Breastfeeding in the United States: Economic Analyses of Trends and Policies

by

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Dedication

I dedicate this dissertation to my family. Especially to my husband, Chris, whose love and support carried me through; and to my children, Charlie, Madeline, Evan, and Emily, who inspired my research and provided much needed balance throughout the process.

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Abstract

Public health organizations expend considerable effort and resources to increase breastfeeding rates and reduce disparities on the basis of the medical literature's conclusion that "breast is best." Yet, due to data limitations, little is known about the evolution of breastfeeding rates and the impact of policies aimed at raising rates. My research addresses these limitations by making novel use of publicly-available survey data and applying economic methods to improve knowledge.

I carefully construct a data set of births from 1939-2009. This data set includes breastfeeding as well as demographic variables. I explore multiple weighting methods to develop a nationally-representative sample from the pooled survey data that is comparable to aggregate proprietary survey data.

The twentieth century witnessed dramatic changes and advances in infant-feeding technology, medical understanding, policy, culture, and parenting preferences. The shifts evident in the data affected demographic groups differently, leading to changes in disparities over time. Simulations of breastfeeding rates show that changes in behavior, not characteristics, primarily drove shifts in breastfeeding; however, the magnitudes of the shifts were not universal across racial groups.

Although current breastfeeding rates are at an all-time high, they are still below public health goals, particularly for working mothers. As part of a concerted initiative to raise breastfeeding rates among working women, state and federal legal protections were introduced to

make it easier for mothers to pump at work. I examine the impacts of these laws on breastfeeding rates using data from multiple surveys and the exogenous variation in the existence and timing of state-level workplace lactation support laws.

Legal requirements for lactation support at work successfully raised the percent breastfed at 3 months by 2 percentage points, a substantial increase given the overall trend. In the aggregate, I rule out large effects on long-run measures of duration, but selected groups of mothers were differentially impacted. Overall, the evidence suggests that cultural shifts as well as policy changes affected breastfeeding initiation and duration, and the effects varied across subgroups. My findings and techniques will facilitate future analyses and inform policy going forward.

Chapter 1: Constructing Historical Breastfeeding Data for the United States[1]

1.1 Introduction

Public health officials have increasingly focused on improving breastfeeding initiation rates and encouraging mothers to breastfeed longer. However, policies and programs are largely informed by current breastfeeding behavior and lack historical perspective, due to data limitations. Nationally-representative, historical data on breastfeeding are extremely limited. Historical studies typically rely on data from a proprietary survey, the Ross Mother's Survey (RMS), which is conducted by an infant formula manufacturer. These data are only available to outside researchers in aggregate, greatly limiting the ability of researchers to analyze the data. In response to the lack of publicly-available data, breastfeeding questions were added to the *National Immunization Survey* (NIS) in 2003. Many of the more recently cited statistics and studies are based on these data; however, the horizon is too short to examine the full, historical evolution of breastfeeding, and many key variables are restricted.

This paper makes use of existing, publicly-available data from the *National Health Examination Survey* (NHES), the *National Fertility Surveys* (NFS), the *National Health and Nutrition Examination Surveys* (NHANES), the *National Surveys of Family Growth* (NSFG), and the *National Health Interview Survey* (NHIS) in order to generate new, nationally-representative

[1] All data used in this paper can be downloaded directly from the Inter-university Consortium for Political and Social Research (ICPSR) website: http://www.icpsr.umich.edu/. The Stata code to pool the survey data as described in this paper is available on Open Science Framework: Baker, Lindsay. 2016. "Historical Breastfeeding Data." Open Science Framework. July 25. osf.io/akts5.

estimates of breastfeeding (breastfeeding initiation and breastfeeding duration) overall and by subgroups (maternal age at birth, race, and education level at time of survey) spanning a longer horizon. This paper focuses on the major shifts in breastfeeding behavior over the second half of the twentieth century, and describes the environment in which women were making these decisions in terms of the cultural, political, and legal events related to breastfeeding.

The rest of the paper is organized as follows. Section 1.2 discusses the history of infant feeding in the U.S. Section 1.3 then describes the surveys used to construct the data set, and Section 1.4 outlines the methods used to weight the data. Section 1.5 describes the resulting data series, including how important events align with movements in the data. Section 1.6 concludes.

1.2 History of Infant Feeding

Breastfeeding, either by the mother or wet nurse, has been the main form of infant feeding for most of history. Babies who did not breastfeed often did not survive before the advent of acceptable substitutes. Much of the history of infant feeding is thus a description of the development of infant formula and the shifting perceptions of infant formula versus breastmilk.

1.2.1 Development of Infant Formula and Changes in Infant Feeding Practices

Alternatives to breastfeeding, such as animal's milk, have always existed because not all infants can be breastfed by their mothers for reasons such as insufficient supply or maternal death. Wet nurses were also a common prior to the advent of infant formula. Babies who were not breastfed, by either their mothers or wet nurses, had higher infant mortality leading to ever evolving efforts to find better breastmilk substitutes. As scientists developed the ability to study the composition of human milk, they worked to improve formulations to better match it (Stevens et al. 2009). By the early 1900s, there were hundreds of different infant "formulas," with

pediatricians and manufacturers working together to "scientifically" customize nutrition for each baby (Schwab 1996).

Despite advances in artificial feeding of infants, it was still a dangerous undertaking, with many babies dying. These substitutes were crude attempts at replicating the nutritional composition of breastmilk and also lacked the immune protection afforded by breastfeeding. Additionally, they were not always properly stored and prepared leading to increased risk of illness. As better food handling practices were introduced in the late 1800s and early 1900s, pasteurized milk from milk clinics or stations, canned condensed and evaporated milk were touted as safer baby feeding options (Stevens et al. 2009). The need for breastmilk alternatives was spurred by World War I. Women had to be away from their babies to contribute to the war effort which led to increased demand for breastmilk alternatives. The surge in demand led to increased competition with manufacturers ramping up marketing efforts and changing strategies bypassing the medical community and advertising directly to the end customer. In addition to more targeted marketing, manufacturers tried to distinguish themselves by developing more "humanized milks" designed to better replicate the characteristics of breastmilk through "discoveries in chemistry and pediatrics." These "scientific" infant formulas were increasingly the preferred substitute over animal's milk and more simple formulations (Schwab 1996).

The infant formula industry has its roots in two seemingly distinct industries: pharmaceuticals and food-processing. In the U.S., the infant formula industry rose from the efforts of medical researchers to develop a suitable alternative to mother's milk, and hence has more of a "pharmaceutical orientation." In contrast, European producers of infant formula have their origins in food processing; for example, Nestlé and others became involved in the infant formula business as a result of their products, e.g., evaporated and condensed milk, being used as an infant food.

Eventually, as the market moved toward infant formula, the companies ordinarily characterized as "food-processing" transitioned to developing their own infant formulas to remain competitive (Post 1978).

A number of firms entered the infant formula market in the early 1900s, but the industry saw considerable consolidation during the Great Depression (Oliveira et al. 2005). The main producers of infant formula at the time were Ross Laboratories, Mead Johnson, and Simulated Milk Associates (SMA) (Post 1978).[2] It was a relatively small industry, with most mothers still breastfeeding. Those who did not breastfeed used homemade formulas, as they were far cheaper than commercial formula and were not thought of as deficient; typically, the primary ingredient was evaporated milk or whole cow's milk (Foman 2001). During the 1940s and 1950s, infant formula became more widely accepted as a viable substitute for breastfeeding and its popularity increased among mothers and pediatricians (Stevens et al. 2009). In 1951, concentrated liquid formulas came on the market and the convenience outweighed the relatively higher cost. The convenience, coupled with the introduction of nutritionally-superior fortified formulas and their aggressive marketing by the industry and medical community, led to commercially-prepared formula use becoming favored over homemade formula by 1960 (Foman 2001).

From 1920 to 1950, the "ideology of scientific motherhood" under "expert advice" from physicians, coupled with innovations in the infant formula industry, put artificial infant feeding at the center of hospital training courses for expectant mothers, advice books for new parents, and magazines and periodicals directed at those audiences.[3] Apple (1987) describes changing attitudes

[2] SMA was acquired by Wyeth Laboratories in the late 1920s and Wyeth was acquired by American Home Products shortly after that. Other acquisitions of the other two competitors followed in later periods (Post 1978).

[3] Chief among the concerns of hospitals were outbreaks of intestinal disturbances (diarrhea), and hospitals maintained strict sterilization procedures to protect infants. One such practice was the isolation of babies immediately after birth to sterile nurseries, and nurses would sterilize the mothers and deliver their infants for breastfeeding periodically throughout the day (Apple 1987). Major infant formula manufacturers, like PET and Carnation, capitalized on this

about breastfeeding from 1920 to 1950. Although most advice on the topic began by mentioning the benefits of breastfeeding, most attention in training courses and advice books was given to formula and bottle feeding. Popular commentators of the time attributed the decline in breastfeeding to a host of factors, including changes in norms about "civil" public behavior and maternal modesty; however, most articles claim a role for "deficient" supplies of milk and milk quality (Apple 1987). Without a doubt, the role of "medical information"—propagated by a very lucrative infant formula industry—is central to the story.

The 1957 edition of *The Good Housekeeping Book of Baby and Child Care* describes how advances in science, including pasteurization, refrigeration, sanitation, and others related to infant formula, revolutionized bottle feeding in terms of health implications. "[I]f bottle feeding is carried out under good medical guidance by a reasonably intelligent and careful mother … the risk becomes negligible … A bottle mother may still be a perfect mother" (Holt 1957). Thus, bottle feeding became more widely accepted, and eventually preferred, as mothers believed that the "scientific" approach was better than the "natural" one. This preference was evident in the ways in which childbirth was managed and infant care pushed into routines and schedules.

The acceptance of infant formula coincided with the end of World War II and the subsequent baby boom, which brought about tremendous demand with a 50 percent rise in births from 1940 to 1960 in terms of the general fertility rate. As a result, the industry shifted toward more large-scale manufacturing (Oliveira et al. 2005). With the industry moving toward presumably more cost-effective manufacturing at the same time that demand for infant formula was surging with the baby boom, profit potential was high. Since no new firms were entering the market, the competition among the existing firms intensified as each increased production to meet

opportunity by providing free information to mothers at training classes, baby name books, crib cards for baby's names at hospital nurseries, and free formula (Apple 1987).

demand and capture market share. By the 1960s, Ross Laboratories and Mead Johnson were the dominant players in the U.S. market.[4] Coincidentally, these two market leaders were acquired by large pharmaceutical companies; Ross by Abbott Laboratories in 1964, and Mead Johnson by Bristol Myers in 1967 (Post 1978).

