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The business case for social and behavior change for breastfeeding and complementary feeding

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TECHNICAL REPORT

The Business Case for Social and Behavior Change for Breastfeeding and Complementary Feeding

FEBRUARY 2023



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Breakthrough RESEARCH catalyzes social and behavior change (SBC) by conducting state-of-the-art research and evaluation and promoting evidence-based solutions to improve health and development programs around the world. Breakthrough RESEARCH is a consortium led by the Population Council in partnership with Avenir Health, ideas42, Institute for Reproductive Health at Georgetown University, Population Reference Bureau, and Tulane University.



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The Business Case for Social and Behavior Change for Breastfeeding and Complementary Feeding

Avenir Health

Acronyms

AOP	annual operational plans
BF	breastfeeding
CF	complementary feeding
DALY	Disability-adjusted life year
DHS	Demographic Health Survey
EBF	exclusive breastfeeding (for first six months)
EIBF	early initiation of breastfeeding (within one hour of birth)
GBD	global burden of disease
GDP	gross domestic product
ICER	incremental cost-effectiveness ratio
IPC	interpersonal communication
IYCF	infant and young child feeding
LMIC	low- or middle-income country
MICS	Multiple Indicator Cluster Survey
OR	odds ratio
SBC	social and behavior change
SMS	short message service
USAID	United States Agency for International Development
USD	US dollars
WHO	World Health Organization

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Executive Summary

To better understand the cost-effectiveness of social and behavior change (SBC) investments in nutrition, Breakthrough RESEARCH developed a business case model that examines the impact, costs, and cost-effectiveness of SBC interventions focused on breastfeeding (BF) and complementary feeding (CF) outcomes for children under two years old. The model was applied to two different illustrative SBC investment scenarios; one in Kebbi state, Nigeria and one in Nepal.

First, a literature review was conducted to examine the impact of SBC interventions on the early initiation of breastfeeding (EIBF) and exclusive breastfeeding for the first six months (EBF). Additionally, the literature included a review of CF, which consists of a range of behaviors, including the timely introduction of foods and the adequate dietary diversity needed to ensure that the nutritional needs of infants are met. Next, the literature linking SBC interventions to intermediate determinants of behavior change (e.g., improved knowledge, attitudes, self-efficacy) and the subsequent impact of these improved intermediate determinants on outcomes was reviewed. In summary, 209 studies reporting on the impact of SBC show that SBC interventions are effective at improving these three health behaviors and the intermediate determinants to behavior change. The median impact odds ratios from these studies were used to calculate the median impact associated with increased exposure to SBC interventions.

Next, the SBC costing tool was used to estimate unit costs for the SBC interventions in Nigeria and Nepal. The impact and costs were then combined with country-specific information on demographics and past SBC programs, to create the model that allows for the examination of cost-effectiveness of SBC illustrative investment scenarios by estimating the cost per disability-adjusted life year (DALY) averted. The cost per DALY averted was then compared to the gross domestic product (GDP) per capita, where a cost per DALY averted less than the GDP per capita is considered “highly cost-effective” and a cost per DALY averted between one and three times the GDP per capita is considered “cost-effective.”

In Kebbi state, Nigeria, an illustrative investment scenario was created based on a review of the Multisectoral Plan of Action for Food and Nutrition in Nigeria (2019–2023) and the Kebbi state Annual Operational Plans for 2021 and 2022. A five-year investment in SBC of \$1.3 million

resulted in a 2.4 percentage point increase in EIBF, a 2.7 percentage point increase in EBF, and a 1.5 percentage point increase in CF. When modeled in the Lives Saved Tool (LiST), these improved behaviors over five years result in approximately 270 lives saved, which translates to nearly 8,000 DALYs averted when using the Global Burden of Disease data. Combined with the total SBC costs, the cost per DALY averted for the combined nutrition SBC interventions is \$124, which is well below the Kebbi state GDP per capita of \$568, the benchmark for a highly cost-effective intervention.

For Nepal, the Suahaara II project national workplan and monitoring and evaluation reports were used as a starting point to determine an illustrative investment scenario, resulting in an investment amount of \$7.2 million over five years from 2023 to 2027. These illustrative investments yielded a 6.9 percentage point increase in EIBF, a 10.1 percentage point increase in EBF, and a 3.4 percentage point increase in CF. When modeled in LiST, these improved behaviors resulted in approximately 409 lives saved, which translates to over 12,000 DALYs averted over the five-year period. Factoring in the total costs and DALYs associated with the averted deaths, the cost per DALY averted for the combined nutrition SBC interventions is \$594, which is far below the Nepal GDP per capita benchmark of \$1,147 for a highly cost-effective intervention.

The illustrative investment scenarios for Kebbi state, Nigeria and Nepal were calibrated to reflect realistic SBC activities and corresponding investment amounts that approximate what future SBC investments might cost and achieve in terms of impact and the resulting cost-effectiveness ratios. The key result from these applications is that SBC interventions focused on BF and CF can be a highly cost-effective means to reduce the morbidity and mortality associated with undernutrition. The higher cost per DALY averted in Nepal, compared to Kebbi

state, is primarily due to the higher underlying infant and child mortality rates in Kebbi state versus Nepal. When mortality is higher, there is a greater opportunity for SBC interventions to save lives and thus avert DALYs. Future areas for research include exploring additional intermediate determinants for BF and CF, including research on the social norms around BF and CF, as well as exploring the cost-effectiveness of SBC for women's nutrition.

Background

Social and behavior change (SBC) interventions are crucial to advancing health as they facilitate improvements in health-seeking behaviors, as well as in environmental factors and community norms underlying them.¹ Several different types of SBC interventions can be used to achieve these improvements, including mass media and community media (e.g., radio, community announcements); interpersonal communication (IPC); mobile digital interventions (e.g., text message reminders); provider communication; and community engagement. SBC experts design specific interventions that are grounded in behavioral theory and program evaluation, drawing on a myriad of disciplines, including social psychology, marketing, and behavioral economics.²

In 2019, Breakthrough RESEARCH synthesized the SBC impact and cost literature and modeled the cost-effectiveness of SBC investments in family planning in the *Business Case for Investing in Social and Behavior Change for Family Planning*.³ The analysis demonstrated that SBC interventions can be highly cost-effective and **detailed the pathways through which SBC interventions increased modern contraceptive use**.⁴ Subsequently, at the request of the United States President's Malaria Initiative, *The Business Case for Social and Behavior Change for Malaria with Applications for Côte d'Ivoire and Tanzania* was completed in 2021, which determined that illustrative SBC investments in malaria in these countries were highly cost-effective.⁵ Continuing to build on this work, the United States Agency for International Development's (USAID's) Office of Maternal and Child Health and Nutrition requested the development of a business case that examines the impact, costs, and cost-effectiveness of SBC interventions focused on infant and young child feeding (IYCF) for children under two years old. This report describes the development of this business case model and its findings using illustrative investment scenarios for Kebbi state in Nigeria and for Nepal.

What is a business case?

In global health, a business case analyzes the costs and benefits of investing in a particular health area or intervention. While SBC investments are essential to improving health-seeking behaviors, there are persistent

gaps in evidence documenting the value of their contributions to social and health outcomes. This business case uses an evidence-based approach to address this gap by answering questions about the effectiveness, cost, and cost-effectiveness of SBC interventions on improving and maintaining key breastfeeding (BF) and complementary feeding (CF) behaviors. This business case highlights the benefits of investing in BF and CF SBC activities; the intended audience includes international donors funding or potentially funding SBC activities, health and finance ministries, SBC implementers, and researchers.³

SBC for BF and CF

Undernutrition occurs when the intake of energy and nutrients is insufficient for an individual to maintain good health.⁶ In global health, the problem of undernutrition among children persists, with an estimated 45% of deaths among children under five years linked to undernutrition, primarily from low- and middle-income countries (LMICs).⁷ Undernutrition can lead to stunting (low height for age), wasting (low weight for height), micronutrient deficiencies (e.g., iodine, vitamin A, iron), and makes children more vulnerable to disease and death.⁷ Addressing undernutrition requires a varied and multisectoral approach, with one key pillar being the promotion of optimal IYCF practices.⁸ As such, USAID has addressed malnutrition in part by promoting optimal BF practices, including:

- Early initiation of breastfeeding within one hour of birth (EIBF),
- Exclusive breastfeeding for the first six months (EBF), and
- Continued breastfeeding for up to two years with a diverse complementary diet.⁹

SBC interventions aim to improve the uptake and continuation of these behaviors by influencing the intermediate determinants of behavior change, such as knowledge, attitudes, and self-efficacy. The many types of SBC interventions used for BF are classified into the broader categories listed in **Table 1** (see page 4). Mass media and mid-media refer to one-way SBC messages directed to people through radio, television, and billboards/flyers. Community media also provides one-way messages, but

these messages are typically implemented at a more local level, such as live dramas, loudspeaker announcements, and community radio. Digital and social media interventions can provide targeted information through text messages and social media platforms, as well as establishing chat groups via platforms like WhatsApp and WeChat. Provider communication includes interventions designed to address a provider's knowledge and attitudes to change a specific behavior (i.e., provider behavior change) or interventions implemented by a provider designed to address a patient's knowledge and attitudes to change a specific behavior (i.e., service communication). Finally, IPC uses two-way communication to address intermediate determinants of behavior change via individual and/or group counseling as well as IPC used in conjunction with community engagement and other SBC interventions.

Analysis approach

As with the prior business cases for investing in SBC, we searched the SBC literature to provide a foundation for building a model that examines the expected costs and benefits associated with SBC investments in BF and CF. Developing the model required four main steps: (1) conducting a synthesis of the SBC effectiveness literature, (2) updating a prior synthesis of the SBC cost literature for health interventions, (3) collecting baseline data on BF and CF outcomes and related behavioral determinants from application countries, and (4) crafting illustrative investment scenarios in two countries, Nigeria and Nepal, that can be used to model improvement in health behaviors and the subsequent impact on death and disability.

TABLE 1 SBC INTERVENTION CATEGORIES AND INTERVENTIONS

SBC CATEGORY	SBC INTERVENTIONS
Mass media and mid-media	Radio campaigns Television campaigns Billboards/posters/flyers Live dramas (e.g., stage plays, street shows) Awareness raising activities (e.g., loudspeaker announcements) Community radio
Digital and social media	Mobile phone and text messaging Social media messages Chat groups (e.g., WhatsApp, WeChat)
Provider communication	Provider behavior change Enhanced service communication
Interpersonal communication	Individual/household counseling Group counseling, including peer and popular leader interventions Individual or group counseling in combination with other SBC interventions

Literature Synthesis

The primary objective of the synthesis of the SBC effectiveness literature for BF and CF is to generate evidence-based summary odds ratios (ORs) that link SBC interventions to three primary outcomes: EIBF, EBF, and CF. While several measures make up the concept of CF, one prominent metric is minimum dietary diversity, which is defined as children having consumed at least five of the eight different food groups consumed during the previous day, with breastmilk included as one food group.¹⁰

To begin, we conducted two literature searches to identify relevant studies. Looking at **Figure 1**, the first literature search looked for studies that examined links one and three. Link 1 summarizes the impact of SBC interventions on the intermediate determinants (e.g., knowledge, attitudes, self-efficacy) to behavior change and link 3 summarizes the direct impact of SBC intervention on behavioral outcomes. The second search focused on link 2, summarizing the impact of the intermediate determinants on the behavioral outcomes.

