



Effective Health Care Program

Breastfeeding Programs and Policies, Breastfeeding Uptake, and Maternal Health Outcomes in Developed Countries

Evidence Summary

Background

In reproductive physiology, lactation follows pregnancy; a growing body of evidence supports the association between breastfeeding and better health outcomes for both infants and mothers.¹⁻³ A 2007 Agency for Healthcare Research and Quality (AHRQ) review by Ip and colleagues concluded that breastfeeding was associated with reduced maternal type 2 diabetes, breast cancer and ovarian cancer, but not fractures.² For other outcomes (e.g., postpartum depression), the authors concluded that the relationship between breastfeeding and maternal health was unclear. Since 2007, several new studies have reported on maternal outcomes not addressed in the 2007 AHRQ review, including hypertension, rates of myocardial infarction, and other cardiovascular outcomes.⁴⁻⁷

In 2014, an estimated 82.5 percent of infants born in the United States were breastfed at birth, meeting Healthy People 2020 targets for the percentage of infants who are ever breastfed (81.9%). However, rates of breastfeeding duration fell short of Healthy People 2020 targets. In 2014, only 55.3 percent of women breastfed at 6 months and 33.7 percent at 12 months⁸ (falling short of the 2020 targets of 66.6 and 34.1 percent, respectively, for 6 and 12 months).⁹ Rates of exclusive breastfeeding through 3 and 6 months

Purpose of Review

To summarize the effectiveness of community, workplace, and health care system-based programs and policies aimed at supporting and promoting breastfeeding, and to determine the association between breastfeeding and maternal health.

Key Messages

- Baby-Friendly Hospital Initiative (BFHI) is associated with improved rates of breastfeeding initiation and duration.
- Health care staff education combined with postpartum home visits may be effective for increasing breastfeeding duration.
- Health care staff education alone (with no additional breastfeeding support services) may not be effective for increasing breastfeeding initiation rates.
- For women enrolled in the WIC Program, peer-support interventions offered by WIC agencies may improve rates of breastfeeding initiation and duration.
- Breastfeeding is associated with reduced maternal risk of breast and ovarian cancer, hypertension, and type 2 diabetes.
- Workplace, school-based, and community-based interventions and underlying socioeconomic factors need further research.



were 46.6 and 24.9 percent, respectively; these measures are close to Health People 2020 targets (46.2 and 25.5%, respectively).⁸ Women would prefer to breastfeed longer: in a national survey, 45 percent of U.S. women who initiated breastfeeding reported early, undesired weaning.¹⁰ Despite rising breastfeeding initiation and duration rates in the United States, racial and ethnic differences persist. From 2000 to 2014, the percentage of women who initiated breastfeeding went up from 47.4 to 68.0 percent for blacks, 71.8 to 85.7 percent for whites, and 77.6 to 84.8 percent for Hispanics.^{11, 12}

In addition to setting targets for breastfeeding initiation rates and duration of breastfeeding, other Healthy People 2020 objectives related to breastfeeding include (1) increasing the proportion of live births that occur in facilities that provide recommended care for lactating mothers and their babies and (2) increasing the proportion of employers that have worksite lactation support programs.⁹ These community, workplace, and health care system-based programs and policies may be promising strategies to support initiation and increase duration of breastfeeding.

Health care system-based interventions may include maternity staff education or the Baby-Friendly Hospital Initiative (BFHI). The BFHI is a global program sponsored by the World Health Organization (WHO) and United Nations Children’s Fund to encourage and recognize hospitals and birth centers that create an environment supporting breastfeeding. In each country, a BFHI Coordination Group is charged with designating

facilities as Baby-Friendly;¹³ there are likely country-specific differences in the process for determining final accreditation (or certification) status. As a result, details of implementation vary from country to country. The Baby-Friendly USA “Ten Steps to Successful Breastfeeding” for hospitals and birthing facilities are listed in Table A. Insurance coverage for lactation support is another strategy that may enable women to achieve their breastfeeding goals. Costs associated with breastfeeding support (e.g., comprehensive lactation support and counseling, breastfeeding equipment) are currently covered by health insurance marketplace plans and private nongrandfathered health plans under the 2010 Patient Protection and Affordable Care Act.¹⁴ It is not clear whether certain lactation benefit packages (e.g., type of breastfeeding supplies offered, number of visits provided, or qualifications of intervention delivery personnel) are more or less effective than others in increasing breastfeeding initiation and duration. In addition, a key program relevant to breastfeeding is the Special Supplemental Nutrition Program for Women, Infants and Children (WIC), which serves 53 percent of infants born in the United States.¹⁵ Because WIC reaches more than half of U.S. infants, its programs have considerable influence on population health.

Although there is broad appeal and interest in workplace interventions to increase duration and exclusivity of breastfeeding, their effectiveness and harms are uncertain.¹⁶

Table A. Baby-Friendly Hospital Initiative’s 10 steps to successful breastfeeding^a

1. Have a written breastfeeding policy that is routinely communicated to all health care staff.
2. Train all health care staff in skills necessary to implement this policy.
3. Inform all pregnant women about the benefits and management of breastfeeding.
4. Help mothers initiate breastfeeding within 1 hour of birth.
5. Show mothers how to breastfeed and how to maintain lactation even if they should be separated from their infants.
6. Give infants no food or drink other than breast milk, unless medically indicated.
7. Practice rooming in—allow mothers and infants to remain together 24 hours a day.
8. Encourage breastfeeding on demand.
9. Give no pacifiers or artificial nipples to breastfeeding infants.
10. Foster the establishment of breastfeeding support groups and refer mothers to them on discharge from the hospital or birth center.

