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Effectiveness of Workplace Lactation Interventions on Breastfeeding Outcomes in the United States: An Updated Systematic Review

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Abstract

Background: Returning to work is one of the main barriers to breastfeeding duration among working mothers in the United States. However, the impact of workplace lactation programs is unclear.

Research Aim: The aim of this study was to evaluate the effectiveness of workplace lactation programs in the United States on breastfeeding practices.

Methods: A systematic search was conducted of seven databases through September 2017. Articles (N = 10) meeting the inclusion criteria of describing a workplace lactation intervention and evaluation in the United States and measuring initiation, exclusivity, or duration using an experimental or observational study design were critically evaluated. Two reviewers conducted quality assessments and reviewed the full-text articles during the analysis.

Results: Common services provided were breast pumps, social support, lactation rooms, and breastfeeding classes. Breastfeeding initiation was very high, ranging from 87% to 98%. Several factors were significantly associated with duration of exclusive breastfeeding: (a) receiving a breast pump for one year (8.3 versus 4.7 months), (b) return-to-work consultations (40% versus 17% at 6 months), and (c) telephone support (42% versus 15% at 6 months). Each additional service (except prenatal education) dose-dependently increased exclusively breastfeeding at 6 months. Sociodemographic information including older maternal age, working part-time, longer maternity leave, and white ethnicity were associated with longer breastfeeding duration.

Conclusion: Workplace lactation interventions increased breastfeeding initiation, duration, and exclusive breastfeeding, with greater changes observed with more available services. More evidence is needed on the impact of workplace support in low-income populations, and the cost-effectiveness of these programs in reducing health care costs.

Keywords

breastfeeding duration, breastfeeding initiation, breastfeeding support, lactation workplace programs, program evaluation

Background

Human milk contains nutritional and bioactive compounds that benefit the mother and infant, with a positive dose-response relationship with longer breastfeeding duration (Mosca & Giannì, 2017; Victora et al., 2016). Despite the high breastfeeding initiation rate (81% of mothers ever breastfeeding) in the United States, by 6 months postpartum, only 52% of mothers continue to provide any human milk, and 22% of mothers exclusively breastfed for 6 months during 2014 (Centers for Disease Control and Prevention, 2016).

The decisions to breastfeed and continue breastfeeding are influenced by numerous factors, including breastfeeding difficulties, confidence, social support, cultural factors, breastfeeding education, exposure to other mothers breastfeeding, and hospital practices (Johnson, Kirk, Rosenblum, & Muzik, 2015). However, returning to work is one of the main barriers to breastfeeding duration among working mothers in the

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United States (Dagher, McGovern, Schold, & Randall, 2016; Johnson, Kirk, & Muzik, 2015). Reported barriers to breastfeeding successfully in the workplace include a nonsupportive workplace, lack of compliance with breastfeeding laws, lack of support from coworkers and supervisors, inadequate breastfeeding information, and a lack of paid maternity leave (Johnson et al., 2015a; Majee, Jefferson, Goodman, & Olsberg, 2016; Kim, Fiese, & Donovan, 2017). About 58% of women in the United States are protected by the Family and Medical Leave Act of 1993, which mandates unpaid leave for 12 weeks for those who need to take care of their newborn or adopted child (U.S. Department of Labor, 2014). Working mothers are further protected by the Affordable Care Act as of March 2010, which requires employers with 50 or more employees to provide break times for breastfeeding mothers for up to 1 year after birth and to provide a private location for expression of their milk that is not a bathroom (U.S. Department of Labor, 2014).

Since 57% of women with children younger than 1 year of age represent the fastest growing segment in the working population (U.S. Department of Labor, 2014), workplace lactation programs are an ideal place to support mothers who want to continue providing human milk to their infants after returning to work. Employers may be more likely to implement programs to promote breastfeeding at the workplace if they are evidence-based and cost-effective. A lack of lactation support can have negative consequences for working mothers, including increased stress and early cessation of breastfeeding (Smith, Javanparast, & Craig, 2017).

Workplace lactation programs provide support for women who choose to continue breastfeeding after returning to work. Various forms of breastfeeding support are provision of breast pumps, employee breastfeeding education, flexible work schedules, lactation rooms, adequate break times, a place to store human milk, maternity leave, child care, ability to bring children to work, and lactation policies. A recent systematic review on breastfeeding and workplace support reported conflicting findings on the impact of lactation rooms and break times on breastfeeding duration, while researchers in other studies found that comprehensive lactation programs may increase any and exclusive breastfeeding duration (Dinour & Szaro, 2017). Dinour and Szaro's (2017) review identified studies from all countries, whereas this systematic review focuses on those conducted in the United States due to the lack of an adequate maternity leave. In addition, an earlier Cochrane systematic review of workplace breastfeeding support was inconclusive due to a lack of randomized controlled trials (Abdulwadud & Snow, 2012). Therefore, it is unclear whether workplace lactation programs improve breastfeeding practices among working mothers.

The aims of this systematic review were (a) to evaluate the effectiveness of workplace lactation programs on breastfeeding outcomes (i.e., initiation, exclusivity, and duration) and (b) to identify key components of an effective workplace support program.

Key Messages

- Comprehensive lactation programs have been shown to increase breastfeeding duration among mothers who were planning to breastfeed before maternity leave in middle- to high-income families.
- Facilitators for workplace lactation interventions include funding, support from upper management, tailoring interventions to the target population, and positive attitudes of lactation professionals.
- A positive dose-response relationship was observed between the number of lactation services received and breastfeeding initiation, duration, and exclusive breastfeeding.
- Cost of a comprehensive lactation program was estimated to $500 per employee and $186 to provide a breast pump for one year.

Methods

Design

A systematic review of the existing literature was conducted to evaluate the evidence of workplace lactation programs on breastfeeding outcomes (Littell, Corcoran, & Pillai, 2008). Approval from the institutional review board was not necessary because our study did not involve any participation of human subjects.