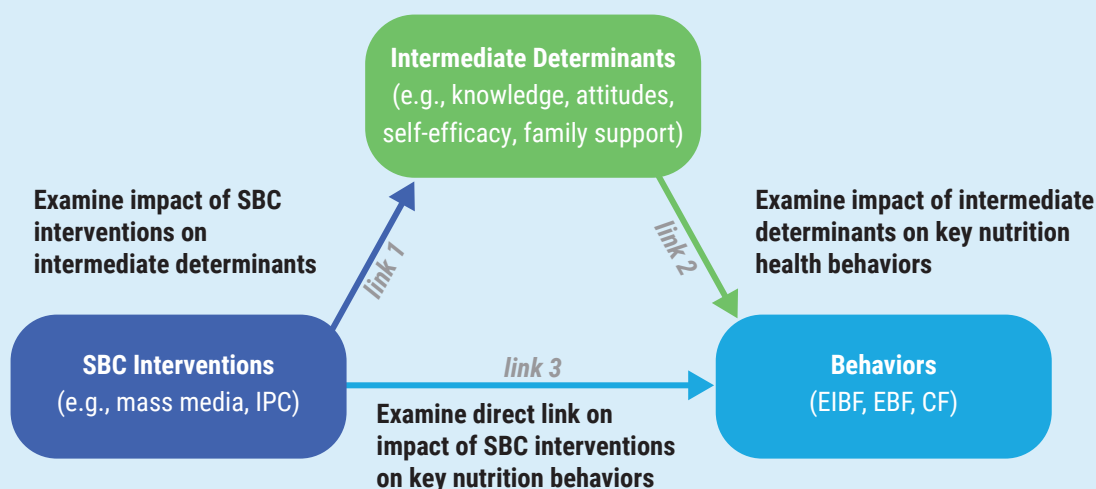
The full methodological details of the literature search and synthesis are provided in **Appendix A**. Due to an abundance of literature reported on BF in LMICs, the initial literature searches included studies from 2017 to 2021, with supplemental searches and the inclusion of secondary references going back to 2010 to enhance areas where there was insufficient evidence in the

primary searches. In summary, the review consisted of screening 5,614 abstracts with 448 studies selected for a full-text review, from which data were extracted for 222 studies across all three links, with several studies having results for more than one link. In total, 209 studies were used in the literature synthesis. The 13 studies that were not used in the synthesis were those that had ORs that either duplicated findings from a related study or had unique outcomes other than those that are the focus of this business case and could not be included in the model.

For the first search that examined links 1 and 3, the inclusion criteria for data extraction were that the study: 1) reported quantitative data on an SBC intervention; 2) was located in a LMIC; 3) had a comparison group such as intervention/control, pre/post, or exposed/unexposed groups; and 4) examined a relevant outcome that included either the primary behavioral outcomes (EIBF, EBF, CF) or an intermediate determinant of the outcomes (e.g., knowledge, attitudes, self-efficacy, family support, social norms related to BF/nutrition). The second search examining link 2 required quantitative evidence from a LMIC linking at least one intermediate determinant to at least one of the key behavioral health outcomes.

Data were extracted into an Excel workbook, with a different tab for each of the three different links. Each relevant outcome was extracted into a separate row

FIGURE 1 LITERATURE SYNTHESIS STRATEGY



in the workbook and included SBC intervention details, country, target population, study details, results, and impact findings, typically represented by an OR. **Box 1** explains how ORs represent the impact of SBC programming. Once extraction was complete, the data were sorted to determine which linkages had sufficient evidence to use for modeling. “Sufficient evidence” was defined as having at least three different studies examining the same general relationship (e.g., IPC’s impact on self-efficacy for BF). For linkages with sufficient evidence, the median OR across the studies was then used to model the impact of the pathway between the links. See Appendix A for more details.

Impact synthesis results

Data were extracted from 73 studies that examined the relationship between SBC interventions and intermediate determinants for link 1, the impact of SBC interventions on intermediate determinants (see **Table 2**). There was not sufficient evidence to link each SBC intervention to each intermediate determinant; however, evidence for 14 linkages was found in this category showing that SBC demonstrates a positive impact on the intermediate determinants. Several studies examined the relationship

TABLE 2 LINK 1—SBC INTERVENTIONS TO DETERMINANTS

SBC INTERVENTION	INTERMEDIATE DETERMINANT	# STUDIES	MEDIAN OR
Digital and social media	BF knowledge	4	1.30
Digital and social media	CF knowledge	3	1.76
Individual IPC	BF knowledge	8	2.08
Individual IPC	CF knowledge	6	2.16
Individual IPC	IYCF attitudes	6	2.47
Group IPC	BF knowledge	7	1.95
Group IPC	CF knowledge	8	2.77
Group IPC to attitudes	IYCF attitudes	4	1.62
IPC + other SBC	BF knowledge	6	2.51
IPC + other SBC	CF knowledge	6	1.48
IPC + other SBC	IYCF attitudes	4	2.72
IPC (all types)	Self-efficacy	12	1.64
IPC (all types)	Family support	7	1.97
IPC (all types)	Social norms	3	1.59

BOX 1 UNDERSTANDING ODDS RATIOS

ORs are on a log scale where an OR less than 1.0 implies a negative relationship between the SBC intervention and a change in the determinant/outcome; a ratio greater than 1.0 implies a positive relationship between the SBC intervention and a change in the determinant/outcome. For example, a radio show that aims to improve knowledge that breastmilk provides the best nutrition for one’s infant with a resulting OR = 2.0 implies that those exposed to the show have twice the odds of having this knowledge compared to those not exposed.

The magnitude of the impact of any intervention depends not only on the OR but also on the baseline coverage levels (i.e., what percentage of the population already has this knowledge) and the change in coverage (i.e., how many people are reached who do not already have the characteristic of interest).

between an SBC intervention and BF/CF knowledge with median ORs ranging from 1.30 (digital and social media and BF knowledge) to 2.77 (group IPC and CF knowledge). Evidence on the relationship between IPC and attitudes about BF and CF ranged from ORs of 1.62 to 2.72. Looking across all IPC interventions, there was also evidence of IPC’s impact on self-efficacy (OR=1.64), family support like husband and grandparent support of BF/CF (OR=1.97), and improving social norms (OR=1.59).

A total of 84 studies were used to examine link 2, the relationship between the intermediate determinants and the three primary behavioral outcomes (see **Table 3** on page 7). For EIBF, evidence for five intermediate determinants was identified, with median ORs ranging from 1.31 for self-efficacy to 2.31 for IYCF attitudes. A great deal of evidence was available for linking intermediate determinants to EBF, which included the linkage between EIBF to exclusive BF. The strength of the association as measured by the median ORs ranged from 1.31 for self-efficacy to 2.15 for IYCF attitudes. Data were sparser for CF, with evidence available for only three intermediate determinants. In addition, these links showed lower overall median ORs, ranging from 1.16 for family support and 1.68 for CF knowledge.

There were 133 studies identified that examined the direct link, link 3, between SBC interventions and the key

TABLE 3 LINK 2—INTERMEDIATE DETERMINANTS TO BEHAVIORAL OUTCOMES

INTERMEDIATE DETERMINANT	BEHAVIORAL OUTCOMES	# STUDIES	MEDIAN OR
BF knowledge	EIBF	5	1.33
IYCF attitudes	EIBF	4	2.31
Self-efficacy	EIBF	5	1.31
Family support	EIBF	6	1.52
Social norms	EIBF	4	1.38
BF knowledge	EBF	26	1.74
IYCF attitudes	EBF	7	2.15
Self-efficacy	EBF	14	1.31
Family support	EBF	19	1.49
Social norms	EBF	6	1.78
Early initiation	EBF	17	1.72
CF knowledge	CF	14	1.68
Self-efficacy	CF	5	1.19
Family support	CF	6	1.16

behavioral outcomes (see **Table 4**). Because there were fewer studies available on mass media, mid-media, and community media, all three of these sub-categories were combined into one category; the results showed modest median impact ORs on EIBF, EBF, and CF at 1.30, 1.22, and 1.28, respectively. Digital and social media interventions show low impact on EIBF (OR=1.08), modest impact for CF (OR=1.30), and greater impact on EBF (OR=1.71). Provider behavior change interventions were only linked to EIBF and EBF in the literature, with ORs of 1.86 and 1.74, respectively. Among the IPC sub-categories, the ORs for the direct links were strongest for the “IPC + others” SBC interventions for each of the three outcomes with ORs ranging from 1.85 to 3.27, while the ORs for individual IPC ranged from 1.45 to 2.52, and group IPC ranged from 1.28 to 2.60.

Impact pathways

When combining all the literature synthesis ORs, one can view the pathways through which SBC interventions impact each outcome. **Figures 2–4** (see pages 8 and 9) detail each of the impact pathways, where the arrows represent the available pathways for which evidence is available. The width of the arrow represents the strength of the relationship, as represented by the median ORs on a log scale. For mass/mid-/community media and

TABLE 4 LINK 3—SBC INTERVENTIONS TO BEHAVIORAL OUTCOMES

INTERMEDIATE DETERMINANT	OUTCOME	# STUDIES	MEDIAN OR
Mass/mid-/community media	EIBF	5	1.30
Digital and social media	EIBF	6	1.08
Provider behavior change	EIBF	10	1.86
Individual IPC	EIBF	9	1.72
Group IPC	EIBF	12	1.28
IPC + others	EIBF	8	3.04
Mass/mid-/community media	EBF	7	1.22
Digital and social media	EBF	10	1.71
Provider behavior change	EBF	11	1.74
Individual IPC	EBF	26	2.52
Group IPC	EBF	16	2.60
IPC + others	EBF	12	3.27
Mass/mid-/community media	CF	5	1.28
Digital and social media	CF	4	1.30
Individual IPC	CF	17	1.45
Group IPC	CF	20	1.75
IPC + others	CF	12	1.87

provider behavior change interventions, only the direct relationship is used, due to a lack of evidence available on the impact of these interventions on intermediate determinants. Where intermediate determinants are present, the link 3 ORs are used to capture the remaining impact after the intermediate determinant pathways are accounted for, which is called the “residual impact.”

In comparing these figures, it is evident from the number of pathways that can be included that the largest amount of evidence is available for SBC interventions for exclusive BF, followed by EIBF. In contrast, the CF pathways are less developed due to a lack of published research.

SBC unit costs

Breakthrough RESEARCH conducted a systematic review of the SBC costing literature in 2018 to create a repository of published SBC costs, which can be accessed either as an **Excel workbook** or via the **Unit Cost Study Repository**.^{11,12} Further details on the methodology can be found in Appendix A. Building on this work, a