^a Baby-Friendly USA “Ten Steps to Successful Breastfeeding”¹⁷

Existing Guidelines

Multiple clinical guidelines and health-related organizations recommend exclusive breastfeeding up to (or around) 6 months, including the American Academy of Pediatrics,¹⁸ the American Congress of Obstetrics and Gynecology,¹⁹ the WHO,^{20, 21} and others.^{22, 23} These organizations recommend continued breastfeeding through the first year of life and beyond; the WHO recommends continued breastfeeding through the second year of life and beyond.²⁴

Rationale for Evidence Review

The purpose of this review is to develop an evidence report that summarizes the effectiveness of community, workplace, and health care system–based programs and policies aimed at supporting and promoting breastfeeding. Such knowledge is needed to inform allocation of resources to enable more women to achieve their infant feeding goals. The U.S. Preventive Services Task Force (USPSTF) recommends providing interventions during pregnancy and after birth to support breastfeeding as part of routine primary care (B recommendation).²⁵ To avoid duplication, this review will not address the effectiveness of individual-level primary care interventions to support breastfeeding covered in the recent systematic review to support the USPSTF recommendation.²⁶

In addition, this review will address the association between breastfeeding and maternal health. Substantial time has elapsed since the last AHRQ review on this topic in 2007, and the body of literature focused on the maternal health benefits of breastfeeding has grown.^{1, 27-29} This review will conduct a partial update of the 2007 AHRQ review focused on the relationship between breastfeeding and various maternal health outcomes. This review will inform the extent to which breastfeeding may be an effective primary prevention strategy for improving women’s health.

Key Questions

Key Question 1:

- 1a. What are the effectiveness and harms of programs and policies on initiation, duration, and exclusivity of breastfeeding?
- 1b. To what extent do the effectiveness and harms of programs and policies on initiation, duration, and exclusivity of breastfeeding differ for subpopulations of women defined by sociodemographic factors (e.g., age, race, ethnicity, socioeconomic status)?
- 1c. To what extent do intervention-related characteristics (e.g., type of breast pump provided—manual or electric; delivery personnel) influence the initiation, duration, and exclusivity of breastfeeding?

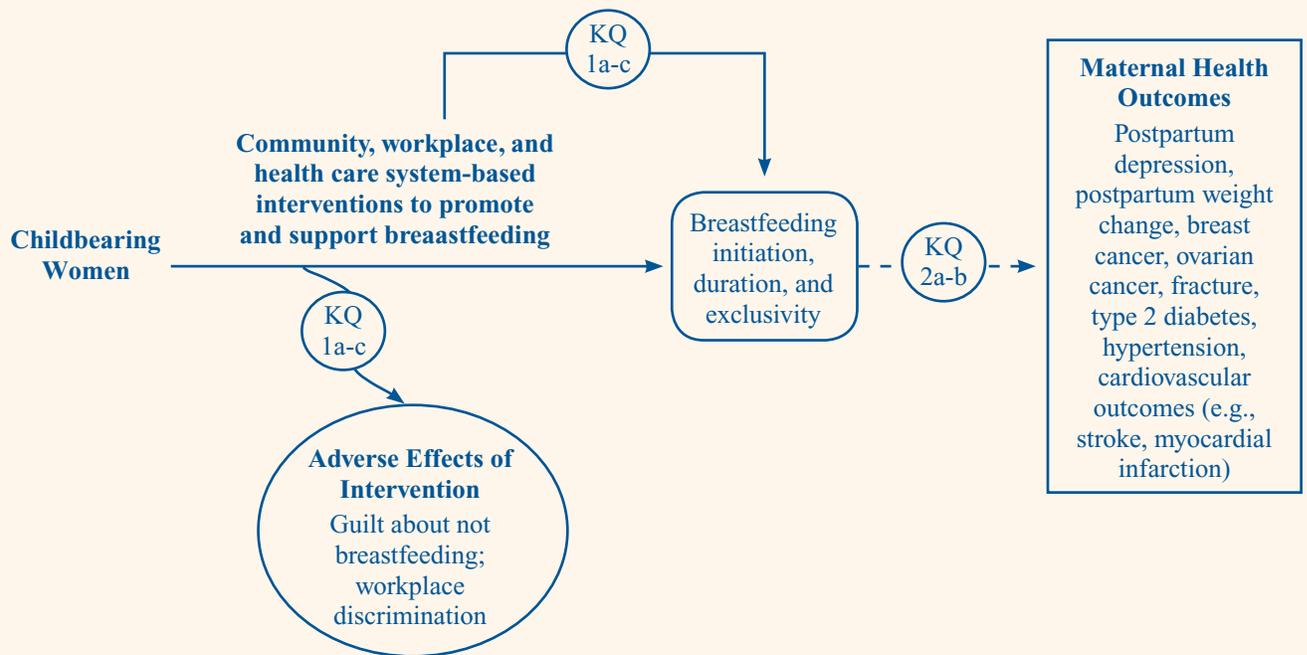
Key Question 2:

- 2a. What are the comparative benefits and harms for maternal health outcomes among women who breastfeed for different intensities and durations?
- 2b. To what extent do benefits and harms for maternal health outcomes differ for subpopulations of women defined by age, race, ethnicity, and comorbidity?

Analytic Framework

We developed an analytic framework to guide the systematic review process (Figure A). The analytic framework illustrates the population, interventions, outcomes, and adverse effects that guided our literature search and synthesis.

Figure A. Analytic framework for breastfeeding programs and policies, breastfeeding uptake, and maternal health outcomes in developed countries



KQ = Key Question.

Methods

The initial Key Questions (KQs) were provided by AHRQ and developed in collaboration with partners from the Centers for Disease Control and Prevention (CDC) and National Institutes of Health Office of Women’s Health. The Evidence-based Practice Center further refined the KQs. We sought input from a Technical Expert Panel on the final research protocol, which was posted on the AHRQ Web site on March 20, 2017, at <https://effectivehealthcare.ahrq.gov/topics/breastfeeding/research-protocol/>; our PROSPERO registration number is CRD42017079125.

Literature Search Strategy

Search Strategy

For KQ 1, we searched PubMed/MEDLINE, the Cochrane Library, and CINAHL from January 1, 1980, to October 12, 2017, to ensure that evidence is applicable to current breastfeeding policies and practices. For KQ 2, we searched PubMed/MEDLINE, the Cochrane Library, and

CINAHL from November 1, 2005 (6 months prior to the search date of the 2007 AHRQ review searches) to October 12, 2017. A full description of the search strategy is provided in the methods section of the full report.

Inclusion and Exclusion Criteria

Interventions of interest for KQ 1 included any community, workplace, or health care system–based interventions aimed at promoting and supporting breastfeeding. Included studies for KQ 1 had to have a concurrent control group or (for single-group pre-post studies) include multiple pre- and post-measures of breastfeeding rates. For KQ1, we included studies conducted in countries categorized as “very high” and “high” human development index per the United Nations Development Programme.³⁰

Eligibility criteria for KQ 2 were based on criteria used in the 2007 AHRQ review by Ip and colleagues for maternal health outcomes (postpartum depression, postpartum weight change, breast cancer, ovarian cancer, osteoporotic fracture, and type 2 diabetes). For this update, we also included hypertension and cardiovascular disease.