1.2.2 The Infant Formula Industry: Boom and Bust of the U.S. Market

The major U.S. companies, Ross and Mead Johnson, were initially focused on their home market, but this changed as the industry and market evolved. Given the high demand in the U.S. market due to the baby boom, they had no incentive to invest elsewhere, but as the baby boom came to an end in the 1960s, the U.S. market was no longer a major source of growth for the infant formula companies. The declining birth rate in the U.S. was likely just one factor in spurring the internationalization of U.S. infant formula companies in the 1960s (Post 1978). According to Post (1978),

> ...available evidence suggests that international expansion was the direct result of (a) expansion of existing demand in foreign nations; (b) shifts in strategic thinking among major firms; (c) the acquisition of infant formula firms by internationally-oriented pharmaceutical companies. Ross Laboratories, Mead-Johnson, and Wyeth Laboratories had each participated in the international sale of infant formula products well before the [1960s].

However, the baby boom and bust likely did contribute to the timing of the international expansion of U.S. firms.

When the U.S. market was booming, firms had less incentive to spend capital abroad when they could invest in the U.S. market more easily and with less risk. The eventual end of the baby boom likely encouraged business leaders to consider investments in geographical areas with increasing birth rates and incomes (i.e., developing countries), but Ross and Mead Johnson still

[4] According to Post (1978), the combined market share of the two market leaders was approximately 90 percent of the domestic infant formula business (Ross's *Similac* at 55%, and Mead Johnson's *Enfamil* at 35%).

were operating near capacity to meet domestic demand, and hence did not have the resources to expand into foreign markets. It was their acquisition by large pharmaceutical companies in the 1960s that provided the necessary capital to move forward with international expansion. In the mid-to-late 1970s, the three major U.S. firms accounted for more than $550 million of the infant formula sales in the world market overall, with close to $300 million in the U.S. and $120 million in developing countries. The three firms' sales in developing countries were estimated to be 20 percent of all infant formula sales in those countries. Mead Johnson and Wyeth accounted for the bulk of the U.S.-based sales in developing countries, with an estimated 80 percent, a little over half of which was Wyeth; Abbott was a relatively smaller player in these markets, accounting for the other 20 percent (Post 1978).

In addition to the declining birth rate, another potential threat facing the infant formula industry in the U.S. was the beginning of a cultural shift in women's attitudes toward the scientific approach to motherhood. The movement toward an interest in more natural methods of childbirth and the promotion of breastfeeding began prior to the infant formula scandal and prior to the resurgence of breastfeeding. The Lamaze method for childbirth was first introduced in the U.S. in 1958 and the organization known today as Lamaze International was formed in 1960 as a not-for-profit organization aimed at "spread[ing] the word about Lamaze and to set[ting] the standards for Lamaze childbirth educators" (Lamaze 2014). Likewise, La Leche League International started in late 1956 to promote and support breastfeeding. During the 1960s, that organization grew from a small group of founding members to many groups around the world that published documents and hosted international conferences (LLLI 2012).

Beyond the threats presented by the declining birth rate and changing parental culture in the U.S., a government program, the Special Supplemental Nutrition Program for Women, Infants,

and Children (WIC), was introduced and essentially subsidized a large fraction of the U.S. demand for infant formula, and thereby arguably increased that demand. WIC was not formally authorized as a permanent national health and nutrition program until 1975, but the seed was planted back in the 1960s when hunger and malnutrition among the poor in the U.S. first was openly recognized. In the late 1960s, the precursors to WIC were established with food voucher programs for low-income women in Atlanta and Baltimore in 1968 and a USDA program, the Commodity Supplemental Food Program, in 1969 aimed at feeding low-income pregnant women, infants, and children. After increasing attention and government conferences, it became clear that more resources were needed to address the problem, with particular attention paid to low-income pregnant women and young children. As a result of these conclusions, WIC was authorized as a two-year pilot program in 1972 and a permanent program in 1975 (Oliveira et al. 2002). Given that WIC supplies low-income women and children deemed to be at nutritional risk with free infant formula, one would expect the breastfeeding incentives for this group of women to be distorted. A simple economic model of supply and demand predicts lower breastfeeding rates (and increased demand for infant formula) among program participants due to the mitigation of the high cost of formula along with a lack of emphasis on the nutritional superiority of breastmilk by program staff.

1.2.3 Infant Formula Scandals

1.2.3.1 Marketing and Sale of Infant Formula in Developing Countries

As discussed, infant formula was increasingly embraced as preferable to breastfeeding in the U.S. and the same trend was evident in other industrialized countries in North America and Europe. In developing countries, on the other hand, most babies were still breastfed, but as the infant formula manufacturers stepped up their marketing in Asia, Africa, and Latin America, those countries also saw breastfeeding fall out of favor. Unlike in industrialized countries, mothers in

developing countries often lacked the necessary conditions to safely bottle feed. To breastfeed safely, little is required, but bottle feeding infant formula requires access to a clean water supply, a means to boil the water and sterilize the bottles and feeding equipment, sufficient income to afford the appropriate amount of powdered formula, and literacy to be able to follow the instructions for safely preparing the formula. In developing countries, most, if not all, of these requirements were not met by most mothers (Chetley 1986). As a result, the health consequences of formula feeding in these areas were devastating. According to Chetley (1986), bottle-fed babies in these countries were more likely to suffer from gastroenteritis, diarrhea, vomiting, dehydration, malnutrition, or die. Similar problems were evident in socioeconomically-depressed areas of the U.S. as well, where conditions were comparable to those in developing countries (Chetley 1986). The dire health consequences of infant formula manufacturers marketing their products to mothers who were unable to meet the requirements necessary to safely use their products went largely unnoticed by the international public until the late 1960s and early 1970s.

Beginning with the observations of doctors working in these countries, the impacts of the aggressive marketing practices of the infant formula manufacturers gained elevated awareness and discussion. A United Nations (UN) working group, including pediatricians, industry representatives, and representatives from various UN agencies, met to discuss the issue several times in the early 1970s, but there was little effect on the rampant and damaging marketing practices of the industry (Chetley 1986). Eventually, other groups began to take notice.

British organizations concerned with poverty in developing countries were the first to sound the alarm. In August 1973, the *New Internationalist*, a British magazine, published *The Baby Food Tragedy*. The publication was the first to expose the industry's dangerous practices to the general public, relating first-hand accounts of two child health experts who had worked in

developing countries (Dobbing 1988). The editors of the *New Internationalist* were interested in using the attention garnered from their publication to launch a campaign to pressure the industry to make changes. War on Want, a British charity organization focused on fighting poverty in developing countries, was also interested in holding the industry accountable and sought additional evidence through a freelance, investigative journalist, Mike Muller. He produced a report, *The Baby Killer*, that was an incredibly damaging exposé of the infant formula manufacturers marketing practices and the associated devastating effects in Third World Countries. The report was published by War on Want in March 1974 (Chetley 1986).

This paper proved to be pivotal in the escalation of the scandal. The paper was distributed widely in the UK and Europe, and eventually was translated into many languages, including German. This translation, done by a small group in Switzerland, the home of Nestlé, was particularly incendiary as the title translated as "Nestlé Kills Babies." This translation eventually led to a libel suit filed by Nestlé. Although Nestlé eventually won the libel suit, it lost the case in the court of public opinion, which was arguably a worse outcome. The damage was done and the news spread around the world. In the U.S., shareholder activism was one outlet for the public's frustration with the infant formula manufacturers. Late in 1974, the Interfaith Center on Corporate Responsibility (ICCR) led an effort to compel public formula manufacturers to share information about their marketing tactics in developing countries. The primary mechanism for this initiative was the filing of shareholder resolutions that resulted in votes at the firms' annual meetings. The resolutions were not successful in terms of securing the votes, but they did bring more attention to the issue. After a couple years of the firms' attempting to tiptoe around the issue, especially in the case of Bristol-Myers, the Sisters of the Precious Blood, a Catholic order of nuns, filed a lawsuit contending that Bristol-Myers misled shareholders in its proxy statement. The lawsuit was

eventually dismissed, but an appeal and the eventual involvement of the SEC raised more awareness for their cause (Chetley 1986, Dobbing 1988).

Nestlé's leadership in the market made it an attractive target in order to make a statement and put other firms on notice. As a result, in July 1977, a boycott of Nestlé formula began and quickly spread around the world (Chetley 1986). In May 1978, the U.S. Senate held hearings on the marketing practices of infant formula manufacturers, drawing further attention to the issue among the American public. The outrage subsequently simmered down in the early 1980s. The WHO adopted the International Code of Marketing of Breast-milk Substitutes in May 1981, and, with the companies appearing to make an effort to change their ways, the fervor died down and the boycott was lifted. However, later violations brought renewed attention to the issue and a reinstatement of the boycott (Dobbing 1988).

1.2.3.2 Other Scares Surrounding Infant Formula

During the same time that the scandal around the marketing and sale of infant formula in developing countries was heating up, a domestic scare involving a product used in infant formulas occurred. Beginning in 1972, several organizations discovered that cans of evaporated milk and other infant foods were contaminated with high levels of lead. Lead solder used to seal the cans was leaching, resulting in high levels of lead in the contents of the cans. The FDA and Consumers Union were at odds over the issue, as described in a *New York Times* article in September 1973 (Blumenthal). Consumers Union alleged high levels of lead, about the maximum daily amount for an infant to safely consume, in many major brands of evaporated milk cans, while in contrast the FDA asserted that the levels were safe. Worthy of note, it turned out the testing by the FDA was done after the industry adopted new standards of lower lead solder, and Consumers Union had tested cans before this change in industry practice. As a result, the safety of cans then on the market

seemed unquestioned, and, while there was no ongoing danger to the public, consumers' confidence in the safety of manufactured food likely was shaken (Blumenthal 1973).

Awareness of the dangers of manufactured food, specifically infant formula, was heightened as a result of the scandals, and, in 1979, when "more than 100 infants became seriously ill [in the U.S.] as a consequence of using soybean-based formulas marketed with an insufficient amount of chloride," Congress acted swiftly (Carter 1980). The Infant Formula Act of 1980 was signed into law on September 26, 1980 and since has required

> …formula manufacturers include chlorides as well as other essential elements in each infant formula preparation sold. It also gives the Secretary of Health and Human Services (HHS) authority to adjust nutritional standards to conform to the best available scientific knowledge. In addition, the bill requires manufacturers to test formulas … and to notify the Secretary promptly whenever formulas do not meet the nutritional requirements (Carter 1980).

1.2.4 Family-friendly Policies and Developments

Following the developments in infant formula marketing standards and content regulation at the end of the 1970s and into the 1980s, not much attention was paid to breastfeeding promotion. At the end of the 1980s, the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) saw that mothers (and their babies) stood a better chance of establishing a successful breastfeeding relationship if they were appropriately supported in the hospitals and maternity care facilities in which they were giving birth. In 1991, they launched the Baby-Friendly Hospital Initiative (BFHI) as a global program "to encourage and recognize hospitals and birthing centers that offer an optimal level of care for infant feeding and mother/baby bonding" (Baby-Friendly USA 2016a). By the late 1990s, the first hospitals in the U.S. were receiving the "Baby-friendly" designation (Baby-Friendly USA 2016b).