Sample

Inclusion criteria for full-text review were the following: (a) Study design was a randomized controlled trial, quasi-experimental study, cohort study, or pretest-posttest, posttest, or cross-sectional design, (b) described the intervention, (c) described the evaluation, (d) measured breastfeeding initiation, exclusivity, or duration, and (e) conducted in the United States. Studies that did not meet the inclusion criteria, editorials, letters, opinions, and reviews were excluded (Figure 1).

A systematic search was conducted on seven electronic databases (Clinical Trials [clinicaltrials.gov], PubMed/MEDLINE, EBSCO, PsycINFO, Scopus, Sociological Abstracts, and Web of Science) in September 2017 using the following algorithm: (work* OR job OR employ* OR workplace) AND (breastfeeding OR breast-feeding OR "infant feeding" OR lactat*) AND (intention OR duration OR initiation OR rate) AND (program* OR intervention or evaluat* OR support). The following keywords were included in the algorithm: *breastfeeding, work, employment, maternity leave, parental leave, paternity leave, workplace support, lactation accommodation, worksite lactation support, intervention*, and *program.* MeSH terms were *breast feeding, lactation, workplace*, and *program evaluation*.

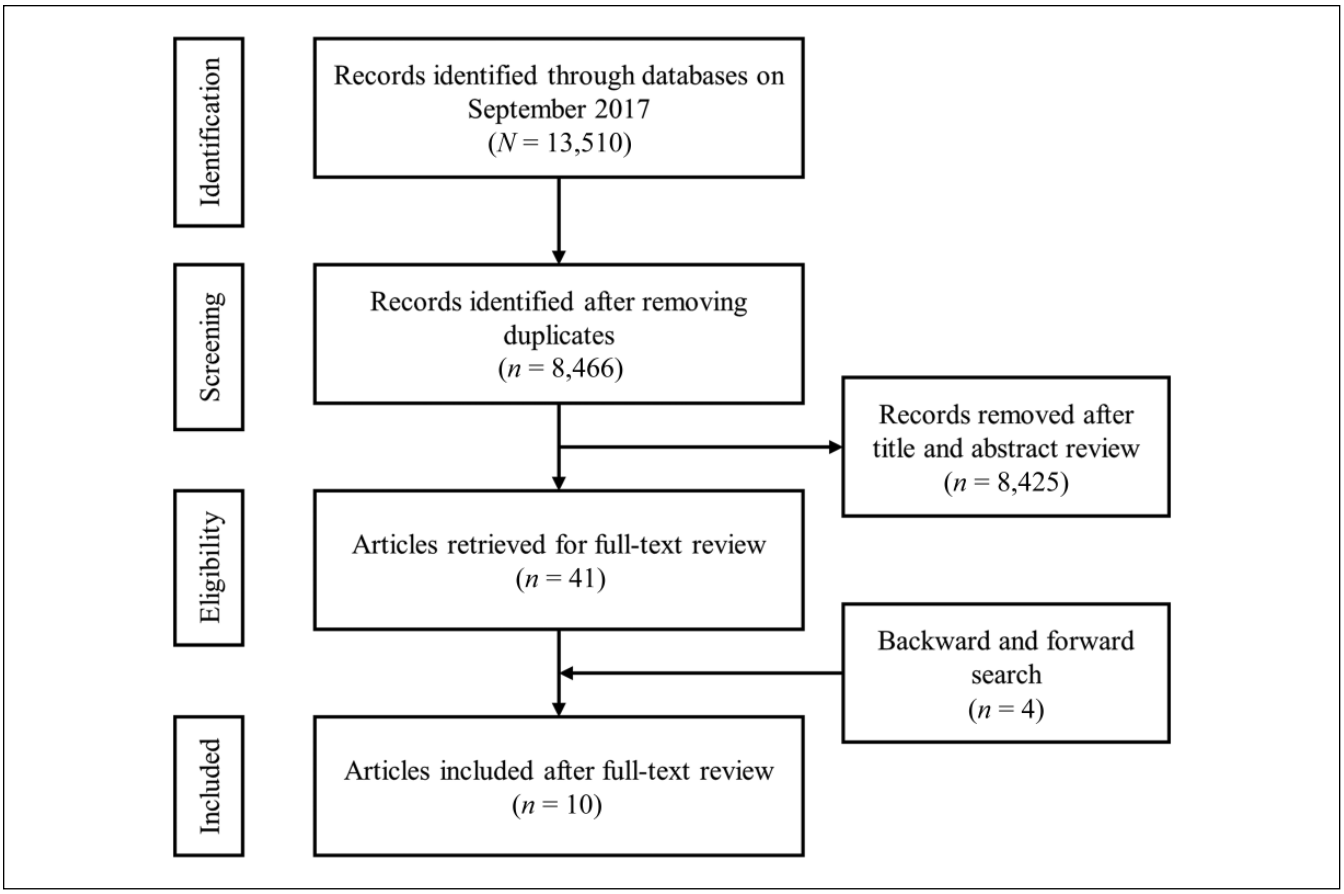

Figure 1. Flow chart of study selection.

Initially, 13,510 articles were identified after searching all databases, 8,466 articles remained after removing duplicates, 41 articles remained after screening by title and abstract, and 10 articles remained after full-text review (Figure 1). Reasons for excluding studies during full-text review are indicated in the Table S1. Two studies were combined for analysis since they evaluated the same program (Balkam, 2006; Balkam, Cadwell, & Fein, 2011), and one study was analyzed as two programs, because it evaluated the same intervention in two corporations (Cohen & Mrtek, 1994).

Data Collection

Protocol for this systematic review included (a) formulating a research question, (b) identifying and screening studies, (c) extracting data, (d) assessing study quality, and (e) synthesizing and assessing bias (Littell et al., 2008). Observational and experimental studies were included to provide a comprehensive examination of the impact of breastfeeding workplace support interventions on breastfeeding outcomes. The PICOS format (i.e., participants, intervention, comparisons, outcomes, study design) was used for data extraction. This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2015).