Eligible studies compared groups of women exposed to breastfeeding with those who did not breastfeed (or breastfed for shorter duration and/or less intensity). To maintain consistency with the 2007 review, we limited to studies enrolling women from countries categorized as “very high” human development index per the United Nations Development Programme.³⁰ A detailed search strategy is provided in the methods section of the full report.

Risk of Bias Assessment of Individual Studies

We adapted existing tools (ROBINS-I³¹ for observational studies, and the Cochrane tool³² for trials) and used predefined criteria based on the AHRQ Methods Guide for Effectiveness and Comparative Effectiveness Reviews. Criterion details are included in the full report, including Appendix C.³³

Risk of Bias Assessment of Systematic Reviews

We assessed the relevance of systematic reviews published within the past 5 years using predefined criteria. For reviews determined to be relevant, we rated the risk of bias (ROB) as low, unclear, or high ROB using the ROBIS tool.³⁴ Appendix C of the full report lists the specific questions used for evaluating the ROB of all relevant reviews.

Data Synthesis

For those KQ 2 outcomes for which we included a recent published systematic review rated low or unclear ROB, we first described the results of the review and then summarized data from primary studies published after the latest search date of those reviews. We included systematic reviews for some outcomes (breast cancer, ovarian cancer, and type 2 diabetes) that had conducted meta-analyses. If individual studies identified in our database searches were generally consistent with the pooled results reported by existing systematic reviews, we did not conduct new meta-analyses.

Strength of the Body of Evidence

We graded the strength of evidence (SOE) based on guidance established for the Evidence-based Practice Center Program.³⁵ This approach incorporates five key domains: study limitations (aggregate ROB), consistency, directness, precision, and reporting bias.

Applicability

We assessed applicability following guidance from the *Methods Guide for Effectiveness and Comparative Effectiveness Reviews*.³⁶ For individual studies, we examined conditions that may limit applicability of evidence such as race or ethnicity of enrolled populations, setting of enrolled populations, geographic setting, time period of enrollment, and availability of health insurance and other health-related employment benefits.

Peer Review and Public Commentary

This report was posted for public comment and peer reviewed. We addressed all comments in the final report, making revisions as needed; a disposition of comments report will be publicly posted 3 months after release of the final report.

Results of Literature Searches

Searches of all sources identified a total of 11,006 potentially relevant citations. We included 128 unique individual studies (described in 137 publications) and 10 systematic reviews. Of these, 40 individual studies (from 44 publications) were relevant to KQ 1, and 88 individual studies (from 93 publications) and 10 systematic reviews were relevant to KQ 2. Of the KQ 2 included studies, 18 were studies from a prior 2007 AHRQ review addressing the maternal health benefits of breastfeeding.² The remaining 34 studies from the 2007 review were included in at least 1 of our 10 systematic reviews or superseded by a new included study. Appendix B in the full report provides a complete list of articles excluded at the full-text screening stage, with reasons for exclusion.

Effectiveness and Harms of Breastfeeding Programs and Policies

The 40 studies that met our inclusion criteria evaluated a range of strategies to improve rates of breastfeeding initiation and duration. No included studies assessed the benefit of workplace interventions or the potential harms of interventions. To aid in synthesizing results of similar studies, we categorized interventions primarily based on intervention type: BFHI, other (non-BFHI) health care system-based interventions (e.g., residency curriculum related to breastfeeding), WIC-based interventions, and community-based interventions (not primarily delivered as part of the health care system). In addition to categorizing interventions by intervention type, we also summarized results for breastfeeding initiation and

duration separately when we had similar studies reporting on multiple breastfeeding outcome types. Below, we provide a summary of our main conclusions related to the effectiveness of programs and policies for improving rates of breastfeeding initiation and duration organized by intervention type.

BFHI Interventions

Twelve included studies (described in 13 publications) assessed the effectiveness of BFHI interventions.³⁷⁻⁵⁰ Studies were conducted in diverse country settings

including the United States (2 studies);^{39, 40} Taiwan (2 studies);^{46, 50} and one each in the Republic of Belarus,³⁷ Hong Kong,⁴¹ Czech Republic,⁴² Russia,⁵¹ Brazil,⁴⁴ Croatia,⁴⁵ Brazil,⁴⁹ United Kingdom (multiple regions),⁴⁷ and Scotland.⁵² Table B presents key findings and SOE related to the benefit of BFHI interventions. Overall, the evidence supports the effectiveness of BFHI for improving rates of breastfeeding initiation and duration.

Table B. Summary of key findings and strength of evidence: Studies assessing BFHI

Breastfeeding Outcome Intervention Versus Comparator	N Studies; N Subjects Study Limitations	Outcome and Results	Strength of Evidence
Initiation BFHI certified/accredited vs. no BFHI status	9 cohorts; ^{39, 40, 42, 43, 46-50} 1,227,532 Medium	Any BF initiation (k=6): higher rates of BF at discharge among BFHI-accredited hospitals than control hospitals (by 0.5% to 10%); differences between groups were not statistically significant in 4 studies Exclusive BF initiation (k=5): significantly higher rates of exclusive BF at discharge among BFHI-accredited hospitals than control hospitals; magnitude varied, ranging from 3 to 56%	Low for benefit (consistent, imprecise)
Duration BFHI vs. no BFHI intervention (evidence from RCTs)	1 RCT; ^{37, 38} 17,046	One RCT found significantly higher rates of exclusive BF among women at BFHI hospitals at 3 mos (43% vs. 6%; p<0.001) and 6 mos postpartum (7.9% vs. 0.6%; p=0.01), and lower odds of weaning (from any BF) at 3, 6, 9, and 12 mos postpartum than women in control hospitals	Moderate for benefit (consistent, imprecise)
Duration BFHI certified/accredited vs. no BFHI status (evidence from observational studies)	8 cohorts; ^{39-41, 43, 46, 47, 49, 50} 136,983 Medium	Any BF duration (k=8 cohort studies): higher rates of BF 1 to 12 mos postpartum among women at BFHI hospitals (by approximately 0.6% to 15%) than women at control hospitals; one study found slightly higher BF rates at 1 mo among women in control hospitals than BFHI hospitals (by 0.4% to 7%) Exclusive BF duration (k=5 cohort studies): higher rates of exclusive BF over 1 to 2 mos among infants born in BFHI hospitals than control hospitals (by approximately 4% to 25%)	
Breastfeeding Outcome Intervention Versus Comparator	N Studies; N Subjects Study Limitations	Outcome and Results	Strength of Evidence
Duration Six or more BFHI steps vs. fewer than six steps	1 cohort; ⁴¹ 1,417 Medium	Significantly higher odds of weaning at or before 8 wks postpartum among women giving birth in hospitals practicing ≤ four BFHI steps than women giving birth in hospitals practicing six BFHI steps (ORs ranged from 2.08 and 3.13); no difference between women exposed to five vs. six steps	Low for benefit (consistent ^a precise)