FIGURE 2 IMPACT PATHWAYS FOR EARLY INITIATION OF BREASTFEEDING

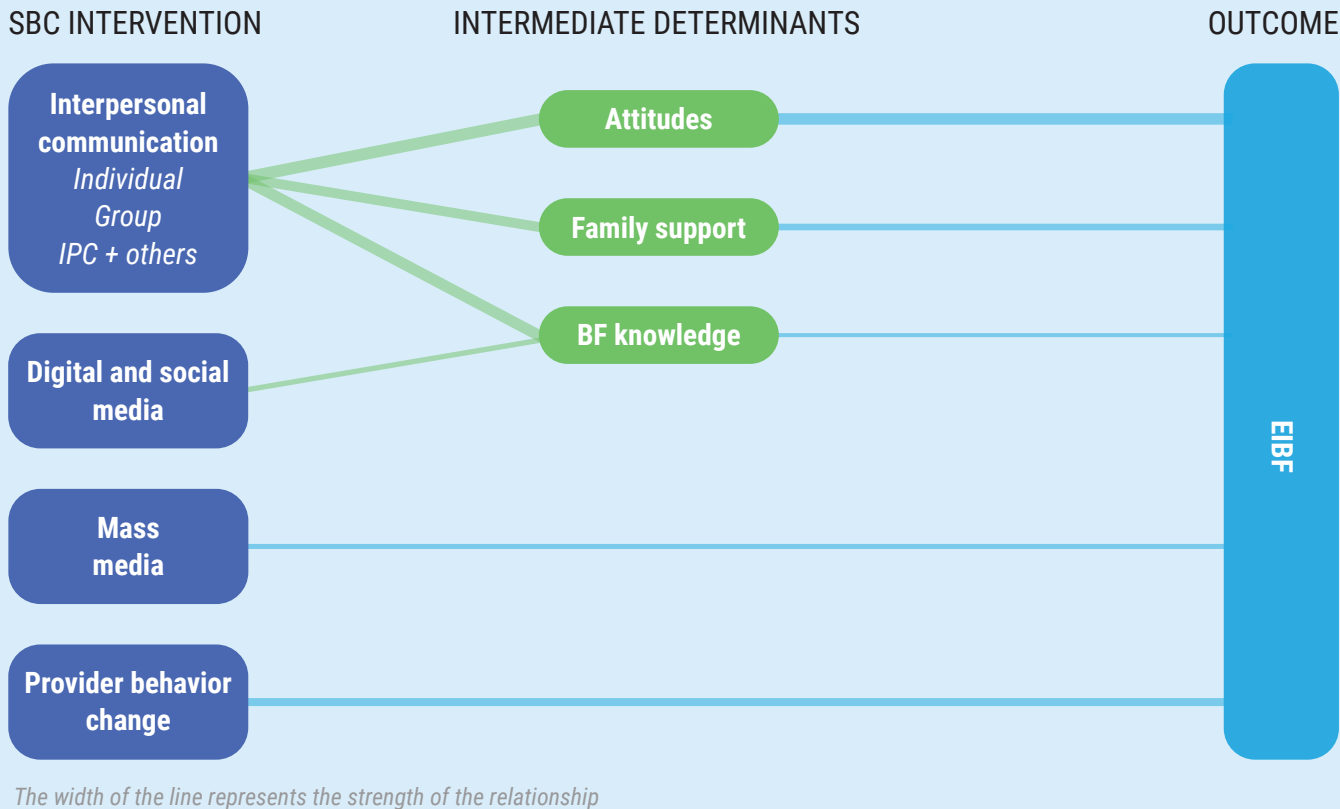


FIGURE 3 IMPACT PATHWAYS FOR EXCLUSIVE BREASTFEEDING

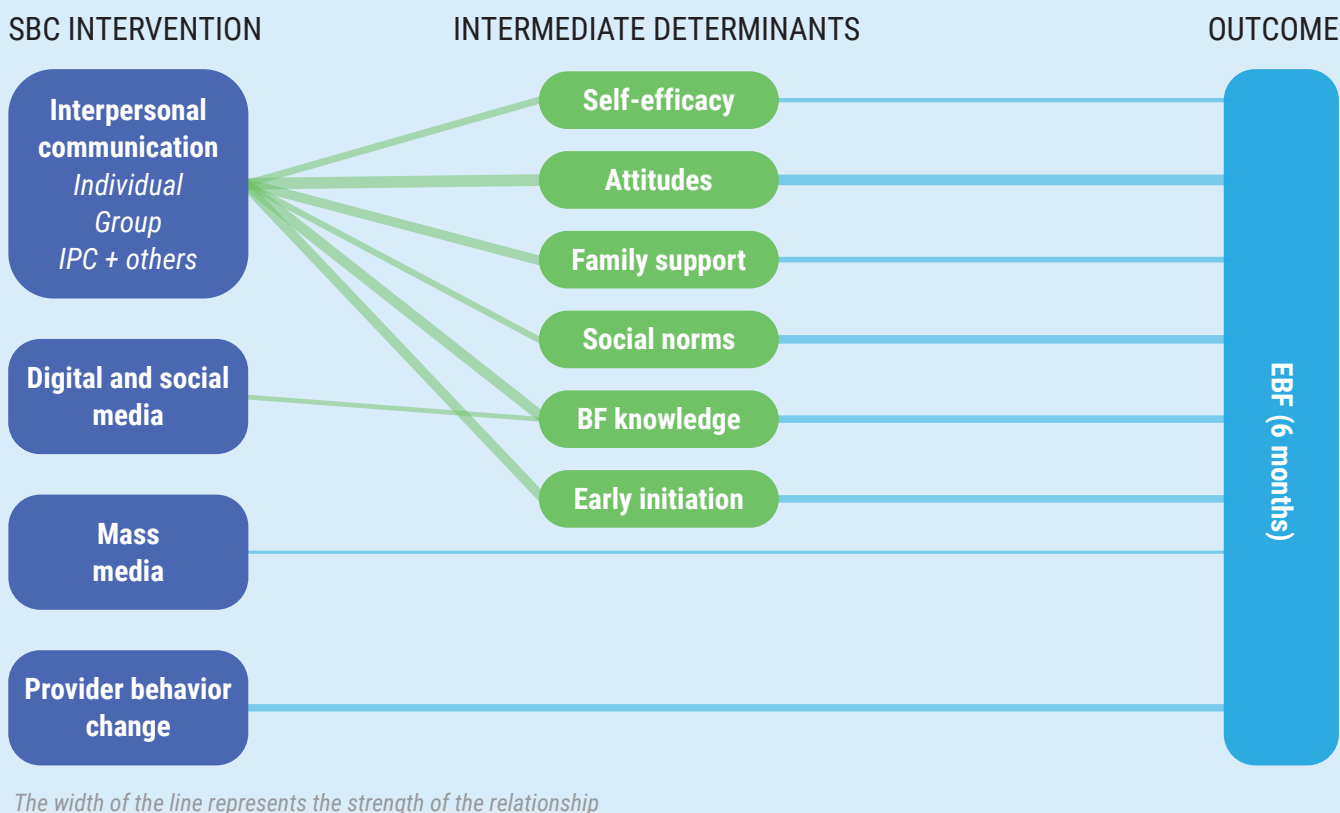
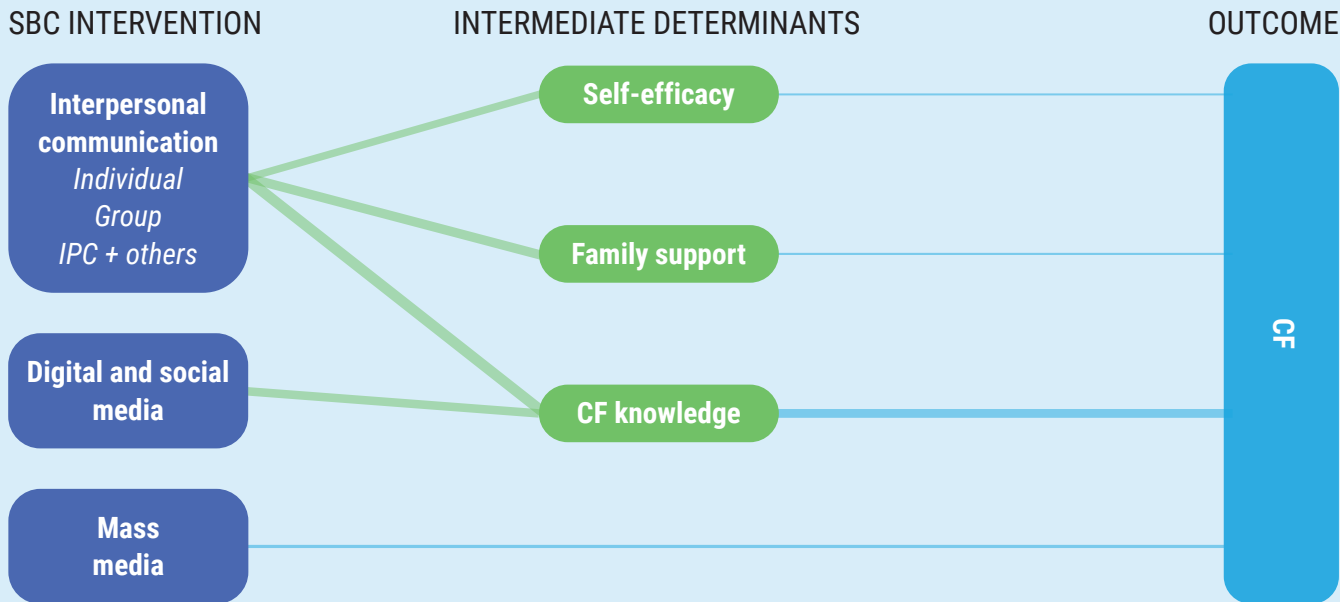


FIGURE 4 IMPACT PATHWAYS FOR COMPLEMENTARY FEEDING



The width of the line represents the strength of the relationship

supplemental search was conducted to capture peer reviewed studies published since the initial search and to expand the grey literature search using additional keywords specific to nutrition, BF, and CF. In total, 48 new studies were incorporated into the SBC cost repository. Among the 197 included SBC costing studies in the repository, 88 studies had comparable unit cost observations that could be used for analysis. From these, a dataset of standardized unit costs was created that include the following units of measurement for each SBC intervention type:

- *Per person exposed*—Used for media interventions (mass, mid, community, and digital/social) and represents one-way communication directed at individuals; measures in the cost literature indicating exposure include terms such as “people who listened to,” “people who watched,” or “people who received SMS messages.”
- *Per person participating*—Used for IPC or other interventions that facilitate interactive communication between SBC practitioners and individuals; measures in the cost literature indicating participation include terms like “people who received (counseling, etc.),” “people who visited/were visited by,” or “people who took part in....”
- *Per provider*—Used for interventions designed to address a provider’s knowledge and attitudes

to change a specific behavior (provider behavior change) or implemented by a provider to address patient knowledge and attitudes to address behavior change (service communication).

The median unit costs for each intervention type were calculated for the overall dataset. Additionally, the main characteristics of SBC unit costs were explored using statistical analysis, examining both internal factors (e.g., intervention intensity, health area) and external factors (e.g., region, country income). The overall median unit costs were then adjusted based on the results from the statistical analyses via Breakthrough RESEARCH’s SBC costing tool.¹³ **Table 5** (page 10) displays the estimated unit costs for SBC activities relevant to the SBC interventions used for modeling investment scenarios in Nigeria and Nepal and a range of higher and lower estimates for sensitivity analysis. The unit costs measured as “per person exposed” are substantially lower than those for “per person participating” due to different features of the interventions and the typically higher denominators used in calculating costs per person exposed. For sensitivity analysis purposes we also use the low- and high-end cost estimates generated by the SBC costing tool. See Appendix A for more details on the unit cost methodology.

TABLE 5 UNIT COSTS FOR SBC INTERVENTIONS (2020 USD)

INTERVENTION	UNIT	NIGERIA* MEDIAN (LOW–HIGH)	NEPAL** MEDIAN (LOW–HIGH)
Radio	per person exposed	\$0.29 (\$0.22–\$0.41)	\$0.25 (\$0.19–\$0.35)
Mid-media (e.g., live drama)	per person exposed	\$0.47 (\$0.35–\$0.66)	\$0.43 (\$0.33–\$0.61)
SMS/phone	per person contacted	n/a	\$0.84 (\$0.63–\$1.18)
Individual IPC	per person participating	\$6.77 (\$4.61–\$10.95)	\$6.76 (\$4.60–\$10.93)
Group IPC	per person participating	\$6.62 (\$4.51–\$10.71)	\$6.67 (\$4.50–\$10.70)
IPC + others	per person participating	\$6.94 (\$4.73–\$11.22)	\$6.93 (\$4.62–\$11.21)
Provider communication	per person exposed via provider***	\$2.66 (\$1.81–\$4.30)	n/a

*Nigeria unit costs estimated based on country, nutrition health area, average intervention intensity, regional program, and public ownership; **Nepal unit costs estimated based on country, nutrition health area, average intervention intensity, national program, and public ownership; ***Assumes each provider trained reaches 50 individuals. The range of low – high estimates are based on the lower and upper bound estimates generated by the SBC costing tool for each SBC intervention, based on intervention characteristics.

