A. K., & Salam, M. A. (2008). Mainstreaming nutrition into maternal and child health programmes: Scaling up of exclusive breastfeeding. *Maternal and Child Nutrition*, *4*(Suppl 1), 5–23.
- Bhutta, Z. A. (2008). Micronutrient needs of malnourished children. *Current Opinion in Clinical Nutrition and Metabolic Care*, *11*, 309–314.
- Bhutta, Z. A., Ahmed, T., Black, R. E., Cousens, S., Dewey, K., Giugliani, E., . . . Maternal, and Child Undernutrition Study Group. (2008). What works? Interventions for maternal and child undernutrition and survival. *The Lancet*, *371*, 417–440.
- Bhutta, Z. A., Das, J., Walker, N., Rizvi, A., Campbell, H., Rudan, I., & Black, R. (2013). Interventions to address deaths from childhood pneumonia and diarrhea equitably: What works and at what cost? *The Lancet*, *381*, 1417–1429.
- Black, R. E., Allen, L. H., Bhutta, Z. A., Caulfield, L. E., de Onis, M., Ezzati, M., . . . Maternal, and Child Undernutrition Study Group. (2008). Maternal and child undernutrition: Global and regional exposures and health consequences. *The Lancet*, *371*, 243–260.
- Bloom, D. E., Canning, D., & Weston, M. (2005). The value of vaccination. *World Economics*, *6*, 15–39.

- Bondi, F. S., & Alháji, M. A. (1992). The EPI in Borno State, Nigeria: Impact on routine disease notifications and hospital admissions. *Journal of Tropical Medicine and Hygiene*, 95, 373–381.
- Bower, H. (2013). Impact of a mass media campaign on bed net use in Cameroon. *Malaria Journal*, 12, 36.
- Briscoe, C., & Aboud, F. (2012). Behaviour change communication targeting four health behaviors in developing countries: A review of change techniques. *Social Science & Medicine*, 75, 612–621.
- Bruyeron, O., Denizeau, M., Berger, J., & Trèche, S. (2010). Marketing complementary foods and supplements in Burkina Faso, Madagascar, and Vietnam: Lessons learned from the Nutridev program. *Food and Nutrition Bulletin*, 31(Suppl 2), S154–S167.
- Calil, R., Marba, S. T. M., Von Nowakowski, A., & Tresoldi, A. T. (2001). Reduction in colonization and nosocomial infection by multiresistant bacteria in a neonatal unit after institution of educational measures and restriction in the use of cephalosporins. *American Journal of Infection Control*, 29(3), 133–138.
- Carrera, C., Azrack, A., Begkoyian, G., Pfaffmann, J., Ribaira, E., O'Connell, T.,... UNICEF Equity in Child Survival, Health, and Nutrition Analysis Team. (2012). The comparative cost-effectiveness of an equity-focused approach to child survival, health, and nutrition: A modelling approach. *The Lancet*, 380, 1341–1351.
- Callaghan-Koru, J. A., Gilroy, K., Hyder, A. A., George, A., Nsona, H., Mtimuni, A.,... Bryce, J. (2013). Health systems supports for community case management of childhood illness: Lessons from an assessment of early implementation in Malawi. *BMC Health Services Research*, 13(1), 55.
- Centers for Disease Control and Prevention. (2013). Impact of an innovative approach to prevent mother-to-child transmission of HIV-Malawi, July 2011–September 2012. *Morbidity and Mortality Weekly Report*, 62, 148.
- Chen, Y. (1989). Synergistic effect of passive smoking and artificial feeding on hospitalization for respiratory illness in early childhood. *Chest*, 95, 1004–1007.
- Chen, Y. (1994). Environmental tobacco smoke, low birth weight, and hospitalization for respiratory disease. *American Journal of Respiratory and Critical Care Medicine*, 150, 54–58.
- Chen, Y., Li, W., Yu, S., & Qian, W. (1988). Chang-Ning epidemiological study of children's health, I: Passive smoking and children's respiratory diseases. *International Journal of Epidemiology*, 17, 348–355.
- Chi, B. H., Adler, M. R., Bolu, O., Mbori-Ngacha, D., Ekouevi, D. K., Gieselman, A.,... Stringer, J. S. (2012). Progress, challenges, and new opportunities for the prevention of mother-to-child transmission of HIV under the US President's emergency plan for AIDS relief. *Journal of Acquired Immune Deficiency Syndromes*, 60, S78–S87.
- Chongsuvivatwong, V., Bujakorn, L., Kanpoy, V., & Treetrong, R. (1993). Control of neonatal tetanus in southern Thailand. *International Journal of Epidemiology*, 22, 931–935.
- Chopra, M., Mason, E., Borazzo, J., Campbell, H., Rudan, I., Liu, L.,... Bhutta, Z. A. (2013). Ending preventable deaths from pneumonia and diarrhea: An achievable goal. *The Lancet*, 38, 1499–1506.
- Christie, C. D. C., & Pierre, R. B. (2012). Eliminating vertically-transmitted HIV/AIDS while improving access to treatment and care for women, children and adolescents in Jamaica. *West Indian Medical Journal*, 61, 397–404.
- Colbourn, T., Lewycka, S., Nambiar, B., Phoya, A., & Mhango, C. (2012). Maternal mortality in Malawi, 1977–2012. *BMJ Open*, 3, 12.
- Creanga, A. A., Bradley, H. M., Kidanu, A., Melkamu, Y., & Tsui, A. O. (2007). Does the delivery of integrated family planning and HIV/AIDS services influence community-based workers' client loads in Ethiopia? *Health Policy Plan*, 22, 404–414.