The 1980s also lacked efforts to improve the conditions for working mothers, yet more and more mothers were working. In addition to hospitals focusing on breastfeeding promotion, policy

and technology improvements began to catch up in the 1990s. While the first patent for a breast pump was filed back in the mid-1800s, it was not until 1991 that the first non-hospital, electric breast pump was made available in the U.S.; sales since have skyrocketed (Lepore 2009). Access to a personal-use breast pump enabled women to more effectively and easily extract milk for their babies during long absences, such as during work. However, establishing breastfeeding and recovering from birth takes time. Without adequate job protection and financial means, many women must return to work immediately, making breastfeeding more difficult.

The federal Family Medical Leave Act (FMLA), enacted in 1993, was a hard-fought attempt to protect some employees following birth (among other circumstances). FMLA allows a covered employee to take up to 12 weeks of unpaid, job-protected leave during a 12-month period for the birth and care of a child (DOL 2014).[5] While FMLA does not apply to all employees and is typically unpaid, it was a vast improvement for covered working mothers, who had no guarantee of job protection prior to its passage.[6]

In 1997, the AAP issued their first new statement on breastfeeding in 15 years, emphasizing recommendations for exclusive breastfeeding for 6 months and continued breastfeeding through the first year (Gartner 1998, AAP 1997). With renewed emphasis in the medical community on the importance of breastfeeding, balancing work and breastfeeding became more of a focus, thereby motivating some states to pass legislation requiring workplace lactation support (Tyler 2000). From 1998-2008, 15 states and the District of Columbia enacted laws requiring employers to provide direct or indirect lactation support for employees, and, as of March 2010, this is also

[5] "FMLA applies to all public agencies, all public and private elementary and secondary schools, and companies with 50 or more employees. Employees are eligible for leave if they have worked for their employer at least 12 months, at least 1,250 hours over the past 12 months, and work at a location where the company employs 50 or more employees within 75 miles" (DOL 2014).

[6] Some states have laws that expand the federal legislation, but, with the exception of California and New Jersey, these extensions of leave all are unpaid.

federal law for a subset of employees. These laws increased breastfeeding duration in the short-run for all mothers and in the long-run for some mothers (Baker 2016c). More family-friendly workplace policies and improved breast pump technology facilitated women's ability to combine work and breastfeeding.

The discussion surrounding infant feeding and shifts in practices over time is overwhelmingly anecdotal and descriptive in nature. The historical narrative has not been validated with data because a single data source with breastfeeding information has not existed for researchers to use until this work. The next section discusses the surveys I use to construct the first publicly-available, historical data set.

1.3 Survey Data

This work is the first to pool historical surveys that ask breastfeeding questions in a single data set. Many national surveys ask breastfeeding questions, but I focus only on those surveys that have publicly-available data for three main reasons. First, the coverage of the publicly-available surveys in terms of number of observations and years of birth is comprehensive. Second, surveys with restricted key variables, such as date of birth, are difficult to pool with the publicly-available survey data because of the time-intensive process involved in gaining access to restricted data as well as the limited accessibility. Last, using restricted data would make it more difficult for other researchers to recreate the data set for their own use. The publicly-available surveys asking breastfeeding questions include the 1963-65 NHES, the 1965 and 1970 NFS, the 1971-1975 and 1976-1980 NHANES, the 1973, 1976, 1982, 1988, 1995, and 2002 cycles of the NSFG, and the

1981 NHIS.[7] The following describes each survey's purpose and target population; see Table 1.1 for a summary.

The second wave of the NHES, conducted from 1963-1965, collected data about various health characteristics related to the growth and development of the target population, children ages 6-11 years old. The survey data was intended to generate national estimates and distributions of the health of children in this age range. Later versions of the NHES targeted an older population and were eventually succeeded by the NHANES.

The 1965 and 1970 NFS were the first and second of three surveys that replaced the Growth of American Families surveys (conducted in 1955 and 1960) and were designed to study marital fertility and family planning in the U.S. The target population for the 1965 NFS was currently-married women born after July 1, 1910, who were living with their husbands, able to participate in an English language interview, and not older than 55 at the time of interview. For the 1970 NFS, ever-married women born after July 1, 1925 were surveyed.

The NHANES is a survey that uses a combination of interviews and physical examinations to assess the health and nutritional status of adults and children in the U.S. The NHANES I (1971-1975) targeted persons 1-74 years old and the NHANES II (1976-1980) targeted persons 6 months to 74 years old. The medical history questionnaire for children aged 11 and younger was used to obtain breastfeeding information.

Data from seven waves of the NSFG are included in the pooled data set. The target population and survey questions for the NSFG evolved over time, but the survey generally collects information about family life related to fertility, health, and marriage. The first and second waves,

[7] Both the NFS and the NSFG include relevant demographic variables, and these are harmonized across these surveys and others in the Integrated Fertility Survey Series (IFSS). Demographic variables from the other surveys were recoded to be comparable to those in IFSS. The NFS aimed to examine marital fertility and family planning, and the main goal of the NSFG is to collect data on factors affecting pregnancy and women's health.

in 1973 and 1976, targeted women aged 15-44 who were ever-married or never married, but with children living with them. In 1982, 1988, and 1995, women aged 15-44 were surveyed regardless of marital status. The 2002 and 2006-2010 surveys included men as well as women, aged 15-44, regardless of marital status.

The NHIS has been providing data to monitor the nation's health since 1957. Data from the surveys help track the health status, health care access, and progress toward achieving national health objectives. In 1981, the NHIS included a Child Health Supplement for children ages 0-17 years and covered breastfeeding history, among other topics.

The data sets from some of these surveys have been studied individually, but this work is the first to combine all of the survey information to create a single, pooled sample that covers much of the twentieth century. Important to this discussion, each of these surveys includes questions about breastfeeding initiation and duration, as well as information on mothers' demographic characteristics (race, education, and age, among others). Together, these surveys contain information on breastfeeding for 149,625 single, live births from 1939 to 2009 to 74,696 women, and provide a rich picture of changes in infant-feeding practice in the U.S. over the course of the twentieth century and into the twenty-first century.

As shown in Figure 1.1, the pooled sample has fewer observations in the early and late parts of the sample, making estimation less precise prior to 1939 and after 2009. Figure 1.1 also shows that the sample has more observations of births in the middle and late parts of the century, which biases the overall descriptive statistics in Table 1.2 towards the behavior of the mid-to-late century when breastfeeding rates were low. Each observation in the sample is given equal weight for the purposes of the descriptive statistics shown in Table 1.2, so the majority of the sample was not breastfed (62.2 percent). In addition to the overrepresentation of mid-to-late century births, the

overall, unweighted sample might also be biased by the oversampling of underrepresented populations by the surveys. Surveys often oversample these populations to ensure they have enough data from these groups to make inferences. Looking at the breakdown of the data by subgroup in Table 1.2, we can see that some groups show lower breastfeeding than others: black mothers compared to white mothers, lower-educated compared to more highly-educated mothers, younger compared to older mothers, unmarried compared to married mothers, and higher-birth-order compared to firstborn children.

Since sampling differences might bias analyses, adjustments should be investigated to make the final pooled sample nationally representative. I explore two weighting methods to create a nationally representative data set. These methods are described in the next section, Section 4.

1.4 Weighting Methodology

The pooled sample described in Section 1.3 comprises data from several different surveys and survey series. Taken as-is, the pooled sample is not expected to be a nationally representative sample of births. Each survey has a target population and population(s) that it over- or under-samples due to expected survey response or other reasons. To create a nationally representative data set, I explore two alternative methods to weight the data and compare the results of the two methods, as well as explore how they relate to the unweighted data and an outside source, the RMS. Both methods yield statistically similar results and are more comparable to the external data source than the unweighted data.

1.4.1 Method 1: Existing Survey Weights

The raw data from each survey included in the pooled sample are not nationally representative, though, using the survey weights, they are nationally representative of the population sampled, assuming that non-response is unrelated to breastfeeding. For example, the

NFS 1970 targets women born after July 1, 1925 who were ever married. Using the weights from this survey, I can generate a sample that is representative of ever-married women in this age range, but not necessarily of all women or even all women in this age range.

My first, and preferred, method for creating a nationally representative sample of births is to use the existing survey weights. Using existing survey weights corrects for over- and/or under-sampling of groups of mothers/children due to survey construction. The remaining concern, however, is whether using the survey weights actually creates a nationally representative sample of all births. Using survey weights should make data nationally representative of births if mothers and children excluded due to death, age limit, and other restrictions of the surveys are not different in terms of demographics and breastfeeding behavior relative to mothers and children that are included. The age limit should not be an issue for most years since earlier surveys cover mothers who might have been excluded from later surveys.

Another issue with using existing survey weights is harmonizing the weights. The weights differ in terms of magnitude and range. To prevent weighting observations from one survey more than another due to different magnitudes, I rescaled the weights for each survey to sum to 1. In other words, for each survey, I totaled the weights for each observation in the sample. I then divided each weight by this total to obtain the new weight. The resulting weights sum to 1 within each birth year and survey. For example, at this stage, the total of all weights for NHIS observations born in 1963 is 1.

Lastly, I needed to address the fact that multiple surveys were being used. Each birth year includes data from multiple surveys, varying from 2-10 surveys, with the mode being 7 surveys. The observations from one survey overlapped with another, and the number of observations contributed by each survey varies across the birth years. With survey weights all summing to 1

within birth year, left as-is, equal weight would be given to the observations from each survey whether the survey contributed 2 observations or 1,000. To prevent a small number of observations from skewing results, I rescale the weights according to the total observations the survey contributes in each birth year. In other words, I multiply the weight by the total number of births the survey contributes to the pooled sample in each year. For example, the NHIS covers 502 births in the pooled sample in 1963 and the NSFG 1973 contributes 1,234 births in the pooled sample in 1963. The new and final weight for each sample is multiplied by the respective survey's number of births. In other words, all NHIS weights in 1963 would be multiplied by 502 and all NSFG 1973 weights in 1963 would be multiplied by 1,234. Thus, the final weight sums to the total number of births in each year in the sample.

The new survey weights that resulted from these steps correct for differing weight magnitudes and overlapping surveys, but cannot correct for missing observations due to survey exclusions, like unmarried mothers underrepresented in earlier surveys. It is unclear whether the missing mothers are different from mothers sampled in terms of breastfeeding. If behavior is similar, their absence would not affect results. Even if their behavior cannot be approximated by the included mothers, it is unlikely that these missing observations would have a significant impact on the results, especially in the aggregate. Unmarried mothers and older mothers were not completely unrepresented in the pooled sample, and, although they were underrepresented in some years, births out of wedlock and births to older mothers were not common mid-century.

The survey weights aim to match the data to the target population across many dimensions, but the target population may differ from the overall universe of births. In addition to comparing the data series weighted with this method to that from an outside source, I also want to compare it

to an alternative weighting method that weights the pooled survey data so that it matches the vital statistics data for all births across several dimensions.