^a Although only one study compared groups of women based on number of BFHI steps practiced by hospitals, we considered evidence on duration from studies comparing BFHI implementation (or accreditation) with nonaccredited hospitals. As shown in the table, we concluded that moderate SOE supports the effectiveness of BFHI for improving breastfeeding duration.

BF = breastfeeding; BFHI = Baby-Friendly Hospital Initiative; HV = home visits; k = number of studies; N = number; OR = odds ratio; RCT = randomized controlled trial; SOE = strength of evidence.

For breastfeeding initiation, evidence from nine cohort studies (1,227,532 women) comparing women giving birth in BFHI-certified (or accredited) hospitals with noncertified hospitals supports the effectiveness of BFHI (low SOE). Although the included studies consistently found higher rates of initiation at accredited hospitals, results were imprecise and the magnitude of benefit varied by breastfeeding measure and country setting (Table B).

Based on evidence from one large RCT (Promotion of Breastfeeding Intervention Trial [PROBIT], N=17,046) and five cohort studies (62,834 women), we concluded that BFHI increases rates of breastfeeding duration through 12 months postpartum (moderate SOE). In the PROBIT trial, women in the intervention group had significantly higher rates of exclusive breastfeeding and lower rates of weaning across various multiple time points (1 to 12 months postpartum). Although the eight observational studies were mostly consistent in finding benefit for BFHI, results were imprecise, and the magnitude of benefit varied by breastfeeding measure and country setting. One cohort study (N=1,417) compared rates of breastfeeding at 6 months among women discharged from hospitals that differed in the number of BFHI steps implemented; low SOE supports the conclusion that implementation of four or more BFHI steps is associated with lower rates of weaning than implementation of fewer than four steps.

Other (Non-BFHI) Health Care System–Based Interventions

Fifteen studies (described in 16 publications) assessed the effectiveness of other (non-BFHI) health care system–based interventions.^{44, 53-67} Studies were conducted in diverse country settings including the United States (3 studies),^{59, 66, 68} Canada (1 study),⁶⁴ Sri Lanka (1 study),⁶¹ Brazil (2 studies),^{65, 69} China (1 study),⁵⁸ and various European countries (6 studies).^{53, 56, 57, 60, 62, 63} Studies assessed a variety of intervention types; the majority focused on health care provider education or training related to breastfeeding, with or without additional services offered (e.g., breastfeeding groups, home visits). Table C presents key findings and SOE conclusions. Overall, the evidence supports the effectiveness of three intervention types for improving the duration of exclusive breastfeeding: modified BFHI policy implementation in outpatient setting (e.g., development of a breastfeeding policy, staff training, outcome assessment, and quality improvement initiatives), continuous nursing care during the perinatal period (the same nurse provides routine perinatal care to the mother and infant), and health care provider education combined with a series of home visits (low SOE). In addition, the evidence suggests that health care provider education and training alone (without additional breastfeeding support services) are not effective in improving rates of breastfeeding initiation (low SOE). As a result of methodological limitations and imprecise and inconsistent findings, we rated the SOE as insufficient for other intervention types.

Table C. Summary of key findings and strength of evidence: Non-BFHI health care system–based interventions

Breastfeeding Outcome Intervention Versus Comparator	N Studies; N Subjects Study Limitations	Outcome and Results	Strength of Evidence
Initiation Education/staff training related to BF alone vs. usual practice	4 (2 RCTs, ^{55, 56, 61} 2 NRCTs ^{59, 64}); 1,532 ^a Medium	No significant difference between intervention and control groups in rates of any or exclusive BF initiation	Low for no benefit (consistent, imprecise)
Initiation Education and staff training plus additional individual services vs. usual care	4 (2 RCTs, ^{60, 63} 1 NRCT, ⁵⁷ 1 pre-post study ⁵³); 34,018 Medium	Inconsistent findings across four studies assessing heterogeneous interventions	Insufficient (inconsistent, imprecise)
Duration Education and staff training related to BF only vs. usual practice	3 (2 RCTs, ^{55, 56, 65} 1 NRCT ⁵⁹); 1,526 ^a Medium	Inconsistent findings across three studies for duration of any and exclusive BF	Insufficient (inconsistent, imprecise)

Table C. Summary of key findings and strength of evidence: Non-BFHI health care system–based interventions (continued)

Breastfeeding Outcome Intervention Versus Comparator	N Studies; N Subjects Study Limitations	Outcome and Results	Strength of Evidence
Duration Education and staff training plus additional individual services vs. usual care	4 RCTs; ^{44, 60, 62, 63} 21, 253 Medium	Two RCTs assessing staff education combined with a series of postpartum HVs found improved rates of any BF duration Two RCTs assessing staff education combined with different clinic-based patient education strategies found no significant difference between groups	Staff education plus HVs: Low for benefit (consistent, precise) Staff education plus clinic-based education/support: Insufficient (inconsistent, imprecise)
Duration Adaptation of the BFHI for integration into routine primary care (maternal and child health centers) vs. usual care	1 NRCT; ⁶⁷ 3,948 Medium	Significantly higher rates of exclusive BF in the intervention group than controls at 6 mos (OR, 1.33; 95% CI, 1.03 to 1.72); no difference between groups in rates of any BF at 5 or 12 mos	Low for benefit (unknown consistency, precise)
Initiation/duration Continuous primary nursing care (same nurse through perinatal period for mother/infant) vs. usual care (task-oriented nursing)	1 RCT; ⁵⁸ 470 Medium	Significantly higher rates of exclusive BF during hospitalization (99% vs. 88%; p=0.001) and higher rates of exclusive BF 6 wks (72% vs. 94%; p=0.001) among women in the intervention group than controls	Low for benefit (unknown consistency, precise)

^a Number here includes participants enrolled from three studies; one study focused on 13 residency programs did not report the number of women included in analyses of breastfeeding outcomes.⁵⁹

BF = breastfeeding; BFHI = Baby-Friendly Hospital Initiative; CI = confidence interval; HV = home visit; N = number; NRCT = non-randomized controlled trial; OR = odds ratio; RCT = randomized controlled trial.