Researchers were contacted for missing information. We did not find sufficient information to complete a meta-analysis due to the lack of studies that had a control group and unknown variance of the mean in one of the studies with a control group.

Articles were reviewed by titles and abstracts by one reviewer, followed by full-text review of the remaining articles independently by two reviewers. One reviewer conducted a backward and forward search of the reference list and cited references, respectively, of included studies after the full-text review. Discrepancies were resolved by discussion. Interrater reliability measured by Cohen's kappa was moderate at .63 between the two raters. The relatively low interrater reliability is possibly due to ambiguity of the inclusion criteria, including needing a description of the intervention.

Data Analysis

Effectiveness was defined as the degree to which workplace lactation programs or individual components contribute to changes in breastfeeding practices (i.e., initiation, duration, or exclusive breastfeeding). To measure whether the intervention components rather than other factors are associated with behavioral changes, it is important to measure process

evaluation, defined as the degree to which the program is being implemented as intended. Process evaluation helps researchers to explain how a program outcome was achieved. In this study, it might also give insight into the most useful intervention components and inform researchers about how the program might be improved. Therefore, process evaluation measures were included to provide a possible explanation for program outcomes or effectiveness. Finally, costs of the program provided a gauge of the potential cost-effectiveness of these programs.

Two reviewers assessed the quality of each study for external validity, selection, attrition, and detection bias and use of validated outcome measures using a 12-item quality assessment tool adapted from the National Institutes of Health's Quality Assessment Tool for before-after studies with no control group (U.S. Department of Health & Human Services, n.d.). Scores were summed by scoring an answer of *yes* with 1 and *no* or missing data as 0, giving a range of 0 to 12 points. Scores of 9 to 12 were categorized as high quality, 5 to 8 were moderate quality, and 0 to 4 were low quality. Discrepancies were resolved by discussion.

Results

Characteristics of the Sample

A majority of the studies were posttest study designs ($n = 6$), with the total number of participants ranging from 18 to 919 (Table 1). Five studies (50%) were located in the Los Angeles, California, area, while others ($n = 4$) were in Minnesota, New Jersey, New York, and Philadelphia (Table 2). Location was unknown for one study. Four workplace lactation programs (40%) were implemented in the private sector, while two programs were found in each other sector: academia, health care, and public. Publication dates ranged from 1985 to 2017, with 80% of the studies published between 1994 and 2014.

Participants were predominantly female, Caucasian, older (>30 years), married, and middle to upper income, had at least a college degree, and worked full-time. In one study, about 69% of participants had an income of $100,000 or higher (Balkam, 2006; Balkam et al., 2011), while 42% of participants earned $85,000 or more per year (Paddock, 2017). Most participants enrolled in the lactation program before birth, suggesting that mothers were motivated to breastfeed after giving birth. Participants had demographic characteristics consistently associated with longer breastfeeding duration (Dunn, Kalich, Fedrizzi, & Phillips, 2015). One study included low-income, Hispanic women (77%) who participated in the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) with an average income of $1,539 per month (Meehan et al., 2008). In this study, WIC records, rather than participants' responses to surveys, were used to measure exclusive breastfeeding duration (Meehan et al., 2008).

Quality Assessment

Five (50%) studies were moderate quality (scores 5 to 8 out of 12), and five were low quality (scores 0 to 4 out of 12) studies (Table 3). On average, studies met five (4.5 ± 1.8) of the 12 criteria, with 80% of the studies with low attrition bias and 80% of studies defining breastfeeding, exclusivity, or duration. Six programs were available both prenatally and postnatally, and four programs hired either certified lactation counselors ($n = 1$) or internationally board-certified lactation consultants ($n = 3$). None of the studies were randomized, and one study had assessors unaware of assigned groups when collecting outcome measures. Overall, the risk of bias was high due to limitations in study design, participants being highly motivated to breastfeed, and sociodemographic factors not being controlled.

Needs Assessment

A needs assessment is a formative research process used to determine the needs and priorities of a group or community (Berkowitz & Nagy, n.d.). Conducting a needs assessment before planning and implementing a workplace lactation program is beneficial for employers to determine which services are needed to better meet the population needs. Researchers in two studies (Dodgson & Duckett, 1997; Katcher & Lanese, 1985) identified the need for a lactation room, break times, and informational materials about breastfeeding, parenting, and community resources.

Effectiveness of Workplace Lactation Programs on Breastfeeding Outcomes

Breastfeeding initiation. Breastfeeding initiation was measured as any breastfeeding defined by one of the included studies as "feeding of human milk directly from the breast or as expressed milk" (Balkam et al., 2011). Breastfeeding initiation rates, measured in four studies, were high, ranging from 87% to 98%, and increased from 71% to 87% after the implementation of a lactation policy and lactation rooms at Cornell University (Paddock, 2017). However, awareness of this policy and lactation room usage were not measured. Mothers ($n = 22$) who received electric breast pumps, had access to lactation professionals, refrigerator and lactation rooms at the Hunterdon Medical Center were more likely to initiate and continue breastfeeding after returning to work (100% vs. 84%, $p < .003$) compared to mothers ($n = 19$) who were not exposed to these services (Katcher & Lanese, 1985). Program usage, enrollment, and awareness were not measured in this study, and therefore it is unknown whether intervention components contributed to increased initiation rates. The highest initiation rates were observed in studies where majority of participants used the intervention components. One study with 73% enrollment and 58% attendance of breastfeeding classes reported an initiation rate of 97.5% (Ortiz, McGilligan, & Kelly, 2004).

Table 1. Descriptive Statistics of Studies Included in the Systematic Review (*N* = 10).