Assessing Cost-effectiveness

The cost-effectiveness of SBC interventions on the nutrition outcomes of interest in this business case can be assessed by combining both impact and cost estimates in the form of an incremental cost-effectiveness ratio (ICER). A common ICER calculated for health interventions is the cost per disability-adjusted life year (DALY) averted, which can then be compared to the gross domestic product (GDP) per capita. According to international standards, a cost per DALY averted less than one times the GDP per capita is considered “highly cost-effective” while a cost per DALY averted between one and three times the GDP per capita is considered “cost-effective.”¹⁴

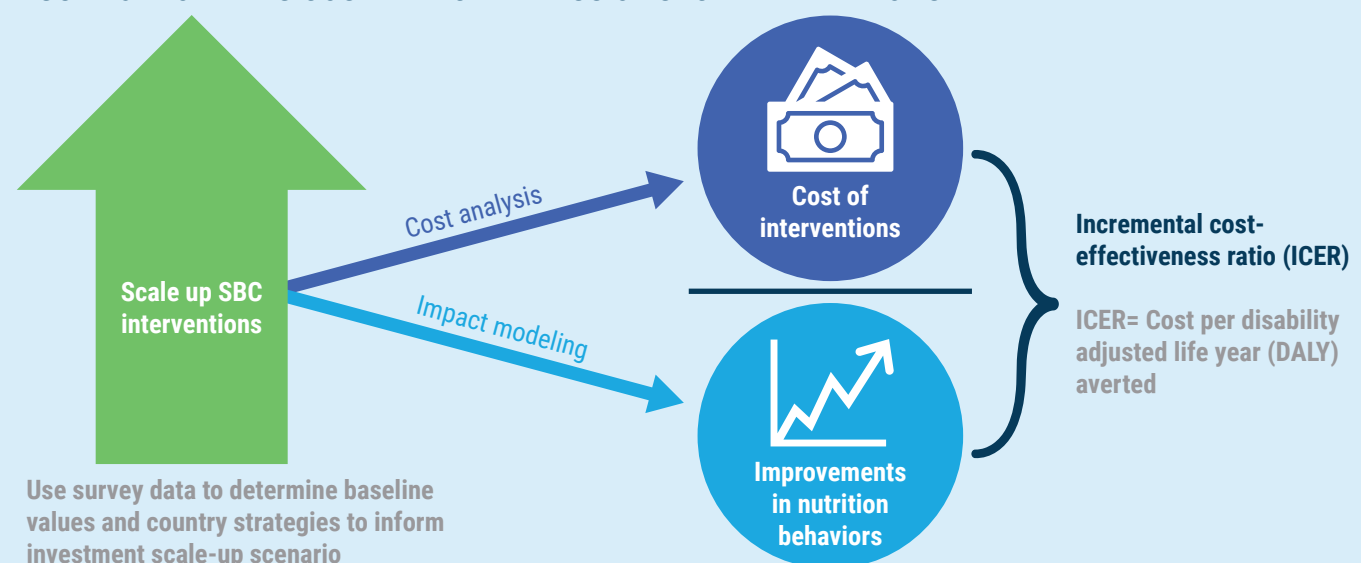
Using the median impact and median unit cost estimates from the literature, we can model SBC investments for an individual country to generate an ICER used to assess cost-effectiveness (**Figure 5**). The two locations, Kebbi state, Nigeria and Nepal, were selected as examples for this analysis in consultation with USAID based on the availability of baseline data of intermediate determinant data. Kebbi state was selected over a national projection due to the greater health burden and availability of intermediate determinant data in Kebbi state from recent surveys conducted by Breakthrough RESEARCH.

Four key inputs are used to generate the ICER via the business case model:

- Population data from Spectrum **DemProj Module**;
- Median ORs on the impact pathways from SBC to the three behavioral outcomes (EIBF, EBF, CF);
- Baseline data on the behavioral outcomes and intermediate determinants obtained from survey data; and
- Illustrative investment scenario for SBC interventions based on country plans and reports.

With these inputs in place, the impact of investing in SBC interventions is calculated both directly and indirectly through the intermediate determinants. The median OR for each SBC intervention included in the scenario—based on the country plans and reports—is applied to those exposed, calculating the change in coverage at the national or state level for each outcome, accounting for the baseline level of these outcomes at the start of the illustrative five-year investment scenario. This yields the resulting percentage point increase in EIBF, EBF, and CF. These percentage point increases for each of the behavioral outcomes are then inputted into the Lives Saved Model (LiST) from 2022 to 2027 (corresponding with a five-year investment scenario starting in 2022). LiST is a deterministic mathematical modeling tool that allows users to enter changes in coverage for key health behaviors and interventions over time and examine the

FIGURE 5 MODELING COST-EFFECTIVENESS OF SBC INTERVENTIONS



resulting impact on mortality among women and children.¹⁷ Here, LiST produces the number of lives saved attributed to the increase in coverage of increased BF and CF due to the SBC interventions when compared with a business-as-usual scenario where coverage levels remain constant at baseline levels, assuming no improvements in BF and CF from SBC interventions.

Next, the number of DALYs averted are calculated. DALYs represent the number of years lost due to premature death, ill health, or disability and consist of years of life lost due to premature death (YLDs) and years lived with disability or ill health (YLLs). We calculate each using the deaths averted from LiST. The years of life lost averted are calculated by multiplying the deaths averted by the ratio of DALYs per death due to non-exclusive BF and due to stunting from Global Burden of Disease (GBD) 2019 for each country. These DALYs are discounted at a 3% annual rate, in accordance with standard cost-effectiveness protocols.^{16,17}

Finally, to calculate the total costs associated with SBC investment scenarios, we use the unit costs for each type of SBC intervention implemented in Nigeria and Nepal and multiply them by the number of persons exposed to or participating in the interventions per year, using an annual discount rate of 3%. The costs per DALY averted are calculated by dividing the total (discounted) costs by the total (discounted) number of DALYs averted over the five-year investment period.

Modeling SBC cost-effectiveness in Kebbi state, Nigeria

Country context

Kebbi state is located in northwestern Nigeria with an estimated 2022 population of 5.5 million.¹⁸ Kebbi state is the poorest state in Nigeria and ranks at or near the bottom of the 37 states in terms of life expectancy, child health, and maternal health.¹⁹ As such, the Kebbi state government and various partners are committed to improving maternal and child health.²⁰ One such partner is the USAID-funded Breakthrough ACTION program, which provides SBC focused on improving health behaviors for pregnant women

and women with children under the age of two, including BF and CF behaviors.

Baseline data: behavioral outcomes and intermediate determinants

According to the 2018 Nigeria Demographic Health Survey (DHS), in Kebbi 25% of newborns had initiated BF within one hour of birth, 20% of children were exclusively BF for the first six months, and 38% of children 6–23 months received adequate CF, as measured by minimum dietary diversity (**Table 6**).²¹

The Breakthrough RESEARCH project is conducting an impact and cost-effectiveness evaluation of the Breakthrough ACTION project in Nigeria, comparing SBC

TABLE 6 KEBBI STATE, NIGERIA BASELINE MODEL PARAMETERS

PARAMETERS	BASELINE VALUE (%)	SOURCE
Behavioral outcomes		
EIBF	25.1	DHS 2018 ²¹
EBF	20.3	DHS 2018 ²¹
CF	38.3	DHS 2018 ²¹
Intermediate determinants		
EIBF knowledge: Women know that BF immediately after birth protects baby after delivery	62.8	BSS midline ²³
EBF knowledge: Women know that BF contains essential nutrients for the first 6m	79.4	BSS baseline ²²
CF knowledge: Women report giving soft or semi-solid food for ages 6–23 months	83.7	BSS baseline ²²
EIBF attitudes: Women disagree that mother's milk after birth is "bad milk"	64.1	BSS baseline ²²
EBF attitudes: Women agree that it is important to practice exclusive BF for first 6 months	48.9	BSS baseline ²²
EIBF family support: Husbands report that BF immediately after birth protects baby after delivery	41.5	BSS midline ²³
EBF family support: Women confident to start a conversation with their partner about BF	59.3	BSS baseline ²²
CF family support: Women discussed with partner healthy food for children	8.4	BSS midline ²³
EBF social norms: Women agree that most women in their community only give infants breastmilk	29.9	BSS baseline ²²
EBF self-efficacy: Women are confident to practice EBF for 6 months	40.4	BSS baseline ²²
CF self-efficacy: Women report they know where to buy healthy foods for their family	39.7	BSS baseline ²²

programming that is integrated across several health areas (e.g., family planning, antenatal care, malaria, nutrition) in Kebbi and Sokoto to a malaria-only program in Zamfara. As part of this evaluation, behavioral sentinel surveillance (BSS) surveys were conducted at the project's initiation in 2019 and at midline in 2021; a final BSS was conducted in late 2022 and analysis is ongoing. Data on intermediate determinants were taken from the BSS baseline and midline surveys (**Table 6**).^{22,23} For this business case, the use of the baseline BSS data was preferred since it is closer to the 2018 DHS outcome baselines; however, the midline BSS results are used for questions that were not asked at baseline.

Illustrative investment scenario

To help guide the illustrative investment scenario for Kebbi state, we reviewed the National Multisectoral Plan of Action for Food and Nutrition in Nigeria (2019–2023) and the Kebbi state Annual Operational Plans (AOPs) for Health Sector for years 2021 and 2022.^{24–26} Both the national and state plans were first used to determine a reasonable five-year SBC budget for BF and CF, estimated to be between \$1 million and \$1.5 million. Next, the types of SBC interventions to include in the scenario, and the relative mix of these interventions within the illustrative scenario and budget, were informed by the state AOPs, with a primary focus on different forms of IPC (individual, group, and IPC in combination with community engagement), along with interventions on mass media (via radio), some community activities such as announcements and live drama, and provider behavior change.

The estimated median unit costs for maternal, newborn, and child health SBC interventions in Nigeria were used based on Breakthrough RESEARCH's SBC costing tool. For radio, the number of persons reached was based on DHS data on the proportion of the population who listen to the radio regularly. For mid-media, the number of persons reached was assumed to be comparable to the reach for radio but aimed at those without access to radio, particularly those in rural areas. Provider communication interventions for BF are typically conducted at the facility after a baby is born. As such, to determine the reach of provider communication interventions, we used the DHS data on the proportion of women delivering in a facility. The costs for radio, mid-media, and provider behavior change summed to approximately 25% of the total budget. The remainder of the budget (75%) was

allocated to IPC activities, which were scaled up over the five-year time frame, keeping radio relatively stable based on listenership over time and the other interventions primarily based on a linear scale up pattern. **Table 7** summarizes the annual reach for the illustrative investment scenario based on this process. These figures are not intended to reflect exactly the SBC activities occurring currently or in the near future, but instead are meant to serve as a reasonable illustrative investment scenario. The USAID Mission in Nigeria reviewed the illustrative investment scenario to ensure its feasibility.

TABLE 7 ESTIMATED ANNUAL REACH FOR SBC INTERVENTIONS IN KEBBI STATE, NIGERIA

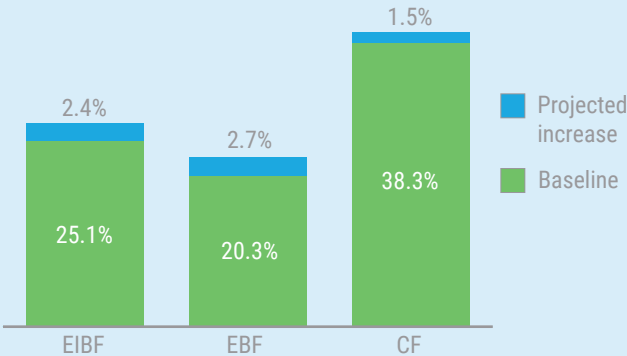
INTERVENTIONS	2023	2024	2025	2026	2027	CUMULATIVE
Radio	62,000	64,000	65,000	66,000	68,000	325,000
Mid-media	45,000	55,000	64,000	73,000	91,000	328,000
IPC*	9,000	18,000	28,000	37,000	49,000	141,000
Provider communication	2,000	5,000	8,000	11,000	14,000	40,000

Numbers rounded to the nearest 1,000. *Combination of individual IPC, group IPC, and IPC packaged with other interventions

Results

Based on this investment scenario, by 2027 SBC interventions are expected to result in a 2.4 percentage point increase in EIBF and a 2.7 percentage point increase in the proportion of EBF (see **Figure 6**). Additionally, there is a 1.5 percentage point increase in CF. When modeled in LiST, over five years these improved behaviors result in approximately 270 lives saved, which translates to nearly 8,000 DALYs averted.