WIC-Based Interventions

Eight included studies assessed changes in breastfeeding rates associated with a WIC program or policy.⁷⁰⁻⁷⁷

Although all studies were set in the United States, they included women from diverse States. Included studies assessed heterogeneous interventions and policies; key findings and SOE assessments are shown in Table D. Overall, low SOE supports the effectiveness of WIC-based peer-support programs for improving rates of any

breastfeeding initiation and duration from 6 weeks to 6 months postpartum. We found insufficient evidence (primarily because of unknown consistency and imprecision) to make a conclusion on the benefit of other WIC programs or policies for improving breastfeeding outcomes, including policy changes related to WIC food packages, provision of different types of breast pumps (electric vs. manual), tailored counseling, cash incentives, and peer-support programs targeted at fathers.

Table D. Summary of key findings and strength of evidence: WIC-based interventions

Breastfeeding Outcome Intervention Versus Comparator	N Studies; N Subjects Study Limitations	Outcome and Results	Strength of Evidence
Initiation/duration Mother peer support vs. control	3 (1 RCT, ⁷³ 1 NRCT, ⁷⁴ 1 cohort ⁷⁵); 2,480 Medium	Two studies of in-person peer support resulted in significantly higher rates of BF initiation and increased BF duration; one telephone-based peer-support study found significantly higher rates of any BF at 3 and 6 mos than controls	Low for benefit (consistent, precise)
Initiation/duration BF rates post-2007 policy revising the WIC food package vs. pre-policy implementation	1 (3 pop. cohorts); ⁷¹ PRAMS (127,477) NIS (73,991) PedNSS (744 infants): 744 High	No association between the policy change and rates of BF; ^a BF rates increased overall with no difference between women receiving WIC benefits and similar groups of women not receiving WIC benefits	Insufficient (high ROB, unknown consistency, imprecise)
Duration Provision of electric breast pump vs. manual pump	1 RCT; ⁷⁰ 280 Medium	No difference in BF duration among women assigned to an electric vs. manual breast pump; median duration of BF was 12 vs. 11 mos, respectively (HR,1.13; 95% CI, 0.79 to 1.50)	Insufficient (unknown consistency, imprecise)
Initiation/duration Peer-support program for fathers (in addition to mother peer support) vs. peer support for mothers alone	1 NRCT; ⁷² 200 Medium	Mothers in the intervention group had slightly higher rate of any BF at 6 mos than controls (63% vs. 55%) that was not statistically significant (p=0.20)	Insufficient (unknown consistency, imprecise)
Duration Cash incentives vs. usual WIC services	1 RCT; ⁷⁷ 36 Medium	BF rates in the intervention group were significantly higher than controls at 1, 3, and 6 months (89% vs. 44%, 89% vs. 17%, and 72% vs. 0%, respectively)	Insufficient (unknown consistency, precise)
Duration Tailored BF counseling and support based on BAPT survey	1 cohort; ⁷⁶ 826 High	Significantly higher rates of exclusive BF in the intervention group at 7 and 30 days than controls; no difference between groups at 2 mos	Insufficient (high ROB, unknown consistency, imprecise)

^a All three databases measured rates of “ever-breastfeeding”; in addition, PRAMS measured rates of breastfeeding for at least 4 weeks, NIS measured rates of breastfeeding for at least 3 months, and PedNSS measured rates of breastfeeding for at least 1 month. Conclusions were consistent across the different measures.

BAPT = Breastfeeding Attrition Prediction Tool; BF = breastfeeding; CI = confidence interval; HR = hazard ratio; N = number; NIS = National Immunization Survey; NRCT = non-randomized controlled trial; PedNSS = Pediatric Nutrition Surveillance System; PRAMS = Pregnancy Risk Assessment Monitoring System; RCT = randomized controlled trial; ROB= risk of bias; WIC = Special Supplemental Nutrition Program for Women, Infants and Children.

Community-Based Interventions

Five included studies (described in 7 publications) assessed the effectiveness of a community-based intervention;⁷⁸⁻⁸⁴ key findings and SOE assessments are shown in Table E. Studies were conducted in diverse country settings including one each in Italy,⁷⁹ Australia,⁸⁰ Mexico,⁸² Chile,⁸⁴ and Canada.⁸³ No studies assessed the same intervention type, which limited our ability to make conclusions on

the SOE for most intervention types. Low SOE supports the benefit of community-based interventions that provide mothers with peer-support (via home visits). In addition, access to a community-based breastfeeding drop-in center among women receiving early home-based breastfeeding support does not increase breastfeeding duration (low SOE).

Table E. Summary of key findings and strength of evidence: Community-based interventions

Breastfeeding Outcome Intervention Versus Comparator	N Studies; N Subjects Study Limitations	Outcome and Results	Strength of Evidence
Initiation/duration Community-based policy aimed at promoting BF in nonhospital-based health and community centers vs. no intervention	1 NRCT; ^{78, 79} 5,094 Medium	No significant difference in rates of exclusive BF at discharge, 3 and 6 mos, or rates of any BF at 5 and 12 mos between groups	Insufficient (unknown consistency, imprecise)
Duration Access to community-based BF drop-in centers (plus early BF support) vs. early BF support alone vs. usual care	1 RCT; ^{80, 81} 9,675 Low	No difference between groups in rates of any BF at 3, 4, or 5 mos.	Low for no benefit (unknown consistency, precise)
Duration Community-based peer support vs. usual care	1 RCT; ⁸² 130 Low	Significantly higher rates of exclusive BF at 3 mos among intervention groups (50% to 67%) than control group (12%), p<0.001; rates of any BF were significantly longer in intervention groups (combined) than in the control group at 3 mos (but not 6 mos)	Low for benefit (unknown consistency, precise)
Duration Peer-led BF support class vs. Nurse-led BF support class	1 cohort; ⁸³ 109 High	No significant difference between groups in rates of any BF at 1 and 6 mos postpartum	Insufficient (high ROB, unknown consistency, imprecise)
Duration Integrated postpartum program (BF education and support, maternal/infant health care) vs. usual care	1 NRCT; ⁸⁴ 392 High	Significantly higher rates of exclusive BF at 6 mos among the intervention group than control group (74% vs. 10%; p=0.001)	Insufficient (high ROB, unknown consistency, precise)

BF = breastfeeding; N = number; NRCT = nonrandomized controlled trial; ROB = risk of bias; RCT = randomized controlled trial.