Study characteristics	*n* (%)
Study design	
Posttest	6 (60)
Cross-sectional	2 (20)
Posttest with control group	1 (10)
Nonequivalent control group	1 (10)
Studies with a control group	
Company type	3 (30)
Private	4 (40)
Public	2 (20)
Health care	2 (20)
Academia	2 (20)
Participants' age[a]	
<30 years	1 (10)
30-34 years	3 (30)
>34 years	3 (30)
Participants' annual income[b]	
<$20,000	1 (10)
$20,001-$40,000	2 (20)
>$80,000	2 (20)
Participation rate by ethnicity[c]	
White (range: 7-86%) *n* = 8 >50%	6 (60)
Hispanic (range: 10-77%) *n* = 6 20-30%	3 (30)
Black (range: 3-21%) *n* = 7 10-20%	3 (30)
Asian (range: 4-16%) *n* = 6 10-20%	4 (40)
Intervention components	
BF classes	8 (80)
Social support (in person or by telephone)	8 (80)
Access to lactation space	8 (80)
Pumping equipment	9 (90)
Outcomes measured	
BF initiation	4 (40)
Exclusive BF	4 (40)
BF duration	10 (100)
Program usage	5 (50)
Program satisfaction	2 (20)

Note. BF = Breastfeeding.
[a]Missing data: *n* = 3.
[b]Missing data: *n* = 5.
[c]Two studies did not report race or ethnicity. One study reported white vs. non-white and another reported white, black, and other.

Another research team measured an initiation rate of 95% among participants who attended classes (21%), used pumping rooms (62%) and enrolled in the pump purchase program (39%; Spatz, Kim, & Froh, 2014).

Exclusive breastfeeding. Exclusive breastfeeding was defined as "no supplementary formula, water, vitamins, or juice" based on Labbok and Krasovec's (1990) strictest definition of exclusive breastfeeding. Exclusive breastfeeding rates at 6 months ranged from 35% at the Children's Hospital of Philadelphia to 57% in a population of which 69% earned ≥$100,000 per year, which has been associated with longer breastfeeding duration (Balkam, 2006; Balkam et al., 2011; Spatz et al., 2014).

Receiving a breast pump for one year was associated with longer exclusive breastfeeding duration (8.8 ± 3.3 vs. 4.7 ± 3.9 months, $p < .0001$) compared to mothers who did not receive a pump (Meehan et al., 2008). However, pump usage was not measured in Meehan and colleagues' (2008) study. The cost of operating this program was $186 per person to provide a breast pump for one year and 5 hours of lactation consultation ($287 per pump/5 mother-infant dyads + $19 per mother for pump attachment kits + $50 maintenance fee/5 mother-infant dyad and about $100 of lactation staff hours estimated by 5 hours at $20/hour; Meehan et al., 2008).

In a posttest study with a control group, participants who were exposed to a workplace lactation program that included a breast pump, lactation room, refrigerator, and access to a breastfeeding consultant had higher exclusive duration rates (12.1 vs.10.6 weeks) than mothers who did not (Katcher & Lanese, 1985). Mothers who attended classes (21%), used lactation rooms (62%), and participated in the pump purchase program (39%) had higher exclusive breastfeeding rates at 3 months (63% vs. 35%) and 6 months (35% vs.14.8%) compared to national rates in 2011 (Centers for Disease Control and Prevention, 2011; Spatz et al., 2014). Therefore, usage of workplace lactation intervention components may contribute to higher exclusive breastfeeding rates at 3 and 6 months.

Finally, exclusive breastfeeding rates at 3 and 6 months were 81% and 47%, respectively, in a program where mothers used a "nursing mother's room" an average of 7.1 (*SD* = 3.7) times per week for an average of 19.5 (*SD* = 11.1) weeks (Dodgson & Duckett, 1997). Participants rated positively in a satisfaction survey that lactation rooms were comfortable, clean, and conveniently located, pumps were easy to use, and it was easy to maintain privacy and reach lactation professionals (Dodgson & Duckett, 1997). Difficulty using the lactation room because it was too busy received a rating of 5 out of 7, while the educational materials received a score of 4.8 (Dodgson & Duckett, 1997). Quality education materials were limited by available funding.

Breastfeeding duration. Average duration of any breastfeeding for all studies ranged from 6.9 to 11.7 months, with most being longer than 8.8 months. Any breastfeeding at 6 months ranged from 19.3% in 1994 to 79% in 2014, with 5 of the 6 studies being 69% or greater. The strongest evidence that lactation services increase breastfeeding duration was reported by Katcher and Lanese (1985) in mothers ($n = 22$) who received social support, breast pumps, lactation rooms, and refrigerator breastfed longer (11.7 vs. 6 months, $p < .003$) compared to mothers ($n = 19$) who did not receive these

Table 2. Description of Intervention Components and Outcomes of Included Studies (*N* = 10).

Author, year, location	Study design, *N*	Inclusion criteria, sample description	Intervention description	Evaluation method	Outcomes measured	Intervention effectiveness
Balkam et al., 2006, 2011 **Location:** Not available	Cross-sectional survey Intervention: *N* = 128	**Inclusion Criteria** • Participated in workplace lactation program within 3 years • Still employed by organization **Age at Delivery** (mean, SD) • 34.4, 4 **Race** (*N* = 126): • White: 70% • Non-white: 30% **Income** (*N* = 122): • <$100,000: 31% • $100,000-$149,999: 40% • >$150,000: 29% **Work Status** (*N* = 128): • Full-time (>35 hours/week): 76% • Part-time (<35 hours/week): 24%	**Class** • Prenatal class on BF and maintaining BF relationship after return to work **Support** • Telephone support from nurses during maternity leave • Return to work consultation with nurses (in person or by telephone) **Equipment & Space** • Access to lactation rooms equipped with electric pumps	Retrospective, cross-sectional survey mailed out to all qualifying women. Modified from the U.S. Food and Drug Administration's Infant Feeding Practices Study II and U.S. Census 2000	**Program evaluation** • Program participation • Problems encountered • Program satisfaction **Breastfeeding practices** • Exclusive BF (feeding human milk as exclusive milk feeding) • Duration of any BF	**Enrollment** • 71% enrolled before birth **Usage** • Mean number of services: 2.4 out of 4 • Lactation room and telephone support were the most used services • Intervention duration (mean): 9 mo. **Breastfeeding practices:** • Exclusivity at 6 mo.: 57% • Any BF duration (mean): 10.4 mo.
Cohen et al., 2002 **Location:** Department of Water and Power in LA, CA	Posttest Intervention: *N* = 126	**Inclusion Criteria** • Male employees and his partner **Mean Age of Male Employees:** 36 **Race** • Caucasian: 53% • Hispanic: 24% • Asian: 16% • African American: 6% **Job Type of Male Employees** • Field or technical workers: 50% • Engineers or professional workers: 42% • Middle management: 8% **Work Status of Female Partners** • Full-time or part-time (undefined): 66%	**Class** • Offered classes to working fathers and their partners (two group classes of 45 minutes each or 1 hour of individual class) • Topic: Advantages of BF, breastfeeding techniques **Support** • Individual lactation counseling • Access to lactation professionals 7 days per week, 8:00 a.m. to 6:00 p.m. **Equipment & Space** • Breast pumps & instructions • Double-pumping breast pump kit	Not described	**Program evaluation** • Program participation **Breastfeeding practices** • BF duration • BF rate at 6 mo.	**Enrollment:** • 39% (128/331) eligible men and partners participated **Usage:** • Not described **Breastfeeding practices:** • Duration (mean): 8 mo. • BF at 6 mo.: 69%