1.4.2 Method 2: Weights Created using Vital Statistics Data

Out of concern that the survey weights might be biasing the sample due to death or other restrictions, I develop an alternative set of weights. This method employs analysis of the unweighted data combined with vital statistics data. The weights created using vital statistics cannot entirely correct for excluded populations in that I cannot fabricate observations for these types of women. Instead, this method assumes that missing observations can be accurately represented by observations included in the sample in terms of their breastfeeding behavior if matched to particular characteristics. If this assumption is correct, using the vital statistics data corrects for the fact that births may not be representative of all and accounts for potential bias due to mortality, age, and other exclusions.

The alternative set of weights were created using a post-stratification method utilizing fixed demographics common across both data sets.[8] Each unique combination of characteristics represented is one weight category; for example, white mothers over 30 years old giving birth to male children. For each year of birth covered by both vital statistics and survey data (1968-2000), and for each of these data sets separately, I calculate a ratio equal to the number of observations in each category divided by the total number of births:

$$ratio_{ycs} = observations_{ycs}/total\ births_{ys}$$

y is year of birth available in both data sources: 1968-2000; s is source: vital statistics or pooled survey data; and c is category, each unique combination of the three demographic variables used.

[8] The demographic categories used were child's sex (male or female), maternal age (<20 years, 20-29 years, 30+ years), and maternal race (white, black, and other). These were the only variables available in both data sets that could not change value from time of birth to time of survey (unlike marital status, education, etc.).

I then use the resulting ratios to calculate the weight for each category and each year of birth. The weight equals the percent in the vital statistics sample divided by the percent in the pooled sample:

$$weight_{yc} = vital\ statistics\ data\ ratio_{yc} / pooled\ survey\ data\ ratio_{yc}$$

y is year of birth available in both data sources: 1968-2000; and c is category, each unique combination of the three demographic variables used; for example, the percent of all single births in 1968 of male children born to white mothers aged 20-29 at the time of birth divided by the percent of male children born to white mothers aged 20-29 in 1968 in the pooled sample.

Recreating the data series using this alternative weighting method provides another comparison series as well as a check that the survey weights are not misrepresenting the population of births along the dimensions available, namely gender, race, and age of mother at birth. Other aspects of the survey design that lead to under- or over-sampling of particular groups are not likely to be captured by the three demographic variables used in this method. Whether this results in any bias is unclear; it depends on whether the omitted or under- or over-represented groups have different breastfeeding behavior than the groups that represent them in the sample.

1.4.3 Comparison of Weighting Methods

Figure 1.2-Figure 1.5 show the pooled data series unweighted and weighted using the two methods for two outcomes of interest: breastfeeding initiation and breastfeeding at least 6 months.[9] Both methods yield similar results: the weighted series lie within the 95 percent confidence interval of the other. For the remainder of the paper, I describe the results in terms of the first weighting method (using the existing survey weights) for two reasons: (1) the vital statistics weights are only easily calculated back to 1968, so using the survey weights allows for greater exploration of the

[9] Other outcomes (breastfeeding duration in months, breastfeeding at least 3 months, breastfeeding at least one year, and duration measures conditional and unconditional on ever having been breastfed) were explored with similar results.

history; and (2) the survey weights account for a greater number of variables in the survey process and are more likely to correct for bias than the three variables selected for the second method.

In addition to comparing the two weighting methods to the unweighted data and to each other, I also validate retrospective reports in my sample against published figures from the RMS. Despite differences in survey design between the publicly-available surveys and RMS, the pooled data are very similar to RMS in the years when both are available. Again, they mostly fall within the 95-percent confidence interval of the weighted estimates for both breastfeeding initiation (Figure 1.3) and breastfeeding at least 6 months (Figure 1.5). Since both methods yield similar results to the outside source, I am less concerned that the survey sample suffers from bias due to certain women being excluded from the sample as a result of death or survey design.

1.5 Data Analysis with Historical Context

The data set resulting from pooling information from the surveys, as discussed in Sections 1.3 and 1.4, provides new statistical evidence to complement the descriptive history detailed in Section 1.2. Generally, shifts evident in the tables and figures align with shifts in the descriptive history, but in some cases shifts differ in timing. In this section, I compare and contrast the two accounts and present possible reasons for similarities and differences, as well as look at shifts by demographic groups. Adding statistical evidence to the literature on breastfeeding history, which was largely descriptive prior to my work, gives a new perspective on how and why breastfeeding rates changed over time.

1.5.1 Overview

Prior to the advent of mass-produced infant formula, most babies had to be breastfed because there were no safe alternatives. As can be seen in Figure 1.2, women who gave birth at the beginning of the period covered, 1939, breastfed at high rates, around 70 percent. Based on the anecdotal

evidence, breastfeeding rates were likely as high, if not higher, in earlier years not shown. While most infants born in 1939 were breastfed for some period of time, the medical community did not emphasize breastfeeding duration milestones and advice regarding solid food introduction was not the same as today, so not as many, only around 40 percent, were breastfed for at least 6 months (see Figure 1.4). Breastfeeding rates, for both initiation and duration, at the end of the period shown are similar to those at the beginning, around 40 percent, but rates have been far from constant over the entire time period.

From the start of the period shown up until the early 1970s, breastfeeding rates declined steadily as infant formula became increasingly available and accepted. Convenience and changes in social norms among groups were likely driving factors. Additionally, marketing by formula manufacturers and acceptance, and even promotion, among doctors hastened the decline of breastfeeding. Accordingly, Figure 1.2 and Figure 1.4 show the steady decline in both initiation and duration of breastfeeding from 1940 to 1959, from about 72 percent to about 32 percent overall (Figure 1.2), and about 42 percent to about 22 percent breastfeeding at least 6 months (Figure 1.4). Bottle-feeding infant formula had become the norm in the U.S., and, consequently, breastfeeding rates fell to historically low levels. Since the substitute was perceived as better than breastfeeding, it is not surprising that the breastfeeding rate dropped precipitously during this period. By the end of 1969, only about 25 percent of babies were ever breastfed (see Figure 1.2), and about 7 percent were breastfed for more than 6 months, as can be seen in Figure 1.4.

Breastfeeding rates reached all-time lows by the early 1970s, but then suddenly reversed their downward trend and exhibited a remarkable increase throughout the decade (see Figure 1.2). Similar trends are present in the measures of percent breastfed for at least 6 months (Figure 1.4). From 1970 to 1979, overall breastfeeding initiation rates increased from 25% to 46% overall, and

from 8% to almost 28% for rates of breastfeeding at least 6 months. The likely triggers for this reversal were a combination of the women's and natural-parenting movements that took hold, along with several scandals surrounding infant formula that unfolded during the 1970s (see Table 1.3 for a list of key events). However, the key events of this decade do not align well with movements in the data. The resurgence in breastfeeding occurred long before health officials clearly articulated their views on breastmilk being superior to alternatives, and even before the formula scandals. A closer look at differences across groups provides additional perspective and will be explored further in Section 1.5.2.

The government got involved in the late 1970s, and by 1980 introduced regulation for the infant formula industry that likely mitigated further damage to the industry's reputation. Additionally, the WHO issued guidance aimed at preventing future harmful marketing tactics internationally. These actions and the subsequent lull in policies related to breastfeeding likely contributed to the plateauing of rates during the 1980s. As new policies and renewed emphasis on the importance of breastfeeding by the medical community emerged during the 1990s and 2000s, breastfeeding initiation and duration rates surged again, as shown in Figure 1.2 and Figure 1.4, returning to levels seen at the start of the 1940s. The overall trends follow the historical narrative pre- and post-resurgence, but the timing and magnitude of the resurgence differed across demographic groups (see Figure 1.6-Figure 1.9 and Table 1.4-Table 1.5).

1.5.2 Differences Across Groups

Large disparities in breastfeeding rates existed at the start of the time period shown, the 1940s, and the end, the 2000s, but the groups with the highest and lowest rates flipped in between. Table 1.4 shows the average breastfeeding initiation rate for each decade, and, looking at racial disparities, the initiation rate for black mothers was over 18 percentage points higher than that of

white mothers over the 1940s. The racial disparities are also evident in Figure 1.6. Teenage mothers had an initiation rate 14 percentage points higher than that of older mothers, those 30 years and older. Initiation rates were not drastically different among mothers of different marital status and educational level, with the exception of high school graduates who breastfed at rates 8-10 percentage points lower than the other groups.

Breastfeeding duration, as measured by those breastfeeding at least 6 months, also exhibited large disparities among mothers of different races: a 24-percentage-point gap with more black mothers still breastfeeding at 6 months in the 1940s. The difference in rates of breastfeeding at least 6 months for mothers of different marital status was not notable in the 1940s, similar to breastfeeding initiation. Unlike breastfeeding initiation rates, however, mothers of different ages did not show notable differences, whereas mothers of different education levels did. A greater percentage of high-school drop-outs were still breastfeeding at 6 months as compared to mothers of other education levels, over 16 percentage points greater in the 1940s. Likely contributors to these differences were availability, cost, and preference for using infant formula. Groups associated with higher socioeconomic status (white, college-educated, older, and/or married) would be the ones who could afford the specialized formulations available through their doctors and the mass-produced, ready-to-use formulas that came on the market. They might also be the ones reading material containing increased promotion of formula. As infant formula became more mainstream through the 1950s, the gap in initiation and duration rates between groups closed steadily, and, during the 1960s, the disparities between those breastfeeding began to reverse.

At the same time that infant formula was scaled up to accommodate mass production and manufacturers started ramping up their marketing to the public, the natural parenting movement was emerging with La Leche League (1956) and other natural birth programs starting in the U.S.

(1960). Thus, affordability was not the only driver of behavior. In Figure 1.6, the lines showing breastfeeding initiation rates for white and black mothers cross in the mid-1960s, with white mothers breastfeeding at higher rates thereafter. Figure 1.8 shows that the reversal in disparities for breastfeeding at least 6 months lagged that of initiation, occurring in the late 1960s. Additionally, Table 1.4 shows that, across every characteristic (race, education, age, and marital status), the groups associated with higher socioeconomic status (white, college-educated, older, and/or married) had higher rates of breastfeeding beginning in the 1960s. Table 1.5 shows that mothers with more education and older mothers had higher rates of breastfeeding at least 6 months beginning in the 1960s, and white mothers and married mothers had higher rates beginning in the 1970s. The competing influences of formula marketing and cultural shifts seem to have affected groups differently.

Differences across socioeconomic status in information diffusion during the 1960s and 1970s likely contributed to the changes in selection into breastfeeding. Education can be thought of as a proxy for information consumption, with higher-educated mothers being more likely to acquire relevant information first. In addition to the cultural shifts towards more natural parenting taking hold with the more highly-educated, the formula industry experienced a number of damaging scandals during this time. These scandals likely drew the attention of new parents in the 1970s, particularly those more informed, potentially altering their perceptions of the ethics of the formula industry and the safety of its products. Figure 1.7 and Figure 1.9 show breastfeeding rates by education level, and the divergence in breastfeeding rates begins around 1960. The highest-educated group reversed its downward trend first and much earlier than other groups. Mothers of other education levels did not reverse their downward trend until the early 1970s, and the rate of increase was lowest for mothers with less than a high school education.