Effectiveness and Harms of Breastfeeding Programs and Policies for Subpopulations of Women

Few studies reported on subgroups of women. Of the four included studies reporting on subgroups of women, two focused on BFHI and reported on differences by education status,^{39, 40} one focused on a WIC peer-support intervention and reported on subgroups by language spoken (Spanish only vs. English),⁷³ and one prospective cohort study assessed a tailored breastfeeding counseling intervention.⁷⁶ Table F shows our key findings

and SOE related to subgroups of women. Low SOE supports the conclusion that BFHI effectiveness may vary among women who differ by education status. For WIC interventions, we found insufficient evidence to make a conclusion on whether benefit of telephone peer support varies by subgroups of women based on language spoken (Spanish only vs. English) or whether benefit of tailored breastfeeding counseling intervention varies by race/ethnicity, primarily because of unknown consistency (and inconsistency across time points) and imprecision.

Table F. Summary of key findings and strength of evidence: KQ 1 studies reporting on subgroups

Breastfeeding Outcome Intervention Versus Comparator	N Studies; N Subjects Study Limitations	Outcome and Results	Strength of Evidence
Initiation (subgroups: education status) BFHI certified/accredited vs. no BFHI status	2 cohort; ^{39, 40} 27,341 Medium	Higher rates of BF initiation found among women with lower education (≤ 12 yrs) at BFHI hospitals compared with control hospitals, but no difference in rates among women with higher education (≥ 13 yrs)	Low (consistent, imprecise)
Duration (subgroups: education status) BFHI certified/accredited vs. no BFHI status	2 cohort; ^{39, 40} 27,341 Medium	Two studies found mixed results.	Insufficient (inconsistent, imprecise)
Initiation/duration (subgroups: language spoken) Mother peer support vs. control	1 RCT; ⁷³ 1948 Medium	One RCT of telephone peer support found mixed results for subgroups of women defined by language (English-speaking vs. Spanish-speaking only)	Insufficient (unknown consistency, imprecise)
Duration (subgroups: race/ethnicity) Tailored BF counseling and support based on BAPT survey	1 cohort; ⁷⁶ 826 High	Significantly higher rates of exclusive BF among non-Hispanic black and Hispanic women in the intervention group than controls at 1 and 2 mos; no significant difference in exclusive BF rates among white women at any time point	Insufficient (high ROB, unknown consistency, precise)

BAPT= Breastfeeding Attrition Prediction Tool; BF = breastfeeding; BFHI = Baby-Friendly Hospital Initiative; KQ = Key Question; N = number; RCT = randomized controlled trial; ROB = risk of bias.

Effect of Intervention Characteristics on Breastfeeding Outcomes

This KQ focused on the extent to which intervention-related characteristics (e.g., type of breast pump provided—manual or electric, delivery personnel) influence the initiation, duration, and exclusivity of breastfeeding. We found no evidence to address this KQ.

Maternal Health Outcomes Associated With Breastfeeding

Table G summarizes our key findings related to KQ 2, including evidence for subpopulations of women, by outcome. Low SOE supports the conclusion that ever breastfeeding, as well as longer durations of breastfeeding,

may be associated with a reduced risk of developing (any) breast cancer, luminal breast cancer, or triple-negative breast cancer. Despite a large body of observational evidence, study and participant characteristics and methodological limitations did not explain the significant heterogeneity of results. Low SOE supports the association between ever breastfeeding, as well as longer versus shorter durations of breastfeeding, and a reduced risk of developing epithelial ovarian cancer. The body of evidence is relatively large and includes one systematic review of 41 studies and 8 additional studies (39,618 women); however, we rated SOE as low because the results included significant heterogeneity not explained by study and participant characteristics and methodological limitations.

Table G. Summary of key findings and strength of evidence: Maternal health outcomes

Maternal Health Outcome	N Studies; N Subjects Study Limitations	Outcome and Results^a	Strength of Evidence
Breast cancer	1 SR of 98 cohort/case-control studies; 1 NR ^b 19 cohort/case-control studies; ⁸⁵⁻¹⁰³ 256,891 women Medium	Consistent association in one SR (98 observational studies) between ever BF and lower rates of breast cancer compared with never BF (pooled OR 0.78, 95% CI 0.74 to 0.82); longer durations of BF was also associated with significantly lower rates of breast cancer than never BF. Results of individual studies were generally consistent in direction of effect (although results were imprecise); magnitude varied significantly across all studies and pooled results were associated with significant heterogeneity, only partially explained by subgroup analyses.	Low for beneficial association (consistent, imprecise)
Breast cancer: BRCA1/2 carriers	1 case-control study; ¹⁰⁴ 5,708 women Medium	Unclear association between BF and breast cancer among BRCA carriers.	Insufficient (unknown consistency, imprecise)
Breast cancer: In situ	3 cohort/case-control studies; ^{96, 99, 105} 67,234 women Medium	Unclear association between BF and breast cancer in situ.	Insufficient (inconsistent, imprecise)
Breast cancer: Hormone receptor subtypes	1 SR of 11 cohort/case-control studies; ¹⁰⁶ 169,879 women for luminal, 14,266 women for HER2, and 176,430 women for triple-negative analyses 7 cohort/case-control studies; ^{91, 95, 102, 107-110} 592,558 women Medium	Consistent association between ever BF or longer duration of BF and lower rates of luminal and triple negative breast cancer (although magnitude of association varies); for HER2, pooled estimates show unclear association between BF and lower rates of breast cancer (results are imprecise and pooled estimate is not statistically significant).	Low for beneficial association (luminal, triple-negative; consistent, imprecise); insufficient (HER2, inconsistent, imprecise)
Breast cancer: Mortality	1 cohort study; ¹¹¹ 250,470 parous women Medium	Unclear association; one study found no significant association between BF and breast cancer mortality (HR, 1.01; 95% CI, 0.79 to 1.29).	Insufficient (unknown consistency, imprecise)
Ovarian cancer	1 SR of 41 cohort/case-control studies; 1 NR ^c 9 cohort/case-control studies; ¹¹²⁻¹²¹ 42,611 women Medium	Consistent association between ever BF and longer durations of BF and lower risk of ovarian cancer; magnitude of association varies across studies by BF exposure definition.	Moderate for beneficial association (inconsistent, precise)
Hypertension	5 cohort studies; ^{4, 5, 122-124} 441,989 women Medium	Consistent association between longer duration of BF (>6-12 mos) and lower rates of HTN; magnitude of association varies by BF exposure comparisons and study design.	Low for beneficial association (consistent, imprecise)