(continued)

Table 2. (continued)

Author, year, location	Study design, *N*	Inclusion criteria, sample description	Intervention description	Evaluation method	Outcomes measured	Intervention effectiveness
Cohen & Mrtek, 1994a **Location:** Department of Water and Power in LA, CA	Posttest Intervention: *N* = 108	**Inclusion Criteria** • Completed questionnaire • Employees returning to work at least 16 hours per week **Age** (mean, range) • 30.5 (23-41) **Race** • White: 41% • Hispanic: 23% • African American: 21% • Asian: 14% • Other: 1% **Income** (mean, range) • $33,000 ($18,000-$70,000) **Work Status** 100% full-time	**Class** • Prenatal classes (30 to 45 minutes) **Support** • Perinatal lactation counseling available for mother, father, and other family members • Lactation maintenance service • Other family members of employee **Equipment & Space** • Electric breast pump • Lactation room (3 × 4 feet, electric outlet, shelf, locks from inside) • Scheduled times for lactation room (30 minutes, two or three times during an eight-hour working day) • Portable cooler case with ice packs, milk storage bottles, and human milk collecting equipment and tubing	• Incidence: Questionnaire • Duration of BF: direct observation by professional responsible for lactation program and company records of equipment usage	**Program evaluation** • Proportion of women returning to work BF and pumping **Breastfeeding practices** • BF duration at 6 mo. (proportion of women still in program 6 mo. after birth) • BF rate at 12 mo. (proportion of women still in program 12 mo. after birth)	**Enrollment** • 27% (108 of 400 possible births in 4 years) **Usage** • Not measured **Breastfeeding practices** • BF duration at 6 mo.: 19.3% • BF duration at 1 year: 5% • BF duration (mean, range): 7.7 mo. (3-24 mo.)
Cohen & Mrtek, 1994b **Location:** Aeronautics Corporation in LA, CA	Posttest Intervention: *N* = 79	**Inclusion Criteria** • Completed questionnaire • Employees returning to work at least 16 hours per week **Age** (mean, range) • 32 (23-43) **Race** (*N* = 79) • White: 63% • Asian: 14% • African American: 10% • Hispanic: 10% • Other: 3% **Income** • >$25,000 (Range: $30,000-$94,000) **Work Status** Two women (3%) worked part-time (≤16 hours per week)	**Class** • Prenatal classes (30 to 45 minutes) **Support** • Perinatal lactation counseling for mother, father and other family members • Lactation maintenance service **Equipment & Space** • Electric breast pump • Lactation room (3 × 4 feet, electric outlet, shelf, locked from inside) • Scheduled times for lactation room (30 minutes, two or three times during an 8-hour working day) • Portable cooler case with ice packs, milk storage bottles, and human milk collecting equipment and tubing	Incidence: Questionnaire Duration of BF: direct observation by professional responsible for lactation program and company records of equipment usage	**Program evaluation** • Not measured **Breastfeeding practices** • BF duration at 6 mo. (proportion of women still in program 6 mo. after birth) • BF rate at 12 mo. (proportion of women still in program 12 mo. after birth)	**Enrollment** • 66% (79 out of an estimated 120 births in 4 years) **Usage** • Not measured **Breastfeeding practices** • BF duration at 6 mo.: 78% • BF duration at 1 year: 27% • BF duration (mean, range): 9 mo. (3-30 mo.)

(continued)

Table 2. (continued)