- Cunliffe, N., Kirsten, M., Madhi, S. A., Witte, D., Ngwira, B., & Pieter Bos, C. (2009). Efficacy of human rotavirus vaccine RIX4414 in Africa during the first year of life. *Pediatric Infectious Disease Journal*, 28, 524.

- Darmstadt, G. L., Ahmed, A. N. U., Saha, S. K., Chowdhury, M. A., Alam, M. A., Khatun, M., ... Santosham, M. (2005). Infection control practices reduce nosocomial infections and mortality in preterm infants in Bangladesh. *Journal of Perinatology*, *25*, 331–335.
- De Gentile, A., Rivas, N., Sinkowitz-Cochran, R. L., Momesso, T., Iriart, E. M., Lopez, E., ... Jarvis, W. R. (2001). Nosocomial infections in a children's hospital in Argentina: Impact of a unique infection control intervention program. *Infection Control and Hospital Epidemiology*, *22*, 762–766.
- Deorari, A. K., Paul, V. K., Singh, M., & Vidyasagar, D. (2001). Impact of education and training on neonatal resuscitation practices in 14 teaching hospitals in India. *Annals of Tropical Paediatrics*, *21*, 29–33.
- Diala, C., Adelaja, A., Astatke, H., & Bery, R. (2012). *Health communication assessment of ministries of health and national AIDS authorities in 6 countries*. Washington, DC: FHI360. Retrieved from <https://www.c-changeprogram.org/sites/default/files/MOH-NAA-Health-Communication-Assessment-FINAL.pdf>
- DiCenso, A., Guyatt, G., Willan, A., & Griffith, L. (2002). Interventions to reduce unintended pregnancies among adolescents: systematic review of randomised controlled trials. *BMJ*, *324*, 1426.
- Ding, H., Yang, Y., Wei, J., Fan, S., Yu, S., Yao, K., & Shen, X. (2008). Influencing the use of antibiotics in a Chinese pediatric intensive care unit. *Pharmacy World and Science*, *30*, 787–793.
- Dyson, L., McCormick, F. M., & Renfrew, M. J. (2005). Interventions for promoting the initiation of breastfeeding. *Cochrane Database of Systematic Reviews*, *2005*(2), CD001688.
- Eickmann, S. H., Lima, A. C., Guerra, M. Q., Lima, M. C., Lira, P. I., Huttly, S. R., & Ashworth, A. (2003). Improved cognitive and motor development in a community-based intervention of psychosocial stimulation in northeast Brazil. *Developmental Medicine and Child Neurology*, *45*, 536–541.
- Elder, J., Louis, T., Sutisnaputra, O., Sulaeiman, N., Ware, L., Shaw, W., ... Graeff, J. (1992). The use of diarrhoeal management counseling cards for community health volunteer training in Indonesia: The HealthCom Project. *Journal of Tropical Medicine and Hygiene*, *94*, 301–308.
- Elder, J. P., Pequegnat, W., Ahmed, S., Bachman, G., Bullock, M., Carlo, W. A., ... Sweat, M. (2014). Caregiver behavior change for child survival and development in low- and middle-income countries: An examination of the evidence. *Journal of Health Communication*, *19*(Suppl 1), 25–66.
- Engle, P. L., Black, M. M., Behrman, J. R., Cabral de Mello, M., Gertler, P. J., Kapiriri, L., ... International Child Development Steering Group. (2007). Strategies to avoid the loss of developmental potential in more than 200 million children in the developing world. *Lancet*, *369*, 229–242.
- Ertem, I. O., Pekcici, E. B., Gok, C. G., Ozbas, S., Ozcebe, H., & Beyazova, U. (2009). Addressing early childhood development in primary health care: Experience from a middle-income country. *Journal of Developmental and Behavioral Pediatrics*, *30*, 319–326.
- Farnsworth, S. K., Böse, K., Fajobi, O., Souza, P. P., Peniston, A., Davidson, L., ... Hodgins, S. (2014). Community engagement to enhance child survival and early development in low- and middle-income countries: An evidence review. *Journal of Health Communication*, *19*(Suppl 1), 67–88.
- Favin, M., Steinglass, R., Fields, R., Banerjee, K., & Sawhney, M. (2012). Why children are not vaccinated: A review of the grey literature. *International Health*, *4*, 229–238.
- Feed the Future. (2013). *Improved nutrition: The U.S. Government's Global Hunger and Food Security Initiative*. Retrieved from <http://www.feedthefuture.gov/approach/Improved-Nutrition#focus-areas>
- Fernald, L. C., Gertler, P. J., & Neufeld, L. M. (2009). 10-year effect of Oportunidades, Mexico's conditional cash transfer programme, on child growth, cognition, language, and behaviour: A longitudinal follow-up study. *The Lancet*, *374*, 1997–2005.

- Fox, E., & Obregón, R. (2014). Population-level behavior change to enhance child survival and development in low- and middle-income countries. *Journal of Health Communication, 19*(Suppl 1), 3–9.
- Franco, L. M., & Marquez, L. (2011). Effectiveness of collaborative improvement: Evidence from 27 applications in 12 less-developed and middle-income countries. *BMJ Quality & Safety, 20*, 658–665.
- Garcés, A., McClure, E. M., Hambidge, M., Krebs, N. F., Mazariegos, M., Wright, L. L., . . . Carlo, W. A. (2012). Training traditional birth attendants on the WHO Essential Newborn Care reduces perinatal mortality. *Acta Obstetrica et Gynecologica Scandinavica, 91*, 593–597.