To further explore the shifts in breastfeeding behavior, the next chapter decomposes the shifts into those due to changes in behavior versus characteristics (Baker 2016b). I find that changes in breastfeeding were primarily driven by changes in behavior rather than changes in characteristics, particularly during the early part of the time period studied. As behavioral changes sparked the reversal from bottle feeding back to breastfeeding, the government started WIC (1972), introducing a strong disincentive for breastfeeding for its participants. Indeed, those more likely to participate in the program, black mothers, mothers with lower education, younger mothers, and unmarried mothers, exhibited slower resurgence in the 1970s. Figure 1.6 and Figure 1.8 illustrate the substantial differences in the rates of increase in breastfeeding in the 1970s for white and black mothers.

The increase in rates stagnated in the 1980s for all groups with no notable changes in policy or other events that might influence breastfeeding. In the 1990s, breastfeeding was again in the spotlight with family-friendly policies and renewed recommendations from the AAP emphasizing the importance of breastfeeding. Interestingly, this surge differed from that in the 1970s in that it was the opposite groups who saw the most movement. Table 1.4 show larger increases for black compared to white mothers, lower educated compared to more educated mothers, and younger compared to older mothers during the 1990s. Figure 1.6 and Figure 1.8 show a coincidental surge in breastfeeding rates by black mothers, while white mothers exhibited only a steady increase. Figure 1.7 and Figure 1.9 show that, in the 1990s, mothers with the lowest educational level, those with less than a high school education, exhibited an increase that closes the gap such that their rates are similar to those mothers with a high school education. Large disparities still remain between black and white mothers and the lowest, middle, and highest educational groups, but the gaps were reduced during the 1990s and 2000s.

For breastfeeding duration, as measured by the rate breastfeeding at least 6 months, a similar pattern is evident, but the rate of increase is not equivalent across groups. Again, in the 1990s and 2000s, the gap widens even further for mothers with a college education as they exhibit another increase in rates. Mothers of higher socioeconomic status are more likely to be eligible for, and thus benefit from, family-friendly work programs, but most of the increase in rates happens among mothers of lower socioeconomic status. At the same time that family-friendly policies were introduced, several legislative changes were made to improve breastfeeding promotion in the WIC program. These changes may have contributed to the surge in rates among mothers of lower socioeconomic status.

1.6 Conclusion

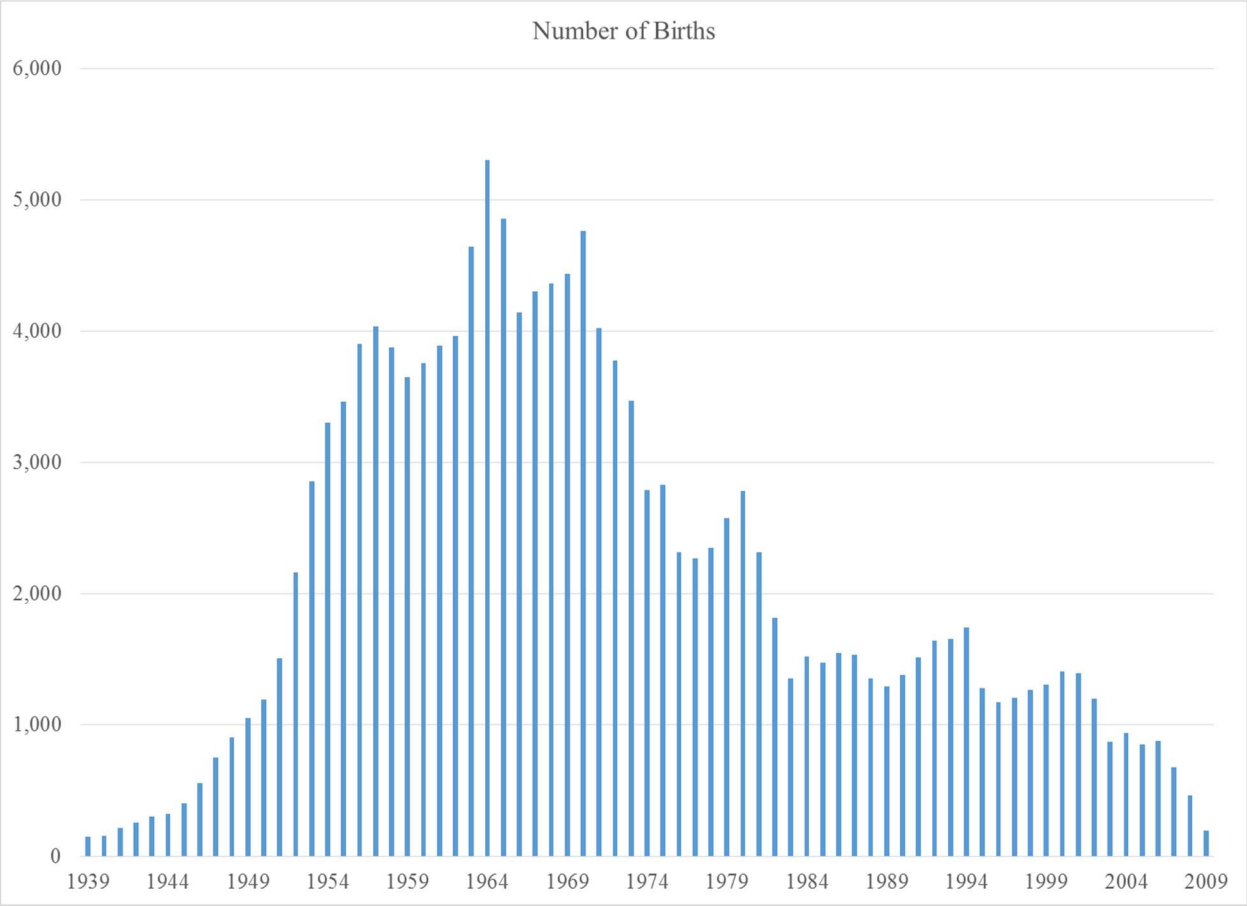
Breastfeeding policy in the U.S. is largely created in response to anecdotal evidence and recent experiences without the benefit of historical knowledge. This is mainly due to data limitations; however, the data set discussed in this paper finally will allow for more data-driven analyses of the evolution of breastfeeding, providing valuable context for current behaviors. By pooling data from a number of surveys, I create a data set that covers the mid-twentieth century up to the beginning of the twenty-first century, and, using survey weights, achieve a nationally-representative sample.

While researchers are aware of shifts in breastfeeding selection, this work provides statistical evidence that breastfeeding rates did shift, and describes how they shifted across demographic groups. The analysis shows large disparities in breastfeeding rates mid-century, but they are the exact opposite of the disparities we see today: then, black mothers, lower-educated mothers, and younger mothers breastfed at higher rates than white mothers, those with more education, and older mothers.

Policies coincidental with noteworthy shifts are highlighted and compel further investigation; namely, the rise of positive breastfeeding and negative formula feeding messages beginning in the late 1960s leading to the resurgence in breastfeeding. The introduction of WIC occurred during this information boom and likely muddled incentives for participants, hindering adoption of breastfeeding for demographic groups more likely to be represented. Another period of resurgence during the 1990s seems to have changed selection into breastfeeding. During this time, family-friendly hospital and workplace policies, along with increased breastfeeding promotion in the WIC program, seem to have helped lower socioeconomic mothers recover some of the ground they lost during the 1970s.

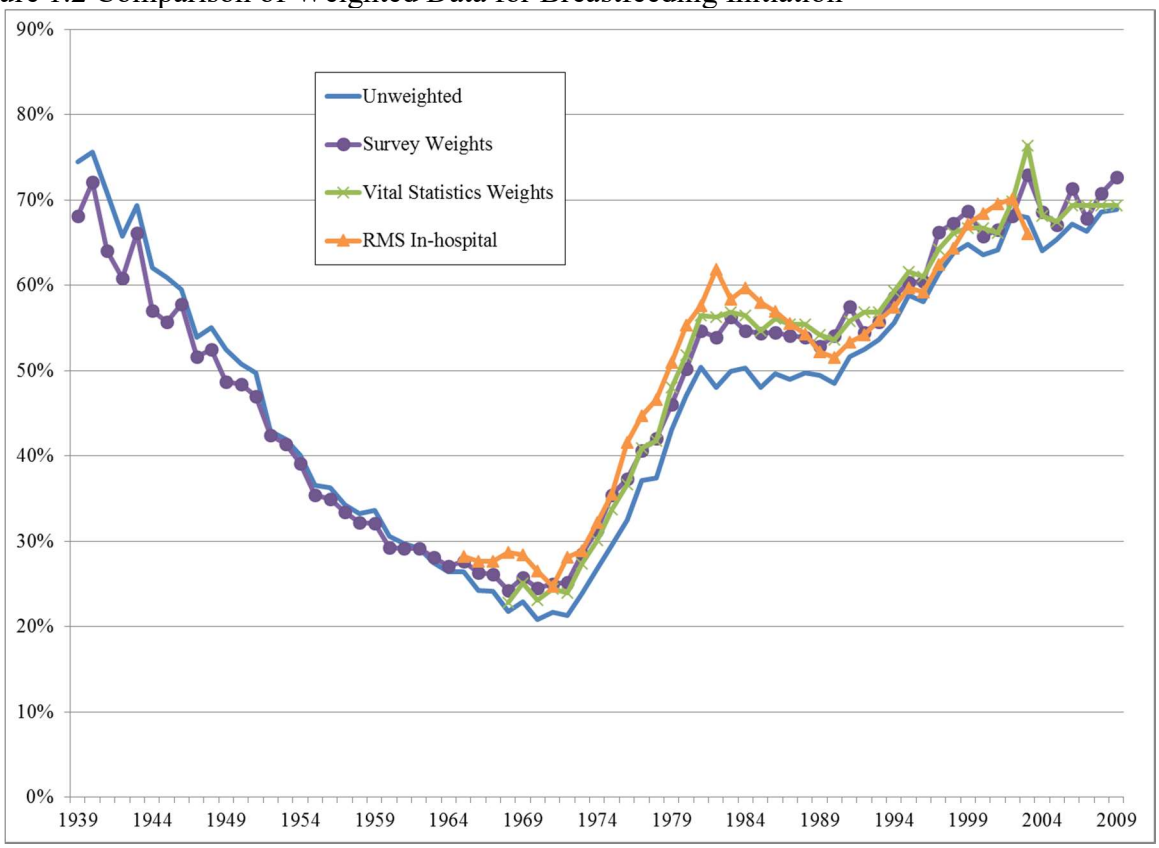
The historical events of the time period are well documented, but pairing the history with the data has not been done to date. Prior to this work, the only available continuous historical data were from a formula manufacturer survey, the details of which were not publicly available, preventing researchers from conducting thorough long-run analyses. Characterizing the shifts in breastfeeding rates in terms of selection and current events allows for better understanding of the potential impact of policies and cultural shifts on current rates. It is clear that selection into breastfeeding is complex, and often policies and programs shift behavior of some groups and not others. The creation of a historical data set enables researchers to investigate further the impacts of specific policies and programs on breastfeeding without being as limited by time horizon and demographic detail.