Author, year, location	Study design, *N*	Inclusion criteria, sample description	Intervention description	Evaluation method	Outcomes measured	Intervention effectiveness
Dodgson & Duckett, 1997 **Location:** University of Minnesota–Twin Cities	Posttest First evaluation (6 mo. after program started): *N* = 18 Second evaluation (18 mo. after program started): *N* = 46	**Inclusion Criteria** • Not described **Age of Baby at Start of Program** • 1 to 44 weeks • *M* = 11.3, *SD* = 9.1 **Race, Income, Work Status** • Not described **User Demographic** (*N* = 52) • Student: 50% Staff: 38% Faculty: 12%	**Classes** • Seminars about returning to work and school following childbirth **Support** • Individual consultation and education programs by lactation professionals • Access to telephone consultations • Publication of quarterly newsletter **Equipment and Space** • Nursing mother's room (sink, electric pump, locked) • Key to nursing room • Small refrigerator for storing milk • Books, pamphlets, flyers about BF, parenting, and community resources	Survey (6 mo. and 18 mo. after start of program) First evaluation: retrospective 8-question survey Second evaluation: retrospective 24-question survey related to quality of facility and services and women's perception of impact of room use had on provision of human milk for infants	**Program evaluation** • Satisfaction • Quality • Frequency • Duration of room usage **Breastfeeding practices** • Exclusivity at 1, 3, 6, 9, and 12 mo. • Duration at 1, 3, 6, 9, and 12 mo.	**Enrollment** • Not measured **Usage** • Weekly usage: 7.1 times (*SD* = 3.7) • Session: M = 20 min. (*SD* = 6) • Duration of room usage: 19.5 weeks (*SD* = 11.1) **Satisfaction** (% agreed) • Clean: 92% • Convenient location: 86% • Pump easy to use: 100% • Maintain privacy: 89% • Room was too busy: 74% **Breastfeeding Practices** • Exclusivity (% of infant's daily intake that were human milk; 1, 3, 6, 9, 12 mo.): 91%, 81%, 47%, 18%, 4% • Duration of any BF (1, 3, 6, 9, 12 mo.): 100%, 97%, 78%, 65%, 43%
Katcher & Lanese, 1985 **Location:** Hunterdon Medical Center in West-Central, New Jersey	Posttest with control group Control: *N* = 19 Intervention: *N* = 22	**Inclusion Criteria** • Every employee who takes maternity leave • **Age, Race, Income, Work Status:** • Not measured	**Classes** • Not provided **Support** • Nurse clinician demonstrates usage of pump and location of pumping room • Access to BF consultation • Information about proper techniques for storing human milk **Equipment & Space** • Electric pump • Breast pumping room • Refrigerator	Telephone questionnaire of women who went on maternity leave	**Program Evaluation** • Not measured **Breastfeeding Practices** • Exclusivity • Rate at time of returning to work • Duration (range)	**Enrollment & Usage** • Not measured **Breastfeeding Practices** • Exclusivity (mean): • Control: 10.6 weeks • Intervention: 12.1 weeks • BF rate at time of returning to work • Control: 56% (7/16) • Intervention: 100% (22/22) • Duration (mean, range): • Control: 6 mo. (1-18) • Intervention: 11.7 mo. (4-24)

(continued)

Table 2. (continued)

Author, year, location	Study design, *N*	Inclusion criteria, sample description	Intervention description	Evaluation method	Outcomes measured	Intervention effectiveness
Meehan et al., 2008 **Location:** Public Health Foundation Enterprises WIC program in LA, CA	Nonequivalent control group Control: *N* = 33 Intervention: *N* = 82	**Inclusion Criteria** • Full-time (≤32 hours/week) • Continue exclusive BF **Age at Delivery** (mean, years) • Control: 27.5 ± 4.0 • Intervention: 28.9 ± 5.5 **Race** (overall) • Hispanic: 77% • African American: 11% • White: 7% • Asian American: 4% **Income** (monthly, $, mean, SD) • Control: 1,331 ± 701 • Intervention: 1,539 ± 757 **Work Status** • Office support staff: 29% • Customer service workers: 21% • Teachers and social workers: 19% • Medical support staff: 12% • Other: 19%	**Classes** • Not provided **Support** • BF information packet for employers (California law, suggestions to help employers create BF-friendly environment) • Monthly phone call by WIC staff member for support • Information packet for employers **Equipment & Space** • Electric pumps until infant's first birthday or until mother began to request formula from WIC (whichever came first)	WIC administrative data	**Program Evaluation** • Not measured **Breastfeeding Practices** • Duration (length of time that women did not request formula from WIC) • % of mothers who did not request formula from WIC for 6 mo. and 12 mo.	**Enrollment & Usage** • Not applicable **Breastfeeding practices** • Duration: Control: 144.8 days (*SD* = 121.5) Intervention: 267.4 days (*SD* = 100.8) $p < .0001$
Ortiz et al., 2004 **Location:** Limerick Inc. in Burbank, CA	Posttest *N* = 462	**Inclusion Criteria** • All female, full-time employees **Age** (mean) • 31.5 years **Race** • White: 52% • Hispanic: 27% • Asian: 14% • African American: 6% • Indian: 1% **Income** • Not available **Work Status** • Salary: 55% • Hourly: 45%	**Classes** • Prenatal classes (two 1-hour classes) **Support** • BF education and lactation consultation (in person or by telephone) • CLCs educated supervisors on needs of lactating women **Equipment & Space** • Electric pumps with accessories • Accessories: insulated tote bags, bottles, flanges, pump tubing, battery pack, and adapter for employees who travel • Private, locked rooms for pumping	Retrospective Reviewed lactation consultant's charts completed by two CLCs	**Program Evaluation** • Not measured **Breastfeeding Practices** • Initiation • Duration of pumping at work (mo.) • Age of baby when pumping ended (mo.)	**Enrollment** • 73% (260/354) **Usage** • 58% (267/336) attended lactation classes **Breastfeeding Practices** • BF initiation: 97.5% • Age of baby when pumping ended (*N* = 332; mo.): *M* = 9.1, *SD* = 4.11, *Mdn* = 8.3 • Duration of pumping at work (mo.): *M* = 6.3, *SD* = 3.87, *Mdn* = 8.3 • BF duration at 6 mo.: 74%

(continued)

Table 2. (continued)