- Garmendia, M. L., Corvalán, C., & Uauy, R. (2013). Addressing malnutrition while avoiding obesity: Minding the balance. *European Journal of Clinical Nutrition, 67*, 513–517.
- Garner, A. S., & Shonkoff, J. P., Committee on Psychosocial Aspects of Child and Family Health Committee on Early Childhood Adoption and Dependent Care, Section on Developmental and Behavioral Pediatrics. (2012). Early childhood adversity, toxic stress, and the role of the pediatrician: Translating developmental science into lifelong health. *Pediatrics, 129*(1), e224–e231.
- Gertler, P. (2004). Do conditional cash transfers improve child health? Evidence from PROGRESA's control randomized experiment. *American Economic Review Papers and Proceedings, 94*, 336–341.
- Gies, S., Coulibaly, S. O., Ouattara, F. T., Ky, C., Brabin, B. J., & D'Alessandro, U. (2008). A community effectiveness trial of strategies promoting intermittent preventive treatment with sulphadoxine-pyrimethamine in pregnant women in rural Burkina Faso. *Malaria Journal, 7*(1), 180.
- Glassman, A., Duran, D., Fleisher, L., Singer, D., Sturke, R., Angles, G., . . . Koblinsky, M. (2013). Impact of conditional cash transfers on maternal and newborn health. *Journal of Health, Population and Nutrition, 31*(4 Suppl 2), S48–S66.
- Goel, S., Dogra, V., Gupta, S. K., Lakshmi, P. V., Varkey, S., Pradhan, N., & Kumar, R. (2012). Effectiveness of Muskaan Ek Abhiyan (The Smile Campaign) for strengthening routine immunization in Bihar, India. *Indian Pediatrics, 49*(2), 103–108.
- Gomes, M. F., Warsame, M., Nasemba, N., Singlovic, J., Kapinga, A., Mwankuyse, S., & Mrango, Z. (2010). Gaining time: Early treatment of severe pediatric malaria in Tanzania. *Drug Development Research, 71*, 92–98.
- Goudar, S. S., Dhaded, S. M., McClure, E. M., Derman, R. J., Patil, V. D., Mahantshetti, N. S., . . . Carlo, W. A. (2012). ENC training reduces perinatal mortality in Karnataka, India. *Journal of Maternal-Fetal and Neonatal Medicine, 25*, 568–574.
- Grantham-McGregor, S. M., Cheung, Y. B., Cueto, S., Glewwe, P., Richter, L., & Strupp, B. International Child Development Steering Group. (2007). Developmental potential in the first 5 years for children in developing countries. *The Lancet, 369*, 60–70.
- Grantham-McGregor, S. M., Powell, C. A., Walker, S. P., Chang, S., & Fletcher, P. (1994). The long-term follow-up of severely malnourished children who participated in an intervention program. *Child Development, 65*, 428–439.
- Grantham-McGregor, S. M., Powell, C. A., Walker, S. P., & Himes, J. H. (1991). Nutritional supplementation, psychosocial stimulation, and mental development of stunted children: The Jamaican study. *The Lancet, 338*, 1–5.
- Grantham-McGregor, S. M., Walker, S. P., Chang, S. M., & Powell, C. A. (1997). Effects of early childhood supplementation with and without stimulation on later development in stunted Jamaican children. *American Journal of Clinical Nutrition, 66*, 247–543.
- Grantham-McGregor, S. M., Schofield, W., & Powell, C. A. (1987). Development of severely malnourished children who received psychosocial stimulation: Six-year follow-up. *Pediatrics, 79*, 247–254.

- Gribble, J. N., Lundgren, R. I., Velasquez, C., & Anastasi, E. E. (2008). Being strategic about contraceptive introduction: The experience of the Standard Days Method⁽⁶⁾. *Contraception*, 77(3), 147–154.
- Grijalva, C. G., Nuorti, J. P., Arbogast, P. G., Martin, S. W., Edwards, K. M., & Griffin, M. R. (2007). Decline in pneumonia admissions after routine childhood immunisation with pneumococcal conjugate vaccine in the USA: A time-series analysis. *The Lancet*, 369, 1179–1186.
- Gupta, N., Goel, K., Shah, P., & Misra, A. (2012). Childhood obesity in developing countries: Epidemiology, determinants, and prevention. *Endocrinology Review*, 33(1), 48–70.
- Gurskis, V., Asembergiene, J., Kevalas, R., Miciuleviciene, J., Pavilonis, A., Valinteliene, R., & Dagys, A. (2009). Reduction of nosocomial infections and mortality attributable to nosocomial infections in pediatric intensive care units in Lithuania. *Medicina (Kaunas)*, 45, 203–213.
- Gutierrez, G., Guiscafre, H., Bronfman, M., Walsh, J., Martinez, H., & Munoz, O. (1994). Changing physician prescribing patterns: Evaluation of an educational strategy for acute diarrhea in Mexico City. *Medical Care*, 32, 436–446.
- Han, M., Chen, Q., Hao, Y., Hu, Y., Wang, D., Gao, Y., & Bulterys, M. (2010). Design and implementation of a China comprehensive AIDS response programme (China CARES), 2003–08. *International Journal of Epidemiology*, 39(Suppl 2), ii47–ii155.
- Harris, M., & Haines, A. (2010). Brazil's family health programme. *BMJ*, 341, 1171–1176.