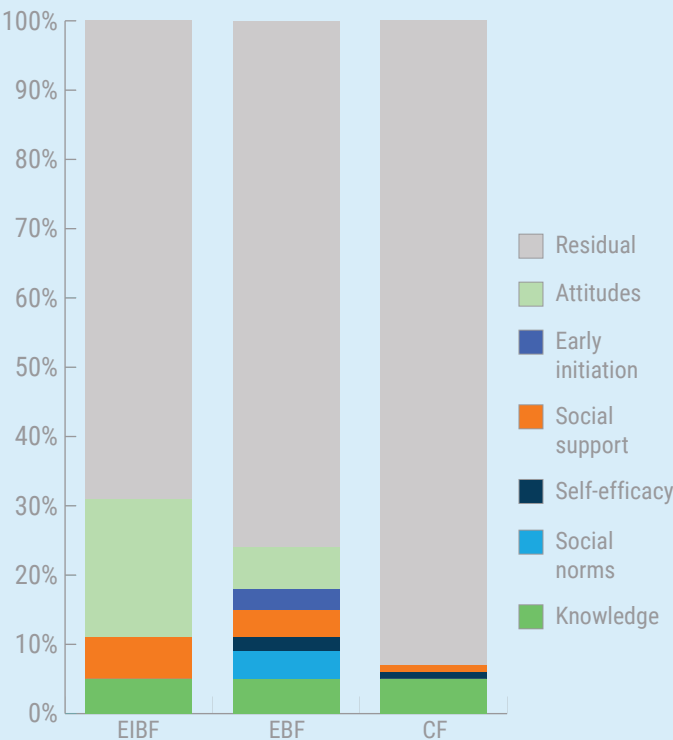
FIGURE 6 CHANGE IN BEHAVIOR DUE TO SBC INTERVENTIONS IN KEBBI STATE, NIGERIA



The contribution of each type of intervention to the growth in behavioral outcomes is displayed in **Figure 7** (see page 14). While IPC reached the fewest number of individuals, it accounts for the largest share of the increase in all three nutrition behaviors modeled due to the high impact ORs associated with IPC interventions. As such, IPC accounts for 34% of EIBF, 54% of EBF, and 44% of CF increases. Together, mass and mid-media make up for a total of 47% for EIBF, 28% for EBF, and 56% for CF.

When examining the contribution to growth by intermediate determinates (see **Figure 8**), we see the limitations of the available evidence to model impact pathways. For EIBF, there is evidence for measuring the impact of pathways through knowledge, attitudes, and social support, with attitudes accounting for the largest contribution to the resulting increase in EIBF. EBF has evidence measuring the impact pathways via knowledge, social norms, self-efficacy, social support, and attitudes, as well as the impact of early initiation. Attitudes again is the largest contributor to growth; however, all the intermediate determinants are relatively small contributors to growth. For CF, we modeled pathways through knowledge, social support, and self-efficacy, with knowledge accounting for the majority of impact. However, most of the impact on all three nutrition behaviors is not explained by these intermediate determinants but rather captured by the “residual impact” when using the ORs from link 3, which capture the relationship between SBC interventions and nutrition behaviors. This indicates a need for further research on the pathways through which SBC interventions generate impact on these nutrition outcomes.

FIGURE 8 CONTRIBUTION TO GROWTH BY INTERMEDIATE DETERMINANT, KEBBI STATE



Combined with the total SBC costs, the cost per DALY averted for the combined SBC interventions for nutrition is \$124, as shown in **Figure 9** (see page 15). The sensitivity analysis calculates the results using the high and low estimates of unit costs, based on the analysis of SBC unit cost data. The entire range of costs are far below the Kebbi state GDP per capita of \$568, the benchmark for a highly cost-effective intervention.

FIGURE 7 CONTRIBUTION TO GROWTH BY INTERVENTION, KEBBI STATE, NIGERIA

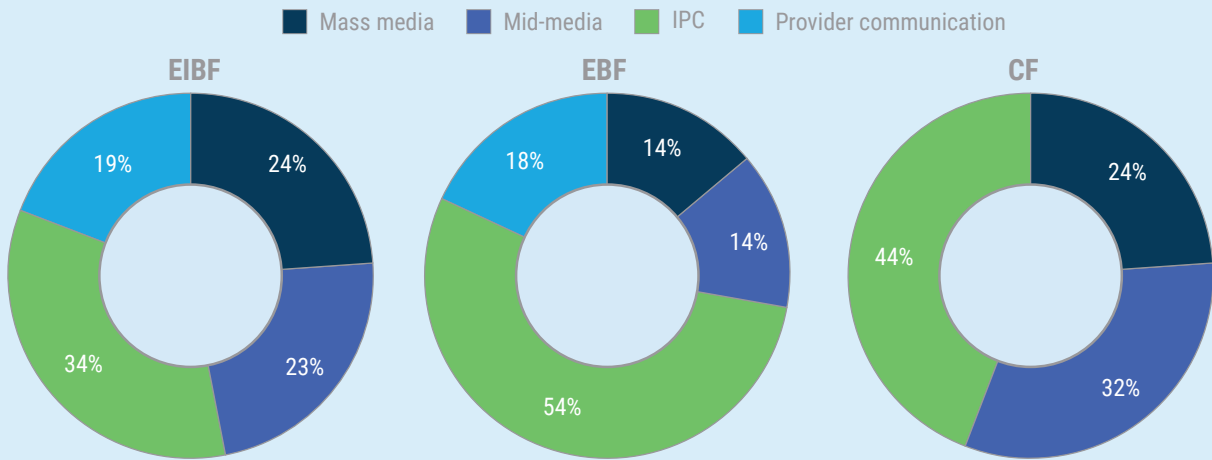
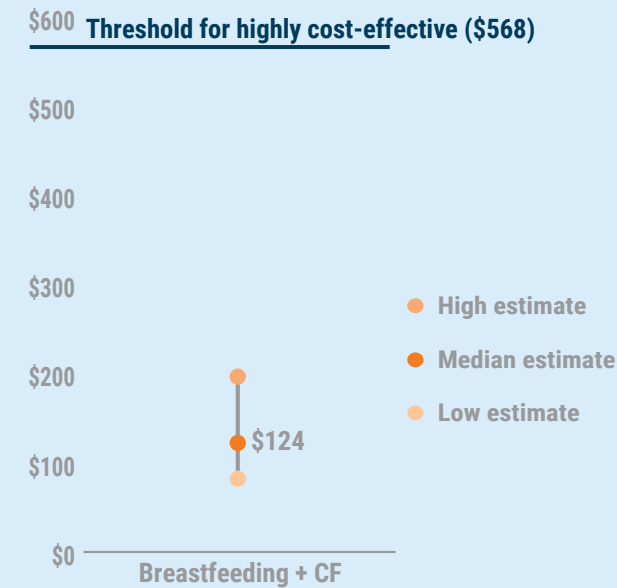


FIGURE 9 COST PER DALY AVERTED BY SBC INTERVENTIONS IN KEBBI STATE, NIGERIA (USD) VARYING UNIT COSTS



Modeling SBC cost-effectiveness in Nepal

Country context

Nepal is located in southern Asia and has an estimated population of 30.3 million in 2022.²⁷ Nepal is considered one of the poorest countries in the world; it ranks near the bottom of the list of countries progressing toward meeting the Sustainable Development Goals, coming in at 93rd out of 163 countries.²⁸ However, recently Nepal has made strides in reducing neonatal, infant, and maternal mortality, and is committed to continuing to improve maternal and child health.²⁹

To accomplish this, the government of Nepal has formed various partnerships to help improve the nutrition status of women and children. USAID, through the Suaahara II project, is one such partnership, which aims to improve the health and nutrition status of women and children through a multi-sector partnership with the Government of Nepal, the private sector, and other USAID-funded projects.³⁰ This program utilizes SBC to promote key nutrition practices, including BF and CF, through various strategies, including IPC activities, radio programs, and the use of mobile technology at the community level.

Baseline data: behavioral outcomes and intermediate determinants

The following baseline values are used in the model to determine the cost-effectiveness of these interventions. Data are gathered from various sources including the available literature, Spectrum and DHS demographic data, and program surveys. According to the 2019 Multiple Indicator Cluster Survey (MICS), 41.7% of newborns in Nepal had initiated BF within one hour of birth, 62.1% of children were exclusively BF for six months, and 35.8% of children aged 6–23 months received CF, as measured by minimum dietary diversity (see **Table 8**).³¹ Fewer baseline values were identified for intermediate determinants in Nepal (as compared to the application in Kebbi state), limiting the number of impact pathways that could be modeled through links 1 and 2. Thus, more of the impact

TABLE 8 NEPAL BASELINE MODEL PARAMETERS

PARAMETERS	BASELINE VALUE %	SOURCE
Behavioral outcomes		
EIBF	41.7	MICS 2019 ³¹
EBF	62.1	MICS 2019 ³¹
CF	35.8	MICS 2019 ³¹
Intermediate determinants		
EIBF knowledge: Mothers know that BF should be initiated within 1 hour	87.2	Suaahara II Annual Survey 2019 ³²
EIBF family support: Household head believes that BF should be initiated within 1 hour	65.5	Suaahara II Annual Survey 2019 ³²
EBF knowledge: Mother knows exclusive BF characteristics	23.5	Suaahara II Annual Survey 2019 ³²
EBF social norms: Decision to breastfeed due to all of mother's friends also BF	70.7	Chandrashekhar 2007 ³³
EBF self-efficacy: Self-reported BF problems	35.4	Dharel 2020 ³⁴
EIBF family support: Husbands report preference for BF	81.8	Karkee 2014 ³⁵
EBF attitudes: Women report favorable attitude toward BF at 12 weeks	18.8	Karkee 2014 ³⁵
CF knowledge: Mother knows 6–9 months is appropriate age for introducing foods	57.3	Suaahara II Annual Survey 2019 ³²
CF family support: Grandmother's knowledge that all 6 complementary foods should be introduced at 6–9 months of age	17.2	Karmacharya 2017 ³⁶

will be determined by link 3 and captured in the residual impact that this link represents.

Illustrative investment scenario

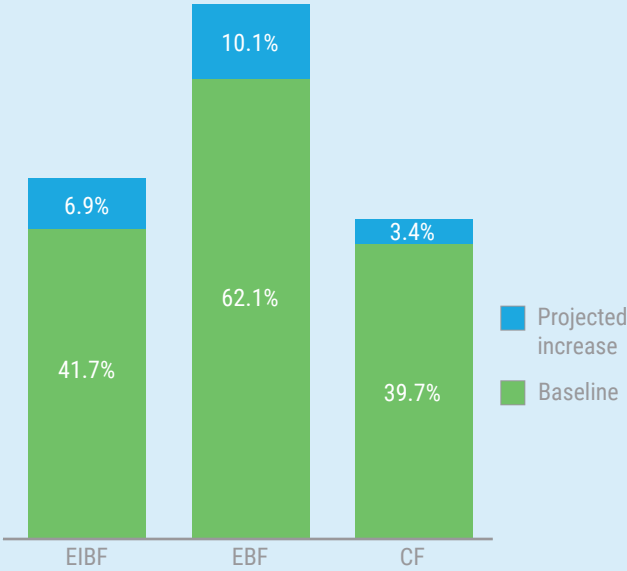
The USAID-supported Suaahara II project is a five-year, \$63 million integrated program with several interventions in addition to SBC for nutrition.³⁷ The Suaahara II national workplan was used as a starting point to determine an illustrative investment scenario, where it was estimated that approximately 10–15% of the budget was spent on SBC nutrition interventions.³² The workplan and monitoring and evaluation reports were also used to identify types of nutrition SBC activities that would be part of the investment scenario. While much of the data came from Suaahara II, many of the model parameters are made based on national and/or global data. As such, this investment scenario is not intended to evaluate any specific project.