Table G. Summary of key findings and strength of evidence: Maternal health outcomes (continued)

Maternal Health Outcome	N Studies; N Subjects Study Limitations	Outcome and Results^a	Strength of Evidence
CVD	3 cohort studies; ^{4, 6, 125} 301,989 women Medium	Unclear association between BF and CVD; three studies conclude an association between longer BF duration and lower CVD rates, each using a different composite outcome. Magnitude of association varies by exposure comparisons, age at cohort enrolment, and study design.	Insufficient (unknown consistency, imprecise)
CVD mortality	1 cohort study; ¹²⁶ 15,000 women Medium	Unclear association between BF and CVD mortality. One study found mixed results: parous women ≤65 yrs at enrollment who had never BF had higher CVD mortality over 14 yrs of followup than women who BF ≥24 mos (HR 2.77; 95% CI, 1.28 to 5.99). No clear associations were observed among women ≤65 yrs at enrollment.	Insufficient (unknown consistency, imprecise)
Type 2 diabetes	1 SR of 6 cohort studies; ¹²⁷ 273,961 women 5 cohort studies; ^{4, 128-132} 325,815 women Medium	Consistent association between ever BF and longer durations of BF and lower rates of type 2 diabetes (among women with and without gestational diabetes); magnitude of association varies by BF exposure duration and study design.	Low for beneficial association (consistent, imprecise)
Fractures	11 cohort/case-control studies; ¹³³⁻¹⁴³ 101,726 women Medium	Consistent lack of association between BF and fractures. Magnitude varies by exposure and outcome measure, but only 1 high ROB study reported statistically significant differences.	Low for no association (consistent, imprecise)
Postpartum depression	1 SR of 48 cohort studies; ¹⁴⁴ 71,245 women 14 cohort studies; ¹⁴⁵⁻¹⁵⁸ 39,372 women Medium	Unclear association between BF and postpartum depression. Magnitude of association and direction of effect unclear; studies are heterogeneous in design and results inconsistent.	Insufficient (unknown consistency, imprecise)
Postpartum weight change	16 cohort studies; ¹⁵⁹⁻¹⁷⁷ 47,655 women Medium	Unclear association between BF and postpartum weight change. Magnitude of postpartum weight change varies by BF exposure and outcome measure.	Insufficient (inconsistent, imprecise)

^a We marked outcomes as indirect for long-term maternal health outcomes primarily due to uncertainty of the relative contribution of

breastfeeding to risk (given that many other potential factors also contribute to outcomes such as hypertension, fracture, and breast cancer); for short-term maternal health outcomes (e.g., postpartum depression) there is uncertainty in the direction of effect between breastfeeding and health outcomes.

^b Per authors, there were 52 studies with >1,500 women, 31 studies with 500-1,499 women, and 15 studies with <500 women. Exact number of participants is unclear.

^c Per authors, there were 22 studies with >1,500 women, 12 studies with 500-1,499 women, and 7 studies with <500 women. Exact number of participants is unclear.

BF = breastfeeding; CI = confidence interval; CVD = cardiovascular disease; HER2 = human epidermal growth factor receptor 2; HR = hazard ratio; HTN = hypertension; N = number; NR = not reported; ROB = risk of bias; SR = systematic review.

For both hypertension and type 2 diabetes, studies varied in terms of outcomes and case definition; however, evidence

was consistent in finding an association between longer duration of breastfeeding and lower rates of hypertension and type 2 diabetes (low SOE for both outcomes).

Eleven studies reported on the association between breastfeeding using different measures (e.g., ever versus never and duration per child) and hip, vertebral, and forearm fracture risk. Apart from two studies (rated high ROB), no study reported a statistically significant association between breastfeeding and fracture. We rated the SOE as low for no association.

Because of significant heterogeneity in study design, breastfeeding exposure definitions, outcomes, and inconsistency in results, we found insufficient evidence on whether breastfeeding is associated with postpartum depression or postpartum weight change. For postpartum depression, current evidence does not establish the direction of relationship between breastfeeding and higher or lower rates of postpartum depression.

Discussion and Findings in Context

For KQ 1, our findings related to the benefit of BFHI for improving breastfeeding initiation and duration support continued efforts to implement this policy. Because of heterogeneity in study design, country setting, and outcome measures, we were not able to pool results. The absolute difference in rates of breastfeeding initiation and duration vary by setting and are likely influenced by a range of factors, such as intervention fidelity, social factors, and others. Although our scope is narrower (in terms of eligible country setting and study design), our conclusions are consistent with a recent narrative review¹⁷⁸ focused on BFHI; the authors concluded that adherence to the BFHI Ten Steps has a positive influence on breastfeeding outcomes. In terms of other health care interventions, staff training alone (without other breastfeeding support components) did not lead to improved breastfeeding outcomes. However, health care interventions that pair staff education with other services, such as a series of home visits, lead to improved rates of exclusive breastfeeding duration. For workplace interventions, we looked for both trials and observational studies with a control group and still found no eligible studies; the absence of eligible evidence precludes us from commenting on the effectiveness of workplace breastfeeding interventions. In 2012 the Affordable Care Act required large employers to provide reasonable break time and a private place for expressing breastmilk, and mandated insurance coverage of lactation support services

and equipment without cost-sharing for new health insurance policies. Without adequate time to express breastmilk in the workplace, working mothers would face significant barriers to breastfeeding. Future studies (as noted below) could address whether certain workplace interventions are more effective than others in improving breastfeeding duration among working mothers.