Figure 1.1 Number of Births in Each Year Covered by Pooled Sample



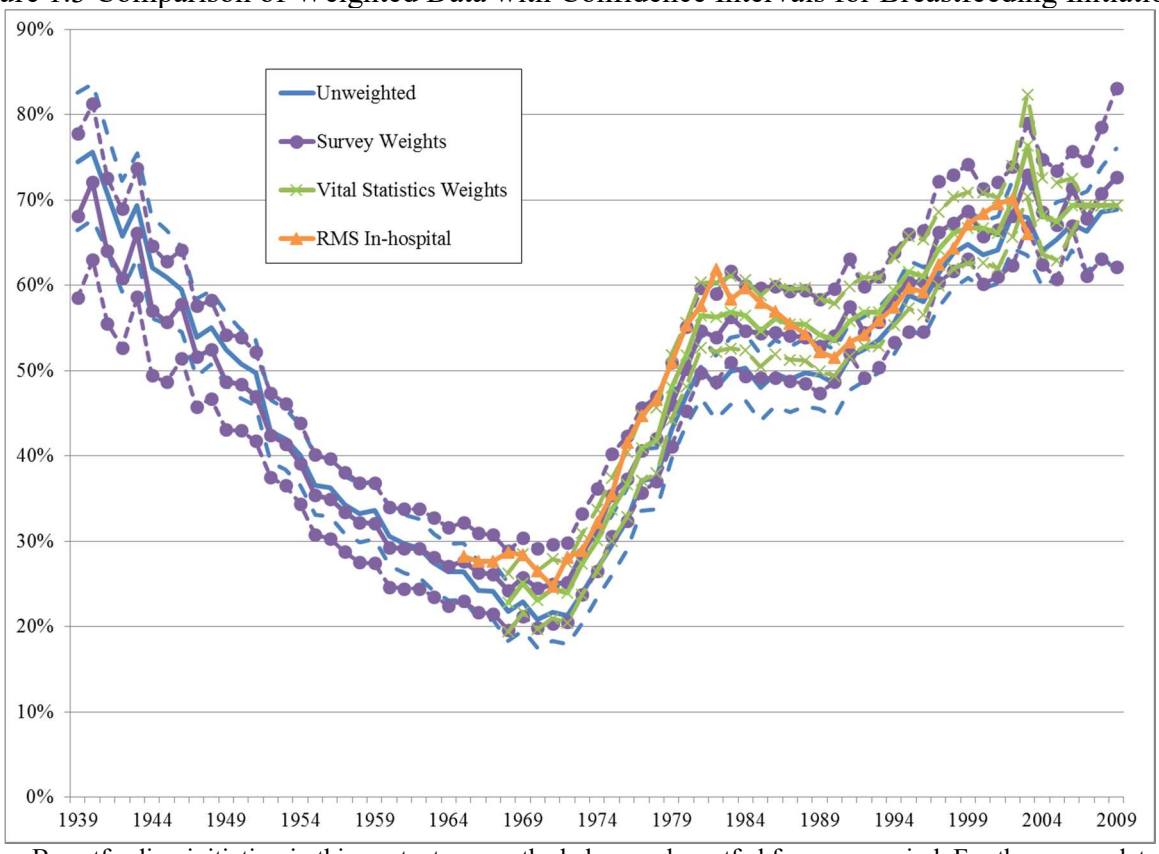
Note: Each bar represents the total number of observations or births (unweighted) in each year covered by the pooled sample.

Figure 1.2 Comparison of Weighted Data for Breastfeeding Initiation



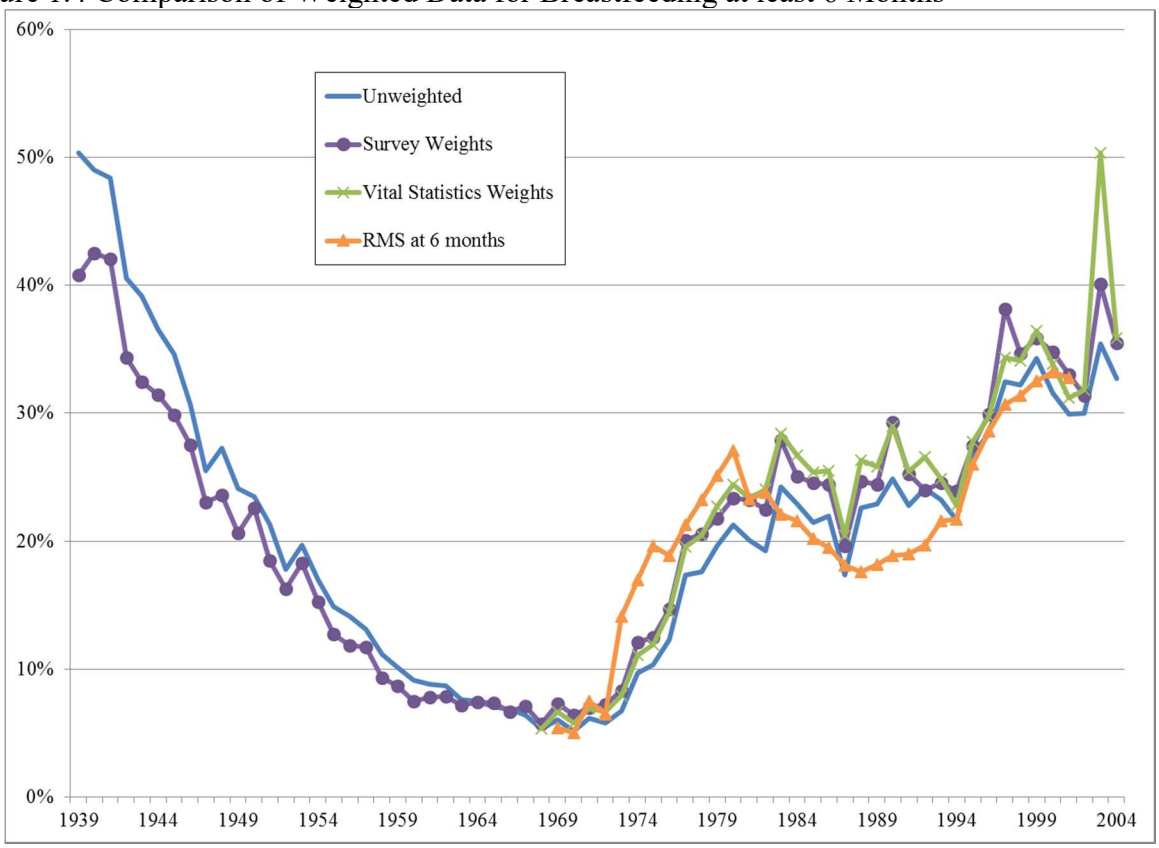
Notes: Breastfeeding initiation in this context means the baby was breastfed for some period. For the survey data this meant the mother answered yes to a question asking whether the child was ever breastfed. For the comparison survey, Ross Mothers' Survey, the question was whether the child was breastfed in the hospital. Each data point represents percent of single births where the infant was breastfed.

Figure 1.3 Comparison of Weighted Data with Confidence Intervals for Breastfeeding Initiation



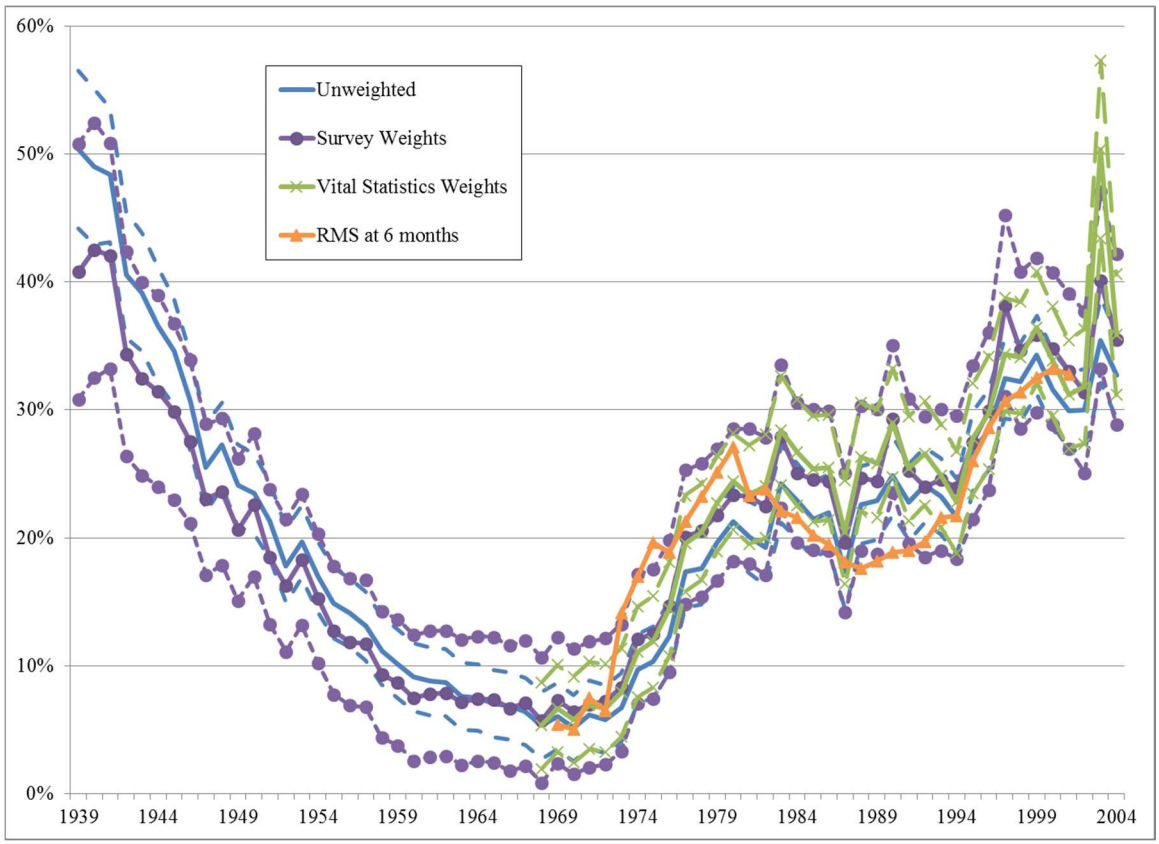
Notes: Breastfeeding initiation in this context means the baby was breastfed for some period. For the survey data this meant the mother answered yes to a question asking whether the child was ever breastfed. For the comparison survey, Ross Mothers' Survey, the question was whether the child was breastfed in the hospital. Each data point represents the percent of single births where the infant was breastfed. The dashed lines represent the 95 percent confidence intervals for these estimates.