As with the Kebbi state application, it was assumed that a majority of the budget would be spent on IPC activities, which was primarily individual IPC via home visits. Other SBC activities include mass media (radio), mid-media (e.g., live events), and SMS.^{32,38} Based on these sources, an investment scenario was developed to approximate a realistic illustrative five-year investment scenario for Nepal. **Table 9** summarizes the annual reach based on this process. Intervention reach was gauged based on both reported figures on reach as well as examining the proportion feasible to reach via radio and SMS based on the most recent DHS. These figures are not intended to reflect exactly the SBC activities occurring currently or soon, but instead are meant to serve as a realistic scenario using the ORs from the literature and the median unit costs, adjusted for Nepal.

Results

Based on the illustrative investment scenario developed with these inputs, by 2027, SBC interventions are expected to result in a 6.9 percentage point increase in EIBF and a 10.1 percentage point increase in EBF (see **Figure 10**). Additionally, there is a 3.4 percentage

FIGURE 10 CHANGE IN BEHAVIOR BY 2027 DUE TO SBC INTERVENTIONS IN NEPAL



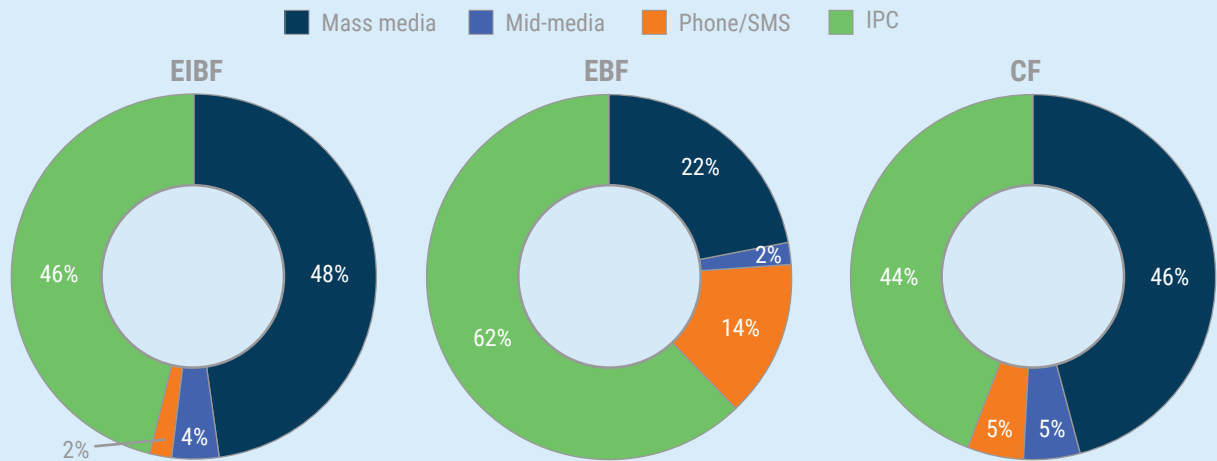
point increase in CF. When modeled in LiST over five years, these improved behaviors result in approximately 409 lives saved, which translates to over 12,000 DALYs averted.

The impact of each type of intervention can be seen in the pie charts shown in **Figure 11** (see page 17). The impact varies substantially by nutrition behavior, even though the coverage for each outcome is the same, due to variation in the ORs associated with each described above. Mass media and IPC account for a large majority of the impact in the three outcome variables due to the high coverage of mass media and the high impact ORs associated with IPC interventions. For EBF, in particular, IPC is the primary driver of impact, accounting for 62% of the growth in the outcome, followed by mass media at 28%. Mid-media and phone/SMS interventions have a smaller contribution to increases in these outcome variables; however, phone/SMS does contribute 14% of the impact for EBF.

TABLE 9 ANNUAL REACH OF SBC INTERVENTIONS

INTERVENTIONS	2023	2024	2025	2026	2027	CUMULATIVE
Radio	300,000	400,000	500,000	600,000	700,000	2,500,000
Community media	5,000	15,000	40,000	60,000	80,000	200,000
SMS	10,000	50,000	100,000	140,000	200,000	500,000
IPC	10,000	90,000	200,000	300,000	400,000	1,000,000

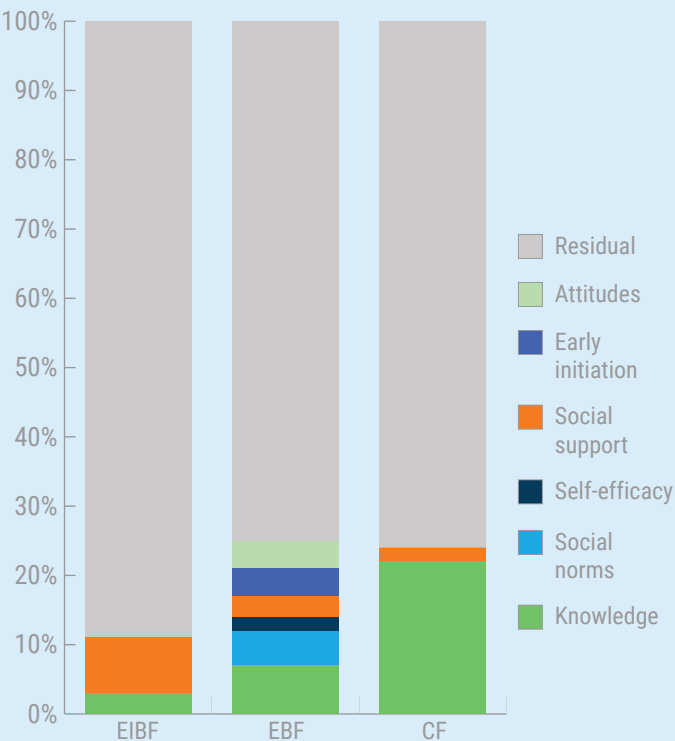
FIGURE 11 CONTRIBUTION TO GROWTH BY INTERVENTION, NEPAL



Looking at the contribution to growth by intermediate determinate (see **Figure 12**), we again see the limitations of the available evidence to model impact pathways. The majority of the impact on all three nutrition behaviors is via the “residual,” which means that most of the impact is not explained by links 1 and 2, but rather captured via link 3. The lack of baseline indicators for the intermediate

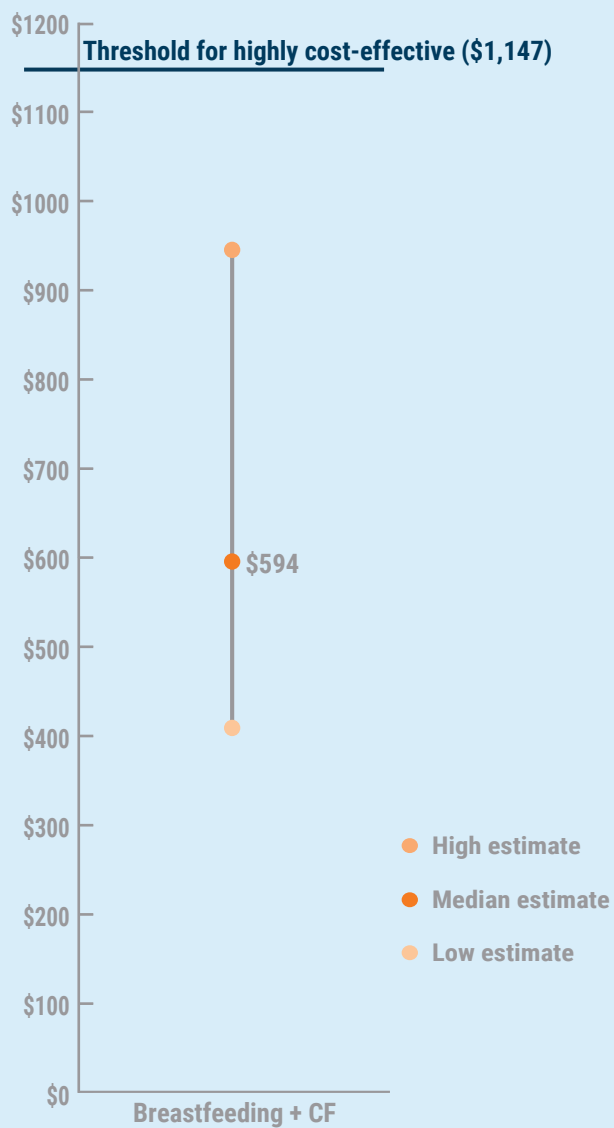
determinants results in fewer pathways available to examine. For early initiation of BF, there is only evidence for the intermediate pathways available for knowledge and social support, with the latter accounting for a larger share of the explained impact. We are able to examine the greatest number of pathways for EBF, with evidence available for pathways related to knowledge, social norms, self-efficacy, social support, and attitudes. For CF, there are only two impact pathways available from the literature, knowledge and social support, with knowledge accounting for the largest share of growth.

FIGURE 12 CONTRIBUTION TO GROWTH BY INTERMEDIATE DETERMINANT, NEPAL



Factoring in the total costs and DALYs associated with the averted deaths, the cost per DALY averted for the combined nutrition SBC interventions is \$594, as shown in **Figure 13** (see page 18). The sensitivity analysis calculates the results using the high and low estimates of unit costs. The entire range of costs are below the Nepal GDP per capita benchmark for a highly cost-effective intervention.

FIGURE 13 COST PER DALY AVERTED BY SBC INTERVENTIONS IN NEPAL



Discussion

Main findings

The findings presented here are the results of modeling based on a literature synthesis of over 200 studies on SBC impact for BF and CF and 88 studies on SBC unit costs. The model utilizes the median impact from SBC interventions and the unit costs to assess the impacts, costs, and cost-effectiveness of the SBC interventions on BF and CF, although it does not intend to serve as an evaluation of any specific SBC program. However, the illustrative investment scenarios for Kebbi state, Nigeria and Nepal were calibrated to reflect realistic and feasible SBC activities and corresponding investment amounts that approximate what future SBC investments might cost and achieve in terms of impact and the resulting cost-effectiveness ratios. The key result from these applications is that SBC interventions focused on BF and CF can be a highly cost-effective means to reduce the morbidity and mortality associated with undernutrition. In both applications, the entire range of the cost per DALY averted results were well below the national GDP per capita for Nepal and below the GDP per capita for Kebbi state, indicating that both investments are highly cost-effective, based on the World Health Organization (WHO) criteria.¹⁴

Beyond this overarching finding, there are other interesting results worthy of discussion. First, there is a higher cost per DALY averted in Nepal (\$594) compared to Kebbi state, Nigeria (\$124). This difference is primarily driven by the different underlying infant and child mortality rates in the two locations. The infant mortality rate is higher in Kebbi state, at 74 deaths per 1,000 live births versus 26 deaths per 1,000 live births in Nepal. The discrepancy for the under-five mortality rate is even greater at 117 versus 31 deaths per 1,000 live births, respectively.^{18,25} When mortality is higher, there is a greater opportunity for SBC interventions to save lives, along with corresponding DALYs. As such, one lesson from these applications is that, because SBC for BF and CF (as well as any child health intervention) is more cost-effective in areas with higher infant and child mortality, program planners should be mindful of this when allocating resources across and within countries to help guide either where to allocate resources for cost-efficiency or to acknowledge that a proposed investment might not be cost-effective, but potentially still necessary.