- Heckman, J. J. (2008). The case for investing in disadvantaged young children. In First Focus (Ed.), *Big ideas for children: Investing in our nation's future* (pp. 49–58). Washington, DC: First Focus.
- Helitzer-Allen, D. L., Macheso, A., Wirima, J., & Kendall, C. (1994). Testing strategies to increase use of chloroquine chemoprophylaxis during pregnancy in Malawi. *Acta Tropica*, 58, 255–266.
- Higgs, E. S., Goldberg, A. B., Labrique, A. B., Cook, S. H., Schmid, C., Cole, C. F., & Obregón, R. A. (2014). Understanding the role of mHealth and other media interventions for behavior change to enhance child survival and development in low-and middle-income countries: An evidence review. *Journal of Health Communication*, 19(Suppl 1), 164–189.
- Hindin, M. J., Christiansen, C. S., & Ferguson, B. J. (2013). Setting research priorities for adolescent sexual and reproductive health in low-and middle-income countries. *Bulletin of the World Health Organization*, 91, 10–18.
- Hosoglu, S., Hascuhadar, M., Yasar, E., Uslu, S., & Aldudak, B. (2012). Control of an *Acinetobacter* [corrected] *baumannii* outbreak in a neonatal ICU without suspension of service: a devastating outbreak in Diyarbakir, Turkey. *Infection*, 40, 11–18.
- Ihab, A. N., Rohana, A. J., Wan Manan, W. M., Wan Suriati, W. N., Zalilah, M. S., & Rusli, A. M. (2013). The coexistence of dual form of malnutrition in a sample of rural Malaysia. *International Journal of Preventative Medicine*, 4, 690–699.
- Independent Evaluation Group. (2011). *Do conditional cash transfers lead to medium-term impacts? Evidence from a female school stipend program in Pakistan*. Washington, DC: World Bank.
- Isakbaeva, E. T., Musabaev, E., Antil, L., Rheingans, R., Juraev, R., Glass, R. I., & Bresee, J. S. (2007). Rotavirus disease in Uzbekistan: Cost-effectiveness of a new vaccine. *Vaccine*, 25, 373–380.
- Jeffery, H. E., Kocova, M., Tozija, F., Gjorgiev, D., Pop-Lazarova, M., Foster, K., ... Hill, D. A. (2004). The impact of evidence-based education on a perinatal capacity-building initiative in Macedonia. *Medical Education*, 38, 435–447.
- Jin, X., Sun, Y., Jiang, F., Ma, J., Morgan, C., & Shen, X. (2007). “Care for Development” intervention in rural China: A prospective follow-up study. *Journal of Developmental and Behavioral Pediatrics*, 28, 213–218.
- John, T. J., Samuel, R., Balraj, V., & John, R. (1998). Disease surveillance at district level: A model for developing countries. *The Lancet*, 352, 58–61.

- Joint United Nations Programme on HIV/AIDS. (2012). *Together we will end AIDS*. Geneva, Switzerland: Author. Retrieved from http://www.unaids.org/en/media/unaids/contentassets/documents/epidemiology/2012/jc2296_unaids_togetherreport_2012_en.pdf
- Jones, C. O., Wasunna, B., Sudoi, R., Githinji, S., Snow, R. W., & Zurovac, D. (2012). “Even if you know everything you can forget”: Health worker perceptions of mobile phone text-messaging to improve malaria case-management in Kenya. *PLoS One*, 7(6), e38636.
- Kanshana, S., & Simonds, R. J. (2002). National program for preventing mother-child HIV transmission in Thailand: Successful implementation and lessons learned. *AIDS*, 16, 953–959.
- Kinuthia, J., Kiarie, J. N., Farquhar, C., Richardson, B. A., Nduati, R., Mbori-Ngacha, D., & John-Stewart, G. (2011). Uptake of prevention of mother-to-child transmission interventions in Kenya: Health systems are more influential than stigma. *Journal of the International AIDS Society*, 14, 61.
- Kirby, D. (2002). Effective approaches to reducing adolescent unprotected sex, pregnancy, and childbearing. *Journal of Sex Research*, 39, 51–57.
- Kraft, J. M., Wilkins, K. G., Morales, G. J., Widyono, M., & Middlestadt, S. E. (2014). An evidence review of gender-integrated interventions in reproductive and maternal-child health. *Journal of Health Communication*, 19(Suppl 1), 122–141.
- Kumar, V., Mohanty, S., Kumar, A., Misra, R. P., Santosham, M., Awasthi, S., ... Darmstadt, G. L. (2008). Effect of community-based behaviour change management on neonatal mortality in Shivgarh, Uttar Pradesh, India: A cluster-randomised controlled trial. *The Lancet*, 372, 1151–1162.
- Kwast, B. E. (1995). Building a community-based maternity program. *International Journal of Gynecology & Obstetrics*, 48, S67–S82.
- Labadarios, D., Steyn, N. P., Mgiijima, C., & Daldla, N. (2005). Review of the South African nutrition policy 1994–2002 and targets for 2007: Achievements and challenges. *Nutrition*, 21, 100–108.
- Lacapère, F., Magloire, R., Danovaro-Holliday, M. C., Flannery, B., Chamoulliet, H., & Celestin, E. P. (2011). The use of rapid coverage monitoring in the National Rubella Vaccination Campaign, Haiti 2007–2008. *Journal of Infectious Diseases*, 204(Suppl 2), S698–S705.