Figure 1.4 Comparison of Weighted Data for Breastfeeding at least 6 Months



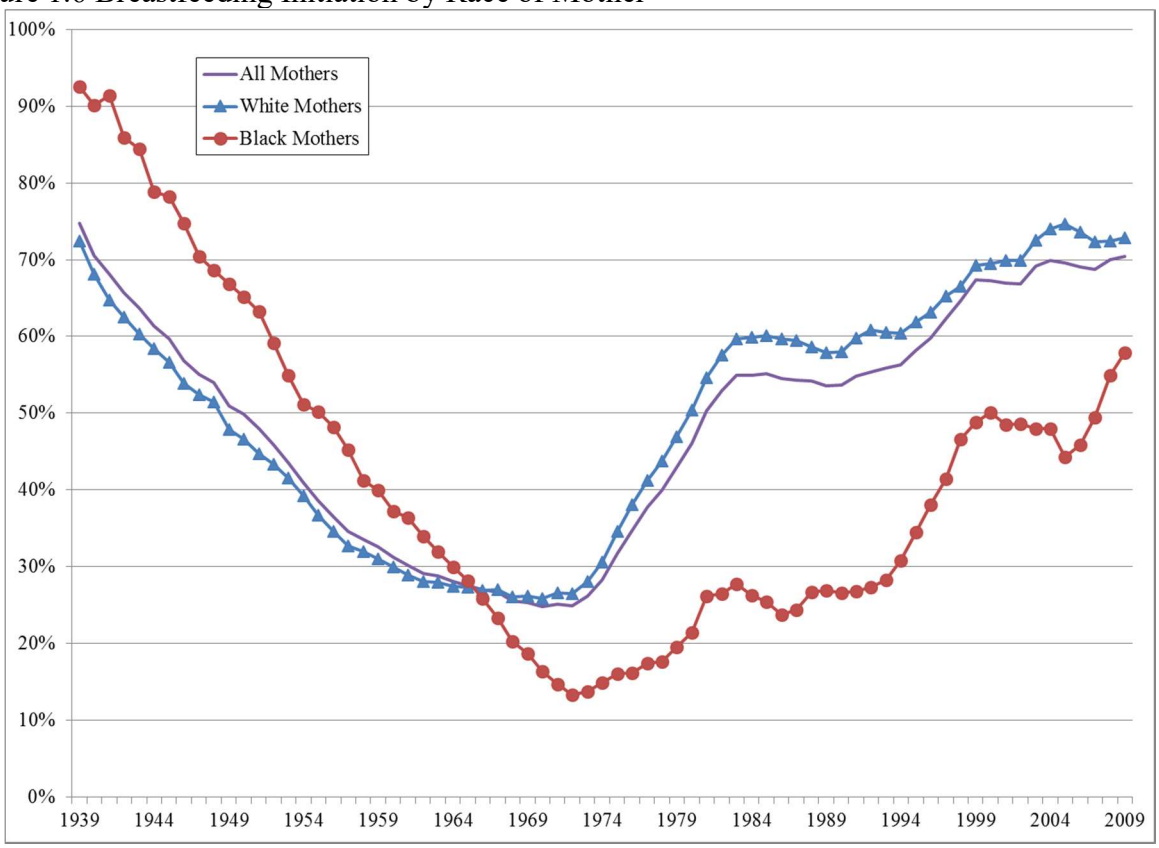
Notes: Breastfeeding at least 6 months in this context means the baby was breastfed for at least 6 months. For the survey data this meant the mother responded to a question asking how long the child was breastfed with an answer that was greater than or equal to 6 months. If her answer was measured in something other than months, e.g., days, weeks, or years, her answer was recalculated in months. These answers are not a measure of exclusive breastfeeding for at least 6 months as most surveys did not ask about breastfeeding exclusivity. Therefore, the babies may have received other food or formula in addition to breastmilk. Each data point represents the percent of single births where the infant was breastfed at least 6 months.

Figure 1.5 Comparison of Weighted Data with Confidence Intervals for Breastfeeding at least 6 Months



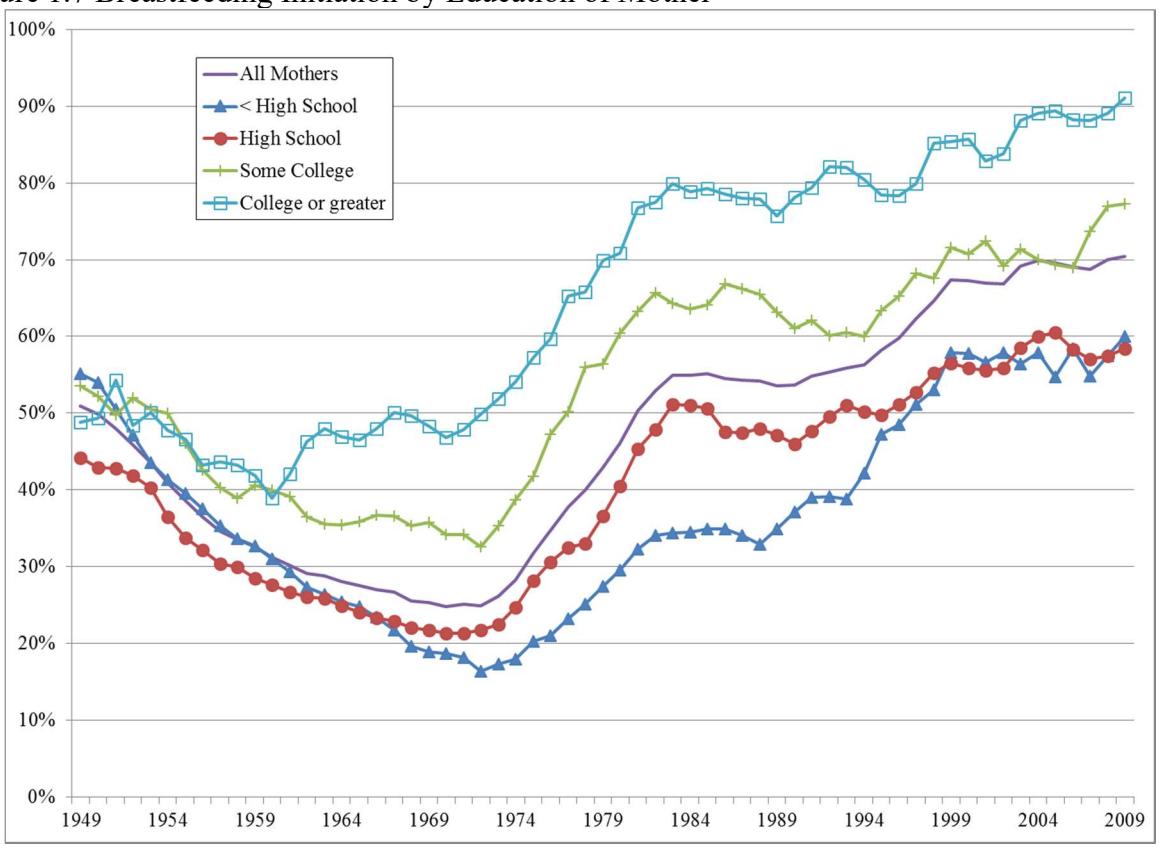
Notes: Breastfeeding at least 6 months in this context means the baby was breastfed for at least 6 months. For the survey data this meant the mother responded to a question asking how long the child was breastfed with an answer that was greater than or equal to 6 months. If her answer was measured in something other than months, e.g., days, weeks, or years, her answer was recalculated in months. These answers are not a measure of exclusive breastfeeding for at least 6 months as most surveys did not ask about breastfeeding exclusivity. Therefore, the babies may have received other food or formula in addition to breastmilk. Each data point represents the percent of single births where the infant was breastfed at least 6 months. The dashed lines represent the 95 percent confidence intervals for these estimates.

Figure 1.6 Breastfeeding Initiation by Race of Mother



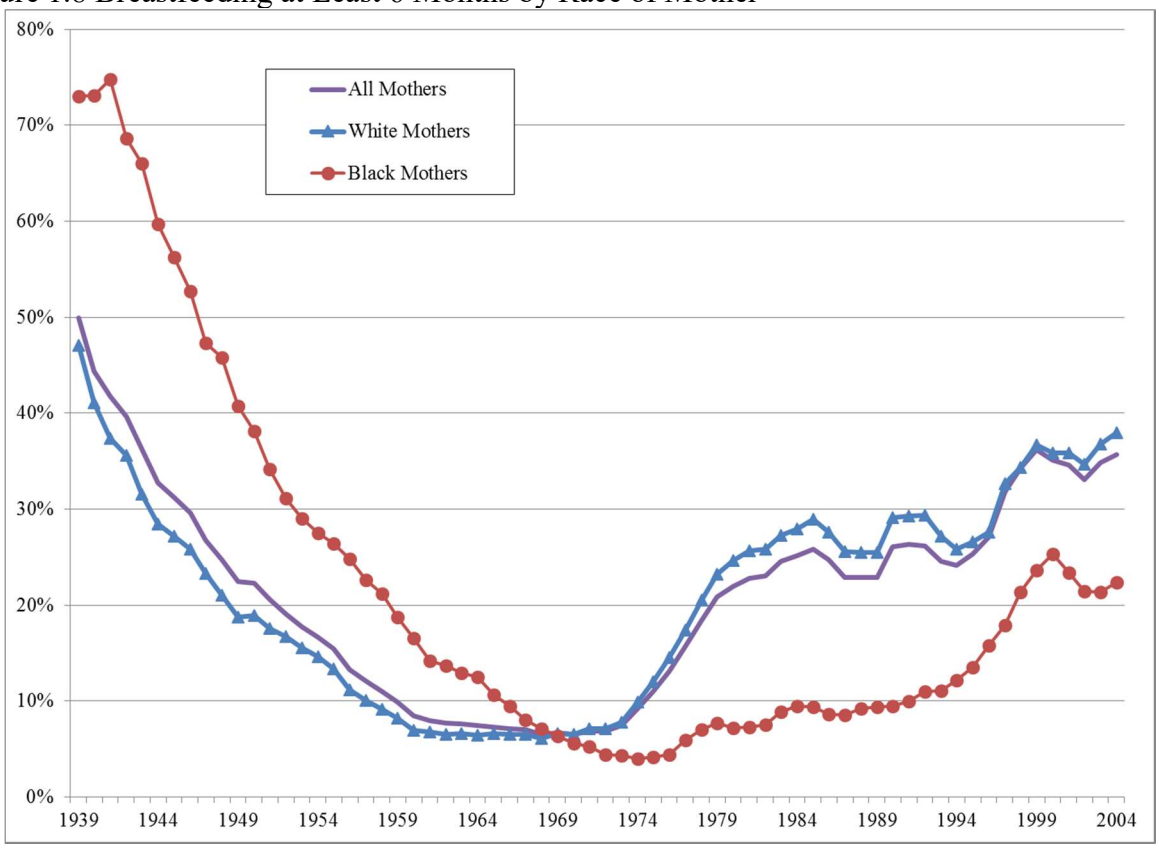
Notes: Data shown are a 3 year moving average of actual annual rates. Breastfeeding initiation in this context means the baby was breastfed for some period. For the survey data this meant the mother answered yes to a question asking whether the child was ever breastfed. Each data point represents the percent of single births where the infant was breastfed. Data for this figure can be found in the Appendix Table A1.1.