Another important finding emerging from this business case highlights the lack of evidence in the published literature to support some of the pathways to impact for SBC in nutrition. The literature review found relatively high link 3 ORs, showing a strong relationship between the SBC interventions and outcomes. However, only a small proportion of this impact was captured through the included intermediate determinants (links 1 and 2). This is in contrast to the Business Case for Social and Behavior Change for Malaria with Applications for Côte d'Ivoire and Tanzania, where a large majority of the direct impact was explained through the intermediate determinants around beliefs, attitudes, self-efficacy, and partner communication.³⁹

For BF and CF outcomes there were fewer intermediate determinants identified to serve as pathways from intervention to impact, which explains why most of the impact is captured in the “residual” or the leftover unexplained impact after accounting for the intermediate determinants. More research is needed to determine what other intermediate determinants might explain the pathways through which SBC improves these behaviors, particularly for CF where few pathways were identified in this process.

Another area for potential further research is the potential impact SBC interventions might have on social norms for BF. Only three studies were identified that examined the link between IPC interventions and social norms, which was subsequently only linked to the EBF outcome. While this met the minimum criterion to be included in the model, more research around the impact of SBC on social norms and the influence of social norms on EIBF and CF would be useful for better understanding this dynamic. Understanding social norms and other intermediate determinants not available in the literature review would provide a better understanding of how SBC interventions work to improve BF and CF outcomes, which in turn would help design programs to maximize impact and cost-effectiveness.

Limitations

There are important limitations of this analysis that need to be acknowledged. Like all modeling, the results presented here are dependent on the assumptions and

the baseline parameter values; while these reflect our best approximations using available data, they are still an approximation of the underlying reality. For example, the underlying SBC impact literature is subject to publication bias, where interventions that were not found to be effective are less likely to be published in the literature.

Furthermore, the SBC model relies on the median effectiveness and adjusted median costs to estimate the cost-effectiveness of the SBC interventions as represented by the aggregated literature, but it does not account for specific SBC interventions, which may be particularly innovative or inexpensive and thus may yield better cost-effectiveness results. Similarly, poorly executed or very costly SBC interventions may not be cost-effective. See **Box 2** on how the model used for this report could be adapted to examine the cost-effectiveness of a specific SBC program.

Another notable limitation is that the model does not account for SBC interventions that are integrated across health areas, which may be more cost-effective if there are efficiencies when planning and leveraging the connections between health behaviors. While studies are underway to examine the impact of integrated SBC on various behaviors, these results are not yet available to be incorporated into this analysis.³⁸

Finally, the SBC business case model used here only focuses on the economic benefits associated with mortality improvements from BF and CF in children and does not capture the potential health benefits for mothers in terms of reduced breast cancer or other potential benefits such as improved child cognitive development.^{39,40}

Conclusions

Despite these limitations, this research examining the cost-effectiveness of SBC for BF and CF was found to be highly cost-effective in two different settings, indicating good value for money for SBC investments focused on these behaviors. Looking ahead, these results can be used to advocate for continued or expanded SBC funding in nutrition. Additionally, the noted literature gaps indicate a need for more research identifying the pathways through which SBC for BF and CF impact key health behaviors. Future research could help fill these knowledge gaps to further assist program planners in identifying the most cost-effective ways to improve child health as well as expand this work to explore the cost effectiveness of SBC for women's nutrition.

BOX 2 POTENTIAL USES OF THE SBC NUTRITION BUSINESS CASE MODEL

In this report, we rely on a large body of evidence regarding the effectiveness and costs of SBC in LMICs to demonstrate the cost-effectiveness of the field. The business case model, however, could also be used to examine the cost-effectiveness of a specific SBC program. To leverage the model for a program-specific application, the following data are needed:

- Population data and baseline values for each nutrition outcome (EIBF, EBF, CF)
- Evaluation data with ORs summarizing the impact of SBC on the three specified nutrition outcomes
- Unit cost estimates on how much it costs to reach individuals for each SBC intervention
- The type of SBC interventions and the number of persons reached by each SBC intervention each year for five years
- The GDP per capita (World Bank) and DALYs associated with child stunting and non-exclusive breastfeeding (GBD tool)

With this information the model, used in conjunction with LiST, can generate an estimate of number of deaths averted, which can be translated into the number of DALYs averted associated with a specific program and thus determine whether the program is cost-effective.

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Appendix A:

Additional methodological details

Literature search

In examining the linkages between SBC interventions and the three behavioral outcomes (EIBF, EBF, CF) the literature search started with two different searches in PubMed. The first search used keywords to examine the intersection of SBC interventions, primary outcomes of interest, age range, and LMICs to find studies examining the impact of SBC interventions on intermediate determinants and outcomes. A second search also include the same key words for the primary outcomes, age range, and LMICs but included keywords for the intermediate determinants and did not require the study to examine an SBC intervention. The search terms are shown in **Table A1** (see page 24).

Due to an abundance of literature in BF, the primary literature searches examined studies from 2017 to 2021. Supplemental searches were conducted in Google Scholar to add studies to areas where insufficient evidence was uncovered in the initial searches. Google Scholar search terms were tailored to identify specific types of evidence where data from the primary searches were lacking and included studies from 2010 to present. For example, one search looked for studies of SBC intervention impact on social norms, while another looked specifically for the impact of mass media interventions on CF practices. In total, 10 Google Scholar searches were conducted, with the first 100 hits reviewed for each search. Other sources included studies cited in systematic literature reviews identified in PubMed or Google Scholar searches; any potentially promising study listed in systematic reviews from 2010 on was reviewed and extracted, as appropriate. Finally, the studies from the **Alive and Thrive web-site** were reviewed to ensure that the information published there from 2010 on was captured in the analysis.

The inclusion criteria for the literature search addressing links 1 and 3 (see **Figure 1**, page 5, in the main body of report) were that the study: 1) had quantitative data on an SBC intervention; 2) was located in a LMIC; 3) had a comparison group such as intervention/control, pre/post, or exposed/unexposed groups; and 4) examined a relevant outcome that included either the primary behavioral outcomes (EIBF, EBF, CF) or an intermediate determinant of the outcomes (e.g., knowledge, attitudes, self-efficacy, family support, social norms pertaining to EIBF, EBF, CF). The second search for literature examining link 2 required quantitative evidence from a LMIC that linked at least one intermediate determinant to at least one of the key health outcomes.

Table A2 details the number of abstracts, full-text study reviews, identified systematic reviews, and the number of included studies for each source. In total, 5,614 abstracts were reviewed, 448 studies had a full text review, 26 systematic reviews were identified, and impact data from 222 studies were extracted. Of the 222 studies, 150 were identified through the PubMed searches, followed by 46 from secondary sources, 16 via the Google Scholar searches, and 10 from the Alive and Thrive web site.

Effectiveness literature synthesis

Data from each of the 222 studies were extracted into an Excel workbook, with a different tab for each of the three

TABLE A2 LITERATURE SEARCH RESULTS

SOURCE	ABSTRACTS	FULL TEXT	LITERATURE REVIEWS	EXTRACTED
PubMed 2017–2021 (Links 1 & 3)	2,431	165	13	96
PubMed 2017–2021 (Link 2)	2,183	136	6	54
Google Scholar targeted searches 2010–2022	1,000	26	7	16
Secondary sources (from reviews)		99		46
Alive and Thrive		22		10
TOTAL	5,614	448	26	222

TABLE A1 LITERATURE REVIEW SEARCH TERMS

CATEGORY	SEARCH TERMS
SBC	SBC “social behavior” OR “social behaviour” OR “Social change” OR “Socio-behavioral” OR Socio-behavioural OR “Behavior change” OR “Behaviour change” OR “Behavioral change” OR “Behavioural change” OR “Behavioral economic” OR “Behavioural economic” OR “Demand creation” OR “Demand generation” OR “Demand generating” OR “Demand-side” OR “Demand side” OR IPC OR “Interpersonal counseling” OR “Face-to-face” OR “group counseling” OR education OR “support groups” OR “peer support” OR “peer groups” OR “male engagement” OR promotion OR “Social marketing” OR “social support” OR mobilization OR mHealth OR “M-health” OR Campaign OR Media OR Radio OR Television OR TV Advertise* OR newspaper OR magazine OR flyers OR brochures OR posters OR Facebook OR Twitter OR WhatsApp OR Telegram OR Messaging OR SEO OR Entertain OR Edutainment OR Drama OR Digital OR SMS OR “Text message” OR “Text-message” OR Phone OR “Behavioral design” OR “Behavioural design” OR “Human-centered design” OR “Human centered design” OR “provider behavior change” OR “provider behaviour change”
Intermediate determinants	knowledge OR attitude* OR norm* OR tradition* OR communicat* OR discuss* OR self-efficacy OR “self efficacy”
Nutrition	nutrition OR breastfe* OR “breast feed” OR “breast feeding” OR lactat* OR prelacteal OR “human milk” OR “breast milk” OR “complementary feeding” OR “dietary diversity” OR “food groups” OR “infant feeding” OR “infant nutrition” OR “minimum meal” OR “minimum diet” OR “adequate diet”
Age	child* OR infant OR “under 2” OR “under two” OR “first 1000 days”
Study design	experiment* OR case-control OR cohort OR quasi* OR quantitative OR association OR odds OR “relative risk” OR regression OR before- OR pre- OR post OR cross-sectional OR “mixed methods”
Location	“Developing Countries” OR “Developing Country” OR “Developing Economies” OR “Developing Economy” OR “Developing Nation” OR “Developing Nations” OR “Developing Population” OR “Developing Populations” OR “Developing World” OR “LAMI Countries” OR “LAMI Country” OR “Less Developed Countries” OR “Less Developed Country” OR “Less Developed Economies” OR “Less Developed Nation” OR “Less Developed Nations” OR “Less Developed World” OR “Lesser Developed Countries” OR “Lesser Developed Nations” OR LMIC OR LMICS OR “Low GDP” OR “Low GNP” OR “Low Income Countries” OR “Low Income Country” OR “Low Income Economies” OR “Low Income Economy” OR “Low Income Nations” OR “Low Income Population” OR “Low Income Populations” OR “Lower GDP” OR “lower gross domestic” OR “Lower Income Countries” OR “Lower Income Country” OR “Lower Income Nations” OR “Lower Income Population” OR “Lower Income Populations” OR “Middle Income Countries” OR “Middle Income Country” OR “Middle Income Economies” OR “Middle Income Nation” OR “Middle Income Nations” OR “Middle Income Population” OR “Middle Income Populations” OR “Poor Countries” OR “Poor Country” OR “Poor Economies” OR “Poor Economy” OR “Poor Nation” OR “Poor Nations” OR “Poor Population” OR “Poor Populations” OR “poor world” OR “Poorer Countries” OR “Poorer Economies” OR “Poorer Economy” OR “Poorer Nations” OR “Third World” OR “Transitional Countries” OR “Transitional Country” OR “Transitional Economies” OR “Transitional Economy” OR “Under Developed Countries” OR “Under Developed Country” OR “under developed nations” OR “Under Developed World” OR “Under Served Population” OR “Under Served Populations” OR “Underdeveloped Countries” OR “Underdeveloped Country” OR “underdeveloped economies” OR “underdeveloped nations” OR “underdeveloped population” OR “Underdeveloped World” OR “Underserved Countries” OR “Underserved Nations” OR “Underserved Population” OR “Underserved Populations” OR Africa OR Asia OR “South America” OR Afghanistan OR Albania OR Algeria OR “American Samoa” OR Angola OR Argentina OR “Argentine Republic” OR Armenia OR Azerbaijan OR Bangladesh OR Belarus OR Byelarus OR Belorussia OR Belize OR Benin OR Bhutan OR Bolivia OR Bosnia OR Botswana OR Brazil OR Bulgaria OR Burma OR “Burkina Faso” OR Burundi OR “Cabo Verde” OR “Cape verde” OR Cambodia OR Cameroon OR “Central African Republic” OR Chad OR China OR Colombia OR Comoros OR Comores OR Comoro OR Congo OR “Costa Rica” OR “Côte d’Ivoire” OR Cuba OR Djibouti OR Dominica OR “Dominican Republic” OR Ecuador OR Egypt OR “El Salvador” OR Eritrea OR Ethiopia OR Fiji OR Gabon OR Gambia OR Gaza OR “Georgia Republic” OR Georgian OR Ghana OR Grenada OR Grenadines OR Guatemala OR Guinea OR “Guinea Bissau” OR Guyana OR Haiti OR Herzegovina OR Hercegovina OR Honduras OR India OR Indonesia OR Iran OR Iraq OR Jamaica OR Jordan OR Kazakhstan OR Kenya OR Kiribati OR Korea OR Kosovo OR Kyrgyz OR Kirghizia OR Kirghiz OR Kirgizstan OR Kyrgyzstan OR “Lao PDR” OR Laos OR Lebanon OR Lesotho OR Liberia OR Libya OR Macedonia OR Madagascar OR Malawi OR Malay OR Malaya OR Malaysia OR Maldives OR Mali OR “Marshall Islands” OR Mauritania OR Mauritius OR Mexico OR Micronesia OR Moldova OR Mongolia OR Montenegro OR Morocco OR Mozambique OR Myanmar OR Namibia OR Nauru OR Nepal OR Nicaragua OR Niger OR Nigeria OR Pakistan OR Palau OR Panama OR “Papua New Guinea” OR Paraguay OR Peru OR Philippines OR Phillippines OR Philippines OR Principe OR Romania OR Rwanda OR Ruanda OR Samoa OR “Sao Tome” OR Senegal OR Serbia OR “Sierra Leone” OR “Solomon Islands” OR Somalia OR “South Africa” OR “South Sudan” OR “Sri Lanka” OR “St Lucia” OR “St Vincent” OR Sudan OR Surinam OR Suriname OR Swaziland OR Syria OR “Syrian Arab Republic” OR Tajikistan OR Tadjikistan OR Tadjikistan OR Tadjik OR Tanzania OR Thailand OR Timor OR Togo OR Tonga OR Tunisia OR Turkey OR Turkmen OR Turkmenistan OR Tuvalu OR Uganda OR Ukraine OR Uzbek OR Uzbekistan OR Vanuatu OR Venezuela OR Vietnam OR “West Bank” OR Yemen OR Zambia OR Zimbabwe