For other intervention types, our results show that WIC programs providing in-person or telephone peer support improve breastfeeding outcomes. We also identified evidence on a range of other WIC programs (e.g., cash incentives, provision of different types of breast pumps, and changes in food package policies); however, primarily as a result of unknown consistency and imprecision, we had insufficient evidence to make a conclusion regarding the benefit of these interventions. We identified no eligible studies assessing workplace breastfeeding interventions; other reviews have highlighted the lack of controlled trials of workplace interventions for promoting breastfeeding in employed women.¹⁶

Our conclusions related to the maternal benefits of breastfeeding (KQ 2) suggest that breastfeeding is associated with lower rates of breast cancer, ovarian cancer, hypertension, and type 2 diabetes. The potential to improve maternal health could be highlighted as a rationale for improving rates of breastfeeding by health care and public health practitioners. For cardiometabolic outcomes, it has been hypothesized that lactation “resets” maternal metabolism after pregnancy, thereby reducing cardiovascular disease risk.¹⁷⁹ Our conclusions related to hypertension and type 2 diabetes support this hypothesis. Results of our current review are, in general, consistent with those in previous reviews with respect to conclusions about the limitations of the evidence base. As was the case in 2007, we are not able to make a conclusion about the association between breastfeeding and postpartum weight change or postpartum depression (because of study limitations and imprecise and inconsistent results). For this review, we added two additional maternal health outcomes: hypertension and cardiovascular disease. We concluded that low SOE supports the association between breastfeeding and reduced hypertension; however, primarily because of heterogeneity in outcome measures and study limitations, we concluded that evidence was insufficient to reach a conclusion about cardiovascular disease.

Limitations of the Review Process

For KQ 1, we looked for and included a broad range of interventions to promote and support breastfeeding. At the same time, we specifically excluded primary care–relevant interventions delivered to individual women (to avoid duplicating a recent review conducted for the USPSTF).²⁶ The studies that met our inclusion criteria assessed a variety of different intervention types. As a result of the inclusion criteria we used, we may have excluded some interventions that could be considered system level or community based. The breadth of our eligibility criteria was also a limitation in terms of evidence synthesis; included studies may have been categorized in different ways. We chose to focus on intervention type and setting because these may be important factors for decisionmakers who plan to implement breastfeeding programs and policies. For KQ 2, we chose to include recent, relevant systematic reviews in our evidence synthesis. Although including these reviews may improve efficiency, this approach has limitations. Some included systematic reviews do not fully report details related to methods (particularly ROB assessment). Because KQ 2 was an update of the 2007 Ip review, we limited our search to very high-income countries; as a result, a secondary analysis of maternal obesity and hypertension from the PROBIT study was excluded from the KQ 2 review.

Limitations of the Evidence Base

For KQ 1, we found no evidence on certain types of interventions (e.g., workplace and school-based interventions), limited evidence for subgroups of women, and no included studies reported on potential harms of interventions. Studies used various definitions of breastfeeding initiation and exclusivity, which may limit the comparability of findings. In addition, because of heterogeneity across studies, we were not able to assess whether certain characteristics of interventions have a greater influence on breastfeeding initiation, duration, and exclusivity. We were also not able to determine whether heterogeneity within some categories of interventions such as BFHI is due to study design, differences in outcome measures, or country setting (since variation exists across all these factors). Factors most likely to limit the applicability of the evidence include country setting, community breastfeeding rates, variation in usual maternity care practices (including other policies and practices to support breastfeeding), and potentially socioeconomic factors.

For KQ 2, although we found a large volume of evidence supporting the association between breastfeeding and improved maternal health, methodological limitations

specific to observational study designs limit the ability to determine the magnitude of effect that lactation has on maternal health outcomes. Although a growing literature documents protective associations between lifetime lactation and improved maternal health, these findings do not establish that breastfeeding prevents poor maternal health. Several other factors may be at work. First, women in very high income countries who choose to and successfully breastfeed are typically better educated, wealthier, and more likely to engage in other beneficial health behaviors.^{180, 181} Moreover, it is plausible that, rather than breastfeeding preventing poor maternal health, poor maternal health may prevent breastfeeding. One limitation of the evidence is related to time frame of enrollment. Many observational studies (including data from Women’s Health Initiative participants⁴) enrolled women who breastfed decades ago. In 1970, only 26.5 percent of women initiated breastfeeding¹⁸² compared with more than 80 percent of women today. Because of these secular changes, confounders of the association between breastfeeding and maternal health have changed over time, and evidence on the association between breastfeeding from older cohorts of women may or may not reflect the strength of association for women currently breastfeeding. Women who chose to breastfeed when breastfeeding rates in the United States were lower could be different in ways that affect risk of adverse maternal health outcomes.

Future Research Needs

For KQ 1, future research should assess the benefit of workplace, school-based, and other community-based interventions for improving rates of breastfeeding. Authors of future studies should more clearly describe characteristics of usual care and what other breastfeeding support services are available. For studies conducted in the United States, future research should address whether certain interventions are more effective for groups of women who differ by socioeconomic factors in order to assess the consistency of current evidence suggesting a difference by education status. In addition, studies are needed to compare types of support, such as manual versus electric pumps or interventions delivered by International Board Certified Lactation Consultants versus Certified Lactation Consultants, to tailor support to the needs of each woman. Study designs with a concurrent control group (e.g., trials or prospective cohort studies) would be helpful in reducing bias and informing the benefit of breastfeeding programs or policies implemented in a wide range of settings, particularly workplace programs.

For KQ 2, observational studies will likely remain the major source of evidence on the association between breastfeeding and maternal health. Use of standardized breastfeeding definitions and clear reporting of how participants were selected could help minimize bias. In terms of analyses, authors should adequately address known confounders, such as breastfeeding intention, birth complications, diet, physical activity, tobacco use, mental health, and social support, and they should clearly report a rationale for why certain factors were chosen. Further studies might also consider the extent to which adverse lactation outcomes, like adverse pregnancy outcomes,¹⁸³ may be a window to maternal health.

More generally, standardized definitions of breastfeeding, as well as consistent methods of collecting these data, are needed to facilitate future systematic reviews and meta-analyses.

Conclusions

The body of evidence for breastfeeding programs and policies was diverse in terms of interventions and settings. Current evidence supports the effectiveness of BFHI for improving rates of breastfeeding initiation and duration; however, evidence from one large RCT (PROBIT) has limited applicability, and observational studies do not clearly establish the magnitude of benefit. For U.S. women enrolled in WIC, peer-support interventions have low SOE for improving breastfeeding outcomes. The identified associations between breastfeeding and improved maternal health outcomes are supported by evidence from observational studies, which cannot determine cause and effect relationships.

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