- Lagarde, M., Haines, A., & Palmer, N. (2007). Conditional cash transfers for improving uptake of health interventions in low- and middle-income countries: a systematic review. *JAMA*, 298, 1900–1910.
- Lejarraga, H., Krupitzky, S., Gimenez, E., Diament, N., Kelmansky, D., Tibaldi, F., & Cameron, N. (1997). The organisation of a national survey for evaluating child psychomotor development in Argentina. *Paediatric and Perinatal Epidemiology*, 11, 359–373.
- Leroy, J. L., Gadsden, P., Rodríguez-Ramírez, S., & de Cossio, T. G. (2010). Cash and in-kind transfers in poor rural communities in Mexico increase household fruit, vegetable, and micronutrient consumption but also lead to excess energy consumption. *Journal of Nutrition*, 140, 612–617.
- Leroy, J. L., García-Guerra, A., García, R., Dominguez, C., Rivera, J., & Neufeld, L. M. (2008). The Oportunidades program increases the linear growth of children enrolled at young ages in urban Mexico. *Journal of Nutrition*, 138, 793–798.
- Loevinsohn, B. P., & Gareaballah, E. (1992). Missed opportunities for immunization during visits for curative care: A randomized cross-over trial in Sudan. *Bulletin of the World Health Organization*, 70, 335–339.
- Maitra, K., Singh, K. K., Sekhar, C. C., & Saxena, B. N. (1995). A multicentre collaborative study of the care of mothers and infants with a comprehensive MCH care package utilizing high risk approach strategy at primary health centres: Summary, conclusions and recommendations. *Indian Pediatrics*, 32, 67–72.
- Malaju, M. T., & Alene, G. D. (2012). Assessment of utilization of provider-initiated HIV testing and counseling as an intervention for prevention of mother-to-child transmission

- of HIV and associated factors among pregnant women in Gondar town, North West Ethiopia. *BMC Public Health*, 12, 226.
- Mannar, M. G., & Sankar, R. (2004). Micronutrient fortification of foods: Rationale, application and impact. *Indian Journal of Pediatrics*, 71, 997–1002.
- Marfin, A. A., Moore, J., Collins, C., Biellik, R., Kattel, U., Toole, M. J., & Moore, P. S. (1994). Infectious disease surveillance during emergency relief to Bhutanese refugees in Nepal. *JAMA*, 272, 377–381.
- Mbabazi, W. B., Nanyunja, M., Makumbi, I., Braka, F., Baliraine, F. N., Kisakye, A., . . . Lewis, R. F. (2009). Achieving measles control: Lessons from the 2002–06 measles control strategy for Uganda. *Health Policy and Planning*, 24, 261–269.
- McCarragher, D. R., Chen-Mok, M., Oronoz, A. S., Brito-Anderson, S., Grey, T., Tucker, H., & Bailey, P. E. (2010). Meeting the needs of adolescent post-abortion care patients in the Dominican Republic. *Journal of Biosocial Science*, 42, 493–509.
- Meeks Gardner, J., Walker, S. P., Powell, C. A., & Grantham-McGregor, S. M. (2003). A randomized controlled trial of a home-visiting intervention on cognition and behavior in term low birth weight infants. *Journal of Pediatrics*, 143, 634–639.
- Meuwissen, L. E., Gorter, A. C., & Knottnerus, A. (2006). Impact of accessible sexual and reproductive health care on poor and underserved adolescents in Managua, Nicaragua: A quasi-experimental intervention study. *Journal of Adolescent Health*, 38(1), 56.
- Mills, A. (2014). Health care systems in low- and middle-income countries. *New England Journal of Medicine*, 370, 552–557.
- Mohan, P., Kishore, B., Singh, S., Bahl, R., Puri, A., & Kumar, R. (2011). Assessment of implementation of integrated management of neonatal and childhood illness in India. *Journal of Health, Population and Nutrition*, 29, 629–638.
- Nahar, B., Hamadani, J. D., Ahmed, T., Tofail, F., Rahman, A., Huda, S. N., & Grantham-McGregor, S. M. (2009). Effects of psychosocial stimulation on growth and development of severely malnourished children in a nutrition unit in Bangladesh. *European Journal of Clinical Nutrition*, 63, 725–731.
- Naimoli, J. F., Frymus, D. E., Quain, E. E., & Roseman, E. L. (2012). *Community and formal health system support for enhanced community health worker performance. A U.S. Government Evidence Summit: Final report*. Retrieved from <http://www.usaid.gov/sites/default/files/documents/1864/CHW-Evidence-Summit-Final-Report.pdf>
- Nair, M. K., Philip, E., Jeyaseelan, L., George, B., Mathews, S., & Padma, K. (2009). Effect of child development centre model early stimulation among at risk babies—A randomized controlled trial. *Indian Pediatrics*, 46, S20–S26.
- Naugle, D., & Hornik, R. C. (2014). Systematic review of the effectiveness of mass media interventions for child survival in low- and middle-income countries. *Journal of Health Communication*, 19(Suppl 1), 190–215.
- Nayar, U. S., Stangl, A. L., De Zaluondo, B., & Brady, L. M. (2014). Reducing stigma and discrimination to improve child health and survival in low- and middle-income countries: Promising approaches and implications for future research. *Journal of Health Communication*, 19(Suppl 1), 142–163.
- Neves, Z. C. P., Tipple, A. F. V., Souza, A. C. S., Pereira, M. S., Melo, D. S., & Ferreira, L. R. (2006). Hand hygiene: The impact of incentive strategies on adherence among healthcare workers from a newborn intensive care unit. *Rev Latino-am Enfermagem*, 14, 546–552.