different links. For links 1 and 3, data extraction included details of the SBC intervention, the study specifics (e.g., study design, time period, sample size, control group), and the outcomes (proportions/ORs and statistical significance). Each relevant outcome was extracted into a separate row in the workbook, with each having an OR that summarized the relationship under study. For many observations, the OR (or adjusted ORs) were reported; however, in many instances the ORs needed to be calculated, most commonly using pre/post percentage data. Logistic regression coefficients were exponentiated; however, linear regression coefficients were not utilized since they could not be converted to ORs.

Based on the SBC categories and the outcome variables (both behavioral and intermediate), each observation could be sorted and classified into a “bucket” representing the same intervention and outcome. To avoid an overreliance on one or two studies, there needed to be at least three studies that examined the impact for a bucket to be included in the analysis. Within each bucket, a study was limited to one observation to represent the strength of the association between the intervention and outcome. If a study had multiple observations within a bucket from the same study, either the ORs were averaged, or the most representative observation was chosen. For example, if the study reported findings from multiple sites, the researcher averaged the ORs across sites to get the average effect size. In contrast, if multiple outcomes from the same study in the same bucket were different indicators and one was clearly more representative of the intermediate outcome, the researcher selected that outcome to represent the study. If the appropriate approach was not clear, the researcher consulted the broader research team for consensus on the best approach.

Within each bucket, observations with an adjusted OR based on multivariate analysis and derived from an experimental or quasi-experimental study design was given twice the weight of studies with bivariate findings or those using only cross-section or pre-post study designs. After weighting, the median OR value was calculated for each bucket and used to represent the relationship between the SBC intervention and the outcome.

For the literature examining the second link between intermediate determinants and behavioral outcomes, a similar process was used with each finding classified as an observation into the relevant intermediate determinant/

behavioral outcome bucket. As with linking SBC to other outcomes (links 1 and 3), when studies had multiple observations in a bucket, they were either combined or the most relevant observation was selected. Most studies examining the relationship between intermediate determinants and the outcomes were cross-sectional logistic regression analysis and were weighted as 1 for a crude OR and 2 for an adjusted OR that controlled for demographic and other variables.

Unit cost analysis

The primary objective of the SBC cost analysis was to identify and standardize SBC unit costs that can be used in conjunction with the country-specific scale-up scenarios to generate estimated costs and cost-effectiveness findings. This required the following research steps: (1) identify SBC costing studies; (2) extract cost data; (3) analyze extracted data to calculate median unit costs for different intervention types; and (4) analyze the dataset of median unit costs to adjust for location and SBC intervention characteristics.

1. Identify SBC cost studies

An earlier review and synthesis of the SBC for cost literature was conducted and summarized in a technical report entitled *Documenting the Costs of Social Behavior Change Interventions for Health in Low- and Middle-Income Countries*. Building on this prior work, additional cost data were sought for more recent years, resulting in a full text review of 110 SBC studies and an additional 48 cost studies for the **SBC cost repository**, yielding a total of 197 SBC costing studies.

2. Extract cost data

Table A3 (page 25) details the various data elements extracted for each study and cost observation.

3. Analyze extracted data for median unit costs

Preparing the extracted cost data for analysis required several steps, including:

Where necessary, dividing the author-provided total cost (numerator) by the quantity of units measured (denominator) to create a unit cost.

Where necessary, multiplying the number of people targeted by the percentage exposed/participated

TABLE A3 DATA EXTRACTION FORM COMPONENTS

INFORMATION TYPE	SPECIFIC FIELDS
Study identification	Study ID, Lead author, All authors, Year of publication, Title, Journal, URL
SBC intervention description	Health area, Main intervention type, Intervention details, Data collection years
Means of service delivery, geography	Platform ^a , Ownership ^b , Geographic scope ^c , Country, Region, Urban/Rural
Population and dissemination	Population served, Number targeted, Number exposed/participated
Cost type and parameters	Cost category/type, Economic/financial costs ^d , Cost perspective ^e , Unit of measurement, Duration of measurement, Intervention phase, Scale
Cost details	Cost per output/outcome, Currency, Currency year, Currency conversion, Cost component amounts (personnel, commodities, recurrent, capital, above-site, and other), Cost inputs, Client costs, Revenues, Scale, Sensitivity analysis, Further cost methodology details, Cost calculation explanation, Additional notes

^aPlatform is the channel of service delivery, such as through fixed facilities like clinics or through outreach modalities like mobile vans.

^bOwnership refers to the type of organizations funding and/or implementing the intervention, whether public/government, private, local NGO, international NGO, or a mix of these.

^cGeographic scope means whether the intervention was implemented nationally, regionally, or at the local level of a city or group of villages.

^dEconomic costs reflect the full value of all resources utilized in producing a good or service, inclusive of “opportunity costs” that represent the value of the forgone opportunity to devote unpaid resources (such as volunteer time and donated goods) to another purpose. Financial costs reflect financial outlays for goods and services needed to carry out a public health or medical intervention, similar to expenditures. However, in contrast to expenditure data, financial costs depreciate capital expenditures over time.

^eThe perspective can typically be provider, societal, or client. According to the SBC Costing Guidelines,³ the provider perspective includes costs by the service provider to produce the activity, service, or intervention at the point of care, while the societal perspective includes all costs, regardless of payor. The client perspective can include costs not typically included in other perspectives, such as travel expenses and lost wages due to the time spent obtaining care. Due to data limitations, the perspective in the extraction template was broken into provider, provider including revenues, client, above-site only costs, health system (provider + above-site), and societal (provider + client).

to get a number exposed/participated that could be used as a denominator for calculating a unit cost.

Where necessary, generating a time period from the dates reported for the beginning and end of the intervention when the time period of the costs was not given.

In cases where the study author did not give a year for the reported cost data, using a formula that took the publication date and subtracted one year to create an estimated year of the cost data (that could be used for inflation purposes).

Standardizing all costs to the 2020 USD (to align with the year/denomination used in the Unit Cost Study Repository by first converting local currency to USD for the reported (or estimated) year of cost data using market exchange rates, then inflating using the US GDP price deflator.

Where necessary, dividing the costs reported as cost per couple by two to obtain a per person cost.

Averaging costs (and denominators) reported in the same study for multiple sites or multiple years that

had the same country, service delivery platform, target population, ownership, urbanicity, and intervention phase to avoid overrepresentation of data from single studies.

Once the entire cost data set was extracted, standardized, and cleaned, analysis was conducted to summarize unit cost findings for a subset of results. To be included in the analysis, the unit costs were filtered to include only those unit costs with the following criteria:

The cost type was listed as a unit cost for an SBC intervention or an SBC component (excludes total cost and cost-effectiveness estimates and excludes non-SBC intervention cost estimates and mixed intervention cost estimates).

Costing was done from a provider costing perspective (excludes estimates that include revenue, above-site only costs, and studies from the health system and client perspectives).

The unit cost was from the intervention phase of implementation or overall implementation (excludes design, training, start-up, or scale-up only phases).

The unit cost included a unit of measurement of cost per person exposed, cost per person participated, or cost per person contacted as appropriate to the intervention type.

The cost estimate was relevant to the SBC interventions listed in **Table 1**. We did not include extracted unit costs for social marketing in the analysis due to challenges in isolating provider costs, since factors affecting the reported cost estimates (e.g., subsidies, revenues) often could not be disaggregated.

The study data did not suffer from methodological issues (e.g., medical commodities costs could not be separated from the SBC costs, or the unit of measurement was not clear).

4. Adjust median costs

To adjust the median costs to reflect the estimated unit costs for BF and CF SBC interventions in Nigeria and Nepal, we conducted further statistical analysis. First, the intensity of the SBC intervention for each unit cost observation was assessed and assigned either “low,” “average,” or “high” intensity. Each intervention type had different criteria for assessing intensity. For example, mobile digital interventions were assessed on how many messages were sent per person and whether there was one- vs. two-way communication, while IPC interventions were assessed based on the number and length of visits, whether peers or professionals facilitated the counseling, and ratio of counselors to attendees. Two researchers assessed intervention intensity and any differences in assessment was arbitrated by a third researcher.

Along with intervention intensity, potential explanatory variables explored included: geographic region, health area (e.g., HIV), scale of intervention (e.g., regional), ownership (e.g., NGO), location (urban vs. rural), target population (e.g., at-risk), and country income as measured by the gross national income per capita. Stepwise regression models were used to determine statistically significant variables predicting unit costs for two separate models; one for costs measured as per person exposed and one for costs measured as per person participating. Once the statistically significant variables were identified, stepwise regression results were used to determine the

percent of the total unit cost variation explained by each characteristic via the changes in the R-squared. These percentages were then multiplied with the percentage differences in medians when tabulated by the different categories to determine the direction and extent to which a unit cost estimate would shift based on a combination of characteristics. As such, country-specific unit costs for nutrition SBC interventions were estimated for Nigeria and Nepal.

Appendix B:

Literature synthesis references

Available online at: https://breakthroughactionandresearch.org/wp-content/uploads/2023/02/BR_NutritionBusCase_Report_AppendixB.pdf

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