Author, year, location	Study design, *N*	Inclusion criteria, sample description	Intervention description	Evaluation method	Outcomes measured	Intervention effectiveness
Paddock, 2017 **Location:** Ithaca, NY	Cross-sectional *N* = 919	**Inclusion Criteria** • All Cornell employees with ≥1 dependent child ≤12 years **Age** • Not measured **Race** (*N* = 886) • White: 86% • Black: 3% • Other: 11% **Income** (*N* = 897) • <$40,000: 13% • $40,000-$60,000: 19% • $60,000-$85,000: 26% • $85,000-$100,000: 17% • >$100,000: 25% **Work Status** • Staff hourly: 35% • Staff salaried: 37% • Nonfaculty: 12% • Faculty: 16%	**Classes** • Prenatal education and postpartum BF support classes **Support** • Social networks for prenatal and BF women • List of community resources for university employees • Orientation to all new staff **Equipment & Space** • Policy requires college/unit to make efforts to provide a private room to express milk • 14 breastfeeding rooms for pumping **Policy** • Lactation and time away from work	Cross-sectional	**Program Evaluation** • Not measured **Breastfeeding Practices** • Initiation • Continue after returning to work	**Breastfeeding Initiation** Overall (*N* = 963): 80.8% ≤36 mo. (*N* = 362): 86.6% >36 mo. (*N* = 579): 77.3% **Breastfeeding after return to work** Overall (*N* = 715): 74% ≤36 mo. (*N* = 294): 78.6% >36 mo. (*N* = 421): 71.3%
Spatz et al., 2014 **Location:** Children's Hospital of Philadelphia	Posttest Intervention: *N* = 545	**Inclusion Criteria** • Maternity leave between 2007 and 2011; current hospital employees **Age at Delivery** • 20-24: 2% • 25-29: 24% • 30-34: 48% • 35+: 26% **Race** (*N* = 545) • White: 76% • Black: 13% • Asian: 8% • Hispanic: 3% **Income** • Not reported **Work Status** • Full-time: 55% • Part-time: 45%	**Classes** • Prenatal BF classes **Support** • Employee lactation policy providing guidance for specific break times for pumping • BF resource nurse 16-hour course • Personal use breast pump purchase program **Equipment & Space** • Pumping rooms throughout campus • Hospital-grade loaner pump program for off-site locations	Emailed survey to all employees who filed for maternity leave between 2007 and 2011	**Program Evaluation** • Awareness and usage of program **Breastfeeding Practices** • Initiation • Exclusivity (defined as no supplemental formula, water, vitamins, or juice) • Duration	**Program Evaluation** • Awareness • Employee lactation policy: 51% • Personal pump purchase program: 74% • Symphony pump loaner program for off-campus locations: 28% **Usage** • Classes: 21% • Pump purchase program: 39% • Pumping rooms: 62% **Initiation:** 95% **Exclusivity**: 1 mo.: 70%, 2 mo.: 68%, 3 mo.: 63%, 4 mo.: 51%, 5 mo.: 41%, 6 mo.: 35% **Duration of any BF** • At 6 mo.: 79% • At 12 mo.: 32%

Note. BF = breastfeeding; CA = California; CLC = Certified Lactation Counselor; LA = Los Angeles; mo. = months, NY = New York, WIC = Special Supplemental Nutrition Program for Women, Infants, and Children.

Table 3. Quality Assessment of Studies That Assessed the Influence of Breastfeeding Workplace Support on Breastfeeding Behavior.

Item	Study quality criterion	*M* (*SD*)
1	Is there a control group or pretest/posttest?	0.2 (0.4)
2	Were participants randomized? (*yes* = 1, *no* = 0; selection bias)	0 (0)
3	Are participants representative of the population who would be eligible for the intervention in the general population?	0.3 (0.5)
4	Are the outcome measures from a validated instrument or public agency administrative data?	0.3 (0.5)
5	Is the intervention available prenatally AND postnatally?	0.6 (0.5)
6	Were demographic factors controlled for?	0.3 (0.5)
7	Did an International Board Certified Lactation Consultant or Certified Lactation Counselor provide services for the intervention?	0.4 (0.5)
8	Attrition bias (losses to F/U ≤20% and equally distributed between comparison groups OR response rate >40%)	0.8 (0.4)
9	Detection bias: Were assessors/researchers unaware of assigned group when collecting outcome measures? (1 = *unaware*, 0 = *aware*)	0.1 (0.3)
10	Is "breastfeeding," "exclusivity," or "duration" defined?	0.8 (0.4)
11	Did study measure exclusivity AND duration?	0.5 (0.5)
12	Did the statistical methods examine changes in outcome measures from before to after the intervention? Were statistical tests done that provided *p* values and for pre to post changes?	0.2 (0.4)
Average	Average study quality score	4.5 (1.8)

Note. F/U = Follow-up. Intraclass correlation between two coders was .63.

services. However, program usage and awareness were not measured for this program.

Any breastfeeding rates at 6 months were relatively high in most studies, regardless of publication year. About 78% of mothers who were exposed to breastfeeding classes, electric breast pump, lactation rooms, and portable coolers were breastfeeding at 6 months (Cohen & Mrtek, 1994). However, any breastfeeding at 6 months was much lower at 19.3% among mothers exposed to the same intervention at a different location where mothers worked in separate rather than connected worksites (Cohen & Mrtek, 1994). Women who were exposed to comprehensive lactation programs (breastfeeding classes, social support from lactation consultants, electric breast pumps with accessories, pumping rooms) had the highest breastfeeding rates at 6 months of 74% to 79%. The study with the longest breastfeeding duration was a comprehensive lactation program with 21% of mothers attending classes, 39% using the pump purchase program, and 62% using pumping rooms (Spatz et al., 2014).

Average breastfeeding duration, measured by four research teams, ranged from 6.3 months in 2005 to 10.4 months in 2006. For the program with the longest average breastfeeding duration, about 71% of mothers enrolled in the program before birth with lactation rooms and telephone support being the most frequently used intervention components. Therefore, mothers were already planning to breastfeed and pump when they returned to work, which may explain the long breastfeeding duration (Balkam, 2006; Balkam et al., 2011).

Breastfeeding duration at 12 months, measured by four research teams, ranged from 5% to 43%. The highest breastfeeding rate at 12 months was observed in a comprehensive lactation program that provided seminars about returning to work, social support, and publication of a quarterly newsletter that addressed parenting issues (Dodgson & Duckett, 1997). The shortest breastfeeding duration at 12 months was observed in a comprehensive lactation program where mothers worked at locations far from the lactation rooms (Cohen & Mrtek, 1994). The cost of this program was $500 per employee, after accounting for all services (prenatal classes, perinatal counseling, and return-to-work maintenance services), except physical facility.