- Nsimba, S. E. D. (2007). Assessing the impact of educational intervention for improving management of malaria and other childhood illnesses in Kibaha district-Tanzania. *East African Journal of Public Health*, 4, 5–11.
- Oringanje, C., Meremikwu, M. M., Eko, H., Esu, E., Meremikwu, A., & Ehiri, J. E. (2009). Interventions for preventing unintended pregnancies among adolescents. *Cochrane Database of Systematic Reviews*, 2009(4).
- Paes-Sousa, R., Santos, L. M., & Miazaki, É. S. (2011). Effects of a conditional cash transfer programme on child nutrition in Brazil. *Bulletin of the World Health Organization*, 89, 496–503.

- Pagnoni, F., Convelbo, N., Tiendrebeogo, J., Cousens, S., & Esposito, F. (1997). A community-based programme to provide prompt and adequate treatment of presumptive malaria in children. *Transactions of the Royal Society of Tropical Medicine and Hygiene*, *91*, 512–517.
- Pariyo, G. W., Gouws, E., Bryce, J., & Burnham, G. (2005). Improving facility-based care for sick children in Uganda: Training is not enough. *Health Policy and Planning*, *20*(Suppl 1), i58–i68.
- Pearson, B. L., & Ljungqvist, B. (2011). REACH: An effective catalyst for scaling up priority nutrition interventions at the country level. *Food and Nutrition Bulletin*, *32*(Suppl 2), s115–s127.
- Philbrick, W. C. (2012). *mHealth and MNCH: State of the evidence. Reviewing evidence on the use of mHealth to improve maternal, newborn and child health: Trends, gaps, stakeholder needs, and opportunities for future research mHealth and MNCH: State of the evidence.* MHealth Alliance. Retrieved from <http://www.gfmer.ch/mhealth/coursefiles2013/mhealthmnch-evidence-final.pdf>
- Population Services International. (2011). *Why PSI uses social marketing: The evidence base.* Retrieved from http://www.psi.org/sites/default/files/publication_files/SM-Evidence-Base_March2011-update.pdf
- Porter, R. W., Steinglass, R., Kaiser, J., Olkhovsky, P., Rasmuson, M., Dzhatdоеva, F. A., . . . , Bragina, V. (2000). Role of health communications in Russia's diphtheria immunization program. *Journal of Infectious Diseases*, *181*(Suppl 1), S220–S227.
- Potterton, J., Stewart, A., Cooper, J., & Becker, P. (2010). The effect of a basic home stimulation programme on the development of young children infected with HIV. *Developmental Medicine and Child Neurology*, *52*, 547–551.
- Powell, C. (2004). *An evaluation of the Roving Caregivers Programme of the Rural Family Support Organization, May Pen, Clarendon, Jamaica.* Kingston, Jamaica: UNICEF.
- Powell, C., Baker-Henningham, H., Walker, S., Gernay, J., & Grantham-McGregor, S. M. (2004). Feasibility of integrating early stimulation into primary care for undernourished Jamaican children: Cluster randomised controlled trial. *British Medical Journal*, *329*, 89–92.
- Powell, C., & Grantham-McGregor, S. M. (1989). Home visiting of varying frequency and child development. *Pediatrics*, *84*, 157–164.
- Prasad, A. M., Chakraborty, G., Yadav, S. S., & Bhatia, S. (2013). Addressing the social determinants of health through health system strengthening and inter-sectoral convergence: The case of the Indian National Rural Health Mission. *Global Health Action*, *6*, 1–11.
- Pridmore, P., & Carr-Hill, R. (2011). Tackling the drivers of child undernutrition in developing countries: What works and how should interventions be designed? *Public Health and Nutrition*, *14*, 688–693.
- Ray, G. T., Whitney, C. G., Fireman, B. H., Ciuryla, V., & Black, S. B. (2006). Cost-effectiveness of pneumococcal conjugate vaccine: Evidence from the first 5 years of use in the United States incorporating herd effects. *Pediatric Infectious Disease Journal*, *25*, 494–501.
- Resende, D. S., Brito, D. V. D. D., Abdallah, V. O. S., & Gontijo Filho, P. P. (2011). Reduction of catheter-associated bloodstream infections through procedures in newborn babies admitted in a university hospital intensive care unit in Brazil. *Revista da Sociedade Brasileira de Medicina Tropical*, *44*, 731–734.
- Rivera, J. A., Sotres-Alvarez, D., Habicht, J. P., Shamah, T., & Villalpando, S. (2004). Impact of the Mexican program for education, health, and nutrition (Progresa) on rates of growth and anemia in infants and young children: a randomized effectiveness study. *JAMA*, *291*, 2563–2570.
- Rocha, R., & Soares, R. R. (2010). Evaluating the impact of community-based health interventions: Evidence from Brazil's Family Health Program. *Health Economics*, *19*(Suppl 1), 126–158.

- Rowe, A. K., Onikpo, F., Lama, M., Osterholt, D. M., Rowe, S. Y., & Deming, M. S. (2009). A multifaceted intervention to improve health worker adherence to integrated management of childhood illness guidelines in Benin. *American Journal of Public Health, 99*, 837–846.
- Ryman, T. K., Trakroo, A., Wallace, A., Gupta, S. K., Wilkins, K., Mehta, P., & Dietz, V. (2011). Implementation and evaluation of the Reaching Every District (RED) strategy in Assam, India, 2005–2008. *Vaccine, 29*, 2555–2560.
- Saha, S. K., Khan, N. Z., Ahmed, A. N. U., Amin, M. R., Hanif, M., Mahbub, M., . . . Baqui, A. H. (2009). Neurodevelopmental sequelae in pneumococcal meningitis cases in Bangladesh: A comprehensive follow-up study. *Clinical Infectious Diseases, 48*(Suppl 2), S90–S96.
- Scherzer, A. L. (2009). Experience in Cambodia with the use of a culturally relevant developmental milestone chart for children in low- and middle-income countries. *Journal of Policy and Practice in Intellectual Disabilities, 6*, 287–292.
- Schouten, E. J., Jahn, A., Midiani, D., Makombe, S. D., Mnthambala, A., Chirwa, Z., . . . Chimbandira, F. (2011). Prevention of mother-to-child transmission of HIV and the health-related Millennium Development Goals: Time for a public health approach. *The Lancet, 378*, 282–284.
- Sebastian, M. P., Khan, M. E., & Roychowdhury, S. (2010). Promoting healthy spacing between pregnancies in India: Need for differential education campaigns. *Patient Education and Counseling, 81*, 395–401.
- Senarath, U., Fernando, D. N., & Rodrigo, I. (2007). Effect of training for care providers on practice of essential newborn care in hospitals in Sri Lanka. *Journal of Obstetric, Gynecologic, & Neonatal Nursing, 36*, 531–541.
- Shah, P. M., Selwyn, B. J., Shah, K., Kumar, V., Abraham, S., Akhter, M. S., . . . Saxena, V. B. (1993). Evaluation of the home-based maternal record: A WHO collaborative study. *Bulletin of the World Health Organization, 71*, 535–548.
- Sharma, S. K., Sawangdee, Y., & Sirirassamee, B. (2007). Access to health: Women's status and utilization of maternal health services in Nepal. *Journal of Biosocial Science, 39*, 671–692.
- Shonkoff, J. P., Richter, L., van der Gaag, J., & Bhutta, Z. A. (2012). An integrated scientific framework for child survival and early childhood development. *Pediatrics, 129*, e460–e472.
- Sinha, A., Levine, O., Knoll, M. D., Muhib, F., & Lieu, T. A. (2007). Cost-effectiveness of pneumococcal conjugate vaccination in the prevention of child mortality: An international economic analysis. *The Lancet, 369*, 389–396.
- Stanton, M. E., Higgs, E. S., & Koblinsky, M. (2013). Investigating financial incentives for maternal health: An introduction. *Journal of Health, Population and Nutrition, 31*(4 Suppl 2), S1–S7.
- Streefland, P. H., Chowdhury, A. M. R., & Ramos-Jimenez, P. (1999). Quality of vaccination services and social demand for vaccinations in Africa and Asia. *Bulletin of the World Health Organization, 77*, 722–730.
- Task Force on Community Preventive Services. (2001). Recommendations regarding interventions to reduce tobacco use and exposure to environmental tobacco smoke. *American Journal of Preventive Medicine, 20*(2 Suppl 1), 10–15.
- Tavrow, P., Shabahang, J., & Makama, S. (2003). Vendor-to-vendor education to improve malaria treatment by private drug outlets in Bungoma District, Kenya. *Malaria Journal, 2*(1), 10.
- Thomas, A., Kumar, V., Bhandari, M., Ahuja, R. C., Singh, P., Baqui, A. H., & Yadav, R. (2009). Neonatal health program management in a resource-constrained setting in rural Uttar Pradesh, India. *International Journal of Health Planning and Management, 24*, 173–184.
- Thompson, M. E., & Harutyunyan, T. L. (2009). Impact of a community-based Integrated Management of Childhood Illnesses (IMCI) programme in Gegharkunik, Armenia. *Health Policy and Planning, 24*, 101–107.

- UNICEF. (2009). *Case study: Uganda Infant and Young Child Feeding Programme review*. New York, NY: Author. Retrieved from http://www.aednutritioncenter.org/update_docs/IYCF_Feeding_Prog_Rev_Case_Study_Uganda.pdf
- UNICEF. (2013). *Literature review of existing evidence on effectiveness and sustainability of behavior change interventions supporting child survival initiatives*. New York, NY: Author. Retrieved from http://www.healthcommcapacity.org/wp-content/uploads/2014/03/ethiopia_meeting_summary_report_final_version.pdf
- UNICEF India Country Office and Population Council. (2013). *Literature review of existing evidence on effectiveness and sustainability of behavior change interventions supporting child survival initiatives*. Unpublished report.
- United Nations Summit. (2010a). *Fact sheet—Goal 1: Eradicate extreme poverty and hunger*. Retrieved from http://www.un.org/millenniumgoals/pdf/MDG_FS_1_EN.pdf
- United Nations Summit. (2010b). *Fact sheet—Goal 4: Reduce child mortality*. Retrieved from http://www.un.org/millenniumgoals/pdf/MDG_FS_4_EN.pdf
- United Nations Systems Standing Commitment to Nutrition. (2009). *Scaling up nutrition: A framework for action*. Retrieved from http://scalingupnutrition.org/wp-content/uploads/2013/05/SUN_Framework.pdf
- Uskun, E., Uskun, S. B., Uysalgenc, M., & Yagiz, M. (2008). Effectiveness of a training intervention on immunization to increase knowledge of primary healthcare workers and vaccination coverage rates. *Public Health, 122*, 949–958.