Researchers tailored their workplace lactation programs to their populations. For example, researchers used photographs of men with babies, using male references (e.g., sports) by calling a class "Coaching Class for Expectant Fathers" and using male and female dolls of diverse ethnicities in a male employee lactation program (Cohen, Lange, & Slusser, 2002).

Effectiveness of Individual Components on Breastfeeding Outcomes

We also investigated the impact of each component of workplace lactation programs on breastfeeding outcomes. One study evaluated the impact of individual program components on breastfeeding outcomes. Receiving telephone support (42% vs. 15%, $p < .05$) and return-to-work consultation (40% vs. 17%, $p < .05$) were independently associated with longer exclusive breastfeeding at 6 months (Balkam, 2006; Balkam et al., 2011). Each additional service (except prenatal education) was positively associated with exclusively breastfeeding at 6 months, indicating a positive dose-response relationship between number of services received and exclusive breastfeeding (Balkam,

2006; Balkam et al., 2011). In addition, Balkam and colleagues (2011) found that return-to-work consultation, which consists of either in-person or telephone consultation with nurses, was significantly and positively associated with any breastfeeding at 6 months (Balkam, 2006; Balkam et al., 2011).

Discussion

The aims of this review were to evaluate the evidence of workplace lactation programs and of individual workplace support program components on breastfeeding initiation, exclusivity, and duration. We also summarized the costs associated with workplace lactation programs.

All studies with a control group ($n = 3$) reported significant increases in breastfeeding initiation, exclusivity, or duration among mothers who were exposed to the workplace lactation program compared to those who were not (Katcher & Lanese, 1985; Meehan et al., 2008; Paddock, 2017). Majority of studies without a control group ($n = 7$) reported higher breastfeeding rates than the national average at the time of the publication year. It is important to acknowledge that these studies were published between 1985 and 2017, during which there have been significant increases in breastfeeding duration (Centers for Disease Control and Prevention, 2017; Ross Products Division & Abbott Laboratories, 2000). Therefore, we along with many other researchers suggest that providing breastfeeding support in the workplace is critical to promoting breastfeeding practices among working mothers (Steurer, 2017). Our findings are consistent with those of a previous study by Kozhimannil, Jou, Gjerdingen, and McGovern (2016) that reported women ($N = 222$) who had access to break times and lactation rooms in the workplace were 2.3 times more likely to exclusively breastfeed at 6 months than women who had neither of these accommodations. One possible explanation for increased breastfeeding practices might be due to enrollment of motivated mothers who desired to continue breastfeeding after returning to work, which is not representative of all populations.

Our findings are similar to another systematic review on the impact of comprehensive lactation programs on breastfeeding practices. Dinour and Szaro (2017) found that comprehensive lactation programs, defined as three or more support components, decreased breastfeeding discontinuation and increased breastfeeding duration and any breastfeeding at 6 and 12 months. Since mothers who decide to pump at work have several needs, it is not surprising that researchers have consistently shown that participation in comprehensive workplace lactation programs may increase any breastfeeding at 6 months, and average breastfeeding duration. However, it is difficult to compare results since Dinour and Szaro (2017) included studies from all countries, whereas we included studies only conducted in the United States. There were mixed findings on the influence of a lactation space and break times on any breastfeeding at 6 months (Dinour & Szaro, 2017). We cannot conclude the affects of these individual resources on breastfeeding practices since the majority of the included studies were comprehensive lactation programs.

Although program implementers encountered low participation rates, lack of resources to create more lactation rooms, and structural challenges to provide a convenient lactation room, they did received support and funding from administrators or department heads and tailored interventions to the target population by accommodating employees' schedules and included lactation professions who had positive attitudes. The importance of administration support was evident in the Fathering Program, which received monetary support and incorporated the lactation program as a yearly strategic objective for the company (Cohen et al., 2002). Effective communication and collaboration with other departments in the workforce, especially human resources, may facilitate program promotion, which may increase program awareness and usage. Finally, adequate funding and full-time lactation professionals (e.g., certified lactation counselor, internationally board-certified lactation consultant) is fundamental to the success of lactation programs.

Several gaps exist in the literature related to breastfeeding support in the workplace. First, randomized controlled trials are lacking. Second, the impact of workplace lactation programs in low-income settings is unknown. Third, more cost-benefit and cost-effectiveness analyses of providing a workplace lactation program on the health benefits of breastfeeding are needed to inform employers about the benefits or costs of operating a program. Finally, the affect of bringing infants to work, which may be an effective way to maintain milk supply and has been implemented at the Champaign-Urbana Public Health District, on breastfeeding practices should be measured.

Various resources from government agencies (e.g., the Health Resources and Service Administration's Business Case for Breastfeeding and the Supporting Nursing Women in the Workplace by the Office on Women's Health) are available for employers, employees, and lactation professionals to support breastfeeding after returning to work. Suggestions for establishing lactation programs in small businesses provide adequate guidelines for the workplace lactation program, defining employers' responsibilities regarding time and space to pump and, once the program is established, ensuring that the lactation policy is communicated to all employees and included in future orientations for new workers (Angeletti & Llossas, 2018). Creating a breastfeeding-friendly work environment has the potential of increasing employee loyalty and retention, ultimately saving resources needed to hiring and training new employees.

Limitations

There are several limitations to this systematic review. First, the included studies have a high risk of bias due to selection bias. In addition, studies were conducted at companies and institutions that had adequate funds to develop a lactation

program. Second, breastfeeding measures were inconsistent, varying from reviewing lactation consultant's charts to reviewing WIC records. Also, exclusive and other breastfeeding rates were defined differently by different researchers and should follow the World Health Organization's definition for consistent measures. Third, more studies are needed to evaluate the impact of individual components since most programs provided more than one service. Finally, process evaluation measures of program usage and awareness should be measured to reduce Type III error and to attribute changes to breastfeeding behavior to program usage.

Conclusion

Our findings suggest that women exposed to lactation services at the workplace have higher rates of breastfeeding initiation, exclusively breastfeeding, and duration. Supporting working mothers' effort to breastfeed is critical in continued breastfeeding.

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Supplementary Material

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