- Vandelaer, J., Bilous, J., & Nshimirimana, D. (2008). Reaching Every District (RED) approach: A way to improve immunization performance. *Bulletin of the World Health Organization, 86*(3), A–B.
- Victora, C. G., Adair, L., Fall, C., Hallal, P. C., Martorell, R., Richter, L., & Sachdev, H. S. (2008). Maternal and child undernutrition: Consequences for adult health and human capital. *The Lancet, 371*, 340–357.
- Walker, S. P., Chang, S. M., Powell, C. A., & Grantham-McGregor, S. M. (2004). Psychosocial intervention improves the development of term low-birth-weight infants. *Journal of Nutrition, 134*, 1417–1423.
- Walker, S. P., Wachs, T. D., Gardner, J. M., Lozoff, B., Wasserman, G. A., Pollitt, E., . . . International Child Development Steering Group. (2007). Child development: Risk factors for adverse outcomes in developing countries. *The Lancet, 369*, 145–157.
- Walker, S. P., Wachs, T. D., Grantham-McGregor, S., Black, M. M., Nelson, C. A., Huffman, S. L., . . . Richter, L. (2011). Inequality in early childhood: Risk and protective factors for early child development. *The Lancet, 378*, 1325–1338.
- Warren, C., Mwangi, A., Oweya, E., Kamunya, R., & Koskei, N. (2009). Safeguarding maternal and newborn health: Improving the quality of postnatal care in Kenya. *International Journal for Quality in Health Care, 22*, 24–30.
- Widdowson, M. A., Meltzer, M. I., Zhang, X., Bresee, J. S., Parashar, U. D., & Glass, R. I. (2007). Cost-effectiveness and potential impact of rotavirus vaccination in the United States. *Pediatrics, 119*, 684–697.
- Wirth, J. P., Laillou, A., Rohner, F., Northrop-Clews, C. A., Macdonald, B., & Moench-Pfanner, R. (2012). Lessons learned from national food fortification projects: Experiences from Morocco, Uzbekistan, and Vietnam. *Food and Nutrition Bulletin, 33*(Suppl 4), S281–S292.
- Wium, A. M., Louw, B., & Elof, I. (2010). Speech-language therapists supporting foundation-phase teachers with literacy and numeracy in a rural and township context. *The South African Journal of Communication Disorders, 57*, 14–21.
- World Health Organization. (2003). *Global strategy for infant and young child feeding*. Geneva, Switzerland: Author. Retrieved from <http://whqlibdoc.who.int/publications/2003/9241562218.pdf>
- World Health Organization. (2010a). *Antiretroviral drugs for treating pregnant women and preventing HIV infections in infants*. Geneva, Switzerland: Author. Retrieved from http://whqlibdoc.who.int/publications/2010/9789241599818_eng.pdf

- World Health Organization. (2010b). *A review of nutrition policies*. Geneva, Switzerland: Author. Retrieved from http://www.who.int/nutrition/EB128_18_Backgroundpaper1_A_review_of_nutritionpolicies.pdf
- World Health Organization. (2011). *Newborn death and illness*. Geneva, Switzerland: Author.
- World Health Organization. (2012a). *Global Vaccine Action Plan*. A65/22. Geneva, Switzerland: Author. Retrieved from [http://globalvaccinesummit.org/Resources/en/02_Information%20on%20Immunization%20&%20Polio%20Eradication/Global-Vaccine-Action-Plan-\(English\).pdf](http://globalvaccinesummit.org/Resources/en/02_Information%20on%20Immunization%20&%20Polio%20Eradication/Global-Vaccine-Action-Plan-(English).pdf)
- World Health Organization. (2012b). *Use of antiretroviral drugs for treating pregnant women and preventing HIV infection in infants*. Geneva, Switzerland: Author. Retrieved from http://www.who.int/hiv/pub/mtct/programmatic_update2012
- World Health Organization. (2013). *WHO framework convention on tobacco control*. Geneva, Switzerland: Author. Retrieved from <http://whqlibdoc.who.int/publications/2003/9241591013.pdf?ua=1>
- World Health Organization. (2014). *Immunization, vaccines and biological*. Geneva, Switzerland: Author. Retrieved from <http://www.who.int/immunization/en>
- World Health Organization. (n.d.). *Health systems strengthening glossary*. Geneva, Switzerland: Author. Retrieved from http://www.who.int/healthsystems/hss_glossary/en/index5.html
- World Health Organization, UNICEF, & World Bank. (2009). *State of the world's vaccines and immunization* (3rd ed.). Geneva, Switzerland: Author.
- Wuehler, S. E., & Ouedraogo, A. W. (2011). Situational analysis of infant and young child nutrition policies and programmatic activities in Burkina Faso. *Maternal and Child Nutrition*, 7(Suppl 1), 35–62.
- Yang, Z., & Huffman, S. L. (2011). Review of fortified food and beverage products for pregnant and lactating women and their impact on nutritional status. *Maternal and Child Nutrition*, 7(Suppl 3), 19–43.
- Zhang, S., Yin, Z., Suraratdecha, C., Liu, X., Li, Y., Hills, S., . . . Liang, X. (2011). Knowledge, attitudes and practices of caregivers regarding Japanese encephalitis in Shaanxi Province, China. *Public Health*, 125(2), 79–83.
- Zimba, E., Kinney, M. V., Kachale, F., Waltensperger, K. Z., Blencowe, H., Colbourn, T., . . . Lawn, J. E. (2012). Newborn survival in Malawi: A decade of change and future implications. *Health Policy and Planning*, 27(Suppl 3), iii88–iii103.