Figure 1.7 Breastfeeding Initiation by Education of Mother



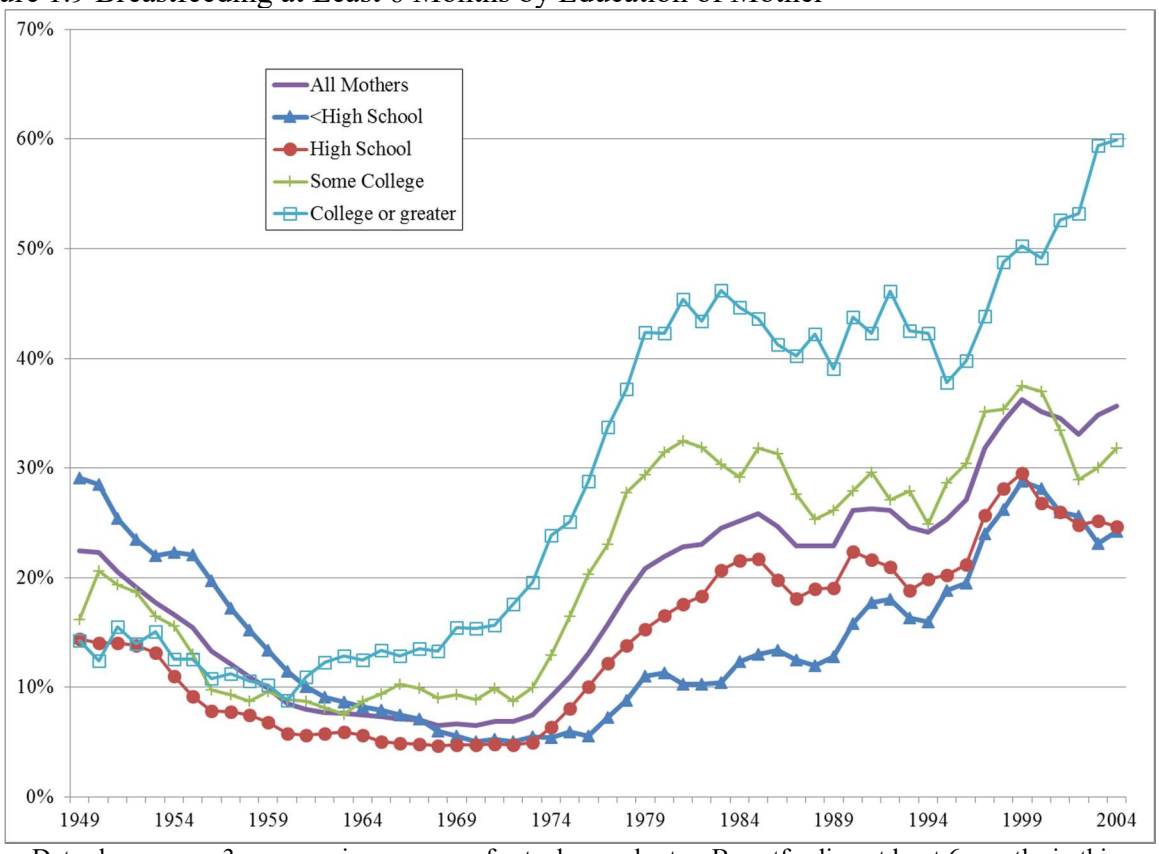
Notes: Data shown are a 3 year moving average of actual annual rates. Breastfeeding initiation in this context means the baby was breastfed for some period. For the survey data this meant the mother answered yes to a question asking whether the child was ever breastfed. Each data point represents the percent of single births where the infant was breastfed. Data for this figure can be found in the Appendix Table A1.1.

Figure 1.8 Breastfeeding at Least 6 Months by Race of Mother



Notes: Data shown are a 3 year moving average of actual annual rates. Breastfeeding at least 6 months in this context means the baby was breastfed for at least 6 months. For the survey data this meant the mother responded to a question asking how long the child was breastfed with an answer that was greater than or equal to 6 months. If her answer was measured in something other than months, e.g., days, weeks, or years, her answer was recalculated in months. These answers are not a measure of exclusive breastfeeding for at least 6 months as most surveys did not ask about breastfeeding exclusivity. Therefore, the babies may have received other food or formula in addition to breastmilk. Each data point represents the percent of single births where the infant was breastfed at least 6 months. Data for this figure can be found in the Appendix Table A1.2.

Figure 1.9 Breastfeeding at Least 6 Months by Education of Mother



Notes: Data shown are a 3 year moving average of actual annual rates. Breastfeeding at least 6 months in this context means the baby was breastfed for at least 6 months. For the survey data this meant the mother responded to a question asking how long the child was breastfed with an answer that was greater than or equal to 6 months. If her answer was measured in something other than months, e.g., days, weeks, or years, her answer was recalculated in months. These answers are not a measure of exclusive breastfeeding for at least 6 months as most surveys did not ask about breastfeeding exclusivity. Therefore, the babies may have received other food or formula in addition to breastmilk. Each data point represents the percent of single births where the infant was breastfed at least 6 months. Data for this figure can be found in the Appendix Table A1.2.

Table 1.1 Description of Surveys Used

Name of Survey	Year(s) of Survey	Years of Births Covered	Description of Survey
NHES	1963-1965	1951-1959	national survey of children 6-11 years old; purpose was to assess the health and nutritional status of children in the U.S.
NFS	1965, 1970	1923-1971	national survey of currently married women living with their husbands born after July 1, 1910 and no older than 55 (1965) and ever-married women born after July 1, 1925 (1970); purpose was to examine marital fertility and family planning in the U.S.
NHANES	1971-1975, 1976-1980	1959-1980	national survey of people 1-74 years old (1971-75), 6 months-74 years old (1976-80); purpose was to assess the health and nutritional status of adults and children in the U.S.
NSFG	1973, 1976, 1982, 1988, 1995, 2002, 2006-2010	1941-2010	national survey of women 15-44 years old who were married, previously married, or never married but with children living with them (1973, 1976), regardless of marital status (1982, 1988, 1995), men and women 15-44 years old regardless of marital status (2002, 2006-10); purpose was to collect data on factors affecting pregnancy and women's health in the U.S.
NHIS	1981	1963-1981	national survey of households; Child Health Supplement covered children in household 0-17 years old (one child selected per family member; 2 children was the maximum per household)

Notes: The relevant variables for NFS and NSFG have been harmonized in the Integrated Fertility Survey Series (IFSS). Variables from the other surveys were recoded to be comparable to those in IFSS.

Table 1.2 Descriptive Statistics from Entire Pooled Sample, unweighted births 1939-2009

	Ever Breastfed	%	Never Breastfed	%	Total
# births	56,523	*37.8%*	93,102	*62.2%*	149,625
# mothers					74,696
Race of mother					
White	39,404	*40.3%*	58,350	*59.7%*	97,754
Black	13,784	*30.2%*	31,842	*69.8%*	45,626
Education of mother					
less than high school	17,763	*33.3%*	35,649	*66.7%*	53,412
high school	17,875	*31.5%*	38,850	*68.5%*	56,725
some college	11,322	*48.5%*	12,027	*51.5%*	23,349
college or greater	9,311	*62.3%*	5,624	*37.7%*	14,935
Mother's age at birth					
Teenager	9,887	*32.5%*	20,574	*67.5%*	30,461
20s	35,860	*37.8%*	58,969	*62.2%*	94,829
30+	10,690	*44.6%*	13,281	*55.4%*	23,971
Mother's marital status					
Married	43,499	*39.8%*	65,930	*60.2%*	109,429
Never married, divorced, widowed	8,700	*34.0%*	16,862	*66.0%*	25,562
Parity					
Firstborn	24,352	*42.0%*	33,650	*58.0%*	58,002
Not firstborn	32,171	*35.1%*	59,452	*64.9%*	91,623

Notes: Each observation in the sample is given equal weight for the purposes of this table.

Table 1.3 Timeline of Breastfeeding/Infant Formula Related Events

Date	Event
1920s	Introduction of proprietary formulas; most parents used evaporated milk because it was easier and affordable (Schuman 2003)
1942	Nutramigen formula introduced (Schuman 2003)
1950s	Commercial formulas more accepted (Schuman 2003)
1951	Ross Laboratories' Similac concentrate formula introduced (Schuman 2003)
1956	La Leche League International started to promote and support breastfeeding (LLLI 2012)
1959	Mead Johnson's Enfamil formula introduced; Similac with iron first marketed (Schuman 2003)
1960s	Commercial formula first used in hospitals (earlier hospitals had on-site labs to prepare formula in-house); hospitals given free samples (Schuman 2003)

Date	Event
1960	Lamaze International formed as a not-for-profit organization aimed to teach as many women as possible about the Lamaze method for childbirth (Lamaze 2014)
1967	AAP Committee on Nutrition's first recommendations for vitamin and mineral levels for formula (Schuman 2003)
1969	AAP Committee on Nutrition endorses iron-fortified infant formula (Schuman 2003)
July 16, 1971	Princess Grace speaks at LLLI (LLLI 2012)
September 26, 1972	WIC formally authorized (USDA 2015)
November 13, 1972	Connecticut study finds lead in infant formula (Lamm and Rosen 1974)
May 16, 1973	New York state finds lead in baby food cans (Lamm and Rosen 1974)
August 1973	New Internationalist publishes "Baby Food Tragedy" (Dobbing 1988)
September 1973	Consumers Union charges that its tests showed high levels of lead in 6 major evaporated milk brands (Blumenthal 1973)
March 1974	War on Want publishes "The Baby Killer" (Dobbing 1988)
June 1974	Nestle sues for libel (Chetley 1986)
December 1974	ICCR member groups began filing shareholder resolutions with U.S. manufacturers of infant formula (Chetley 1986)
March 7, 1975	Four companies (Abbott & Ross Labs, Bristol-Myers & Mead Johnson) charged in anti-trust law suit for monopolizing nation's production and sale of infant formulas (Chetley 1986)
July 1975	Film "Bottle Babies" is released (Lorber and Cornelius 1982)
October 7, 1975	WIC made permanent program (USDA 2015)
Spring 1976	The Sisters of the Precious Blood, an order of Catholic nuns, file lawsuit against Bristol-Myers for misleading shareholders (Chetley 1986)
Week of June 7, 1976	ABC/Abbott Labs film, "The Unfinished Child," on infants airs (Brown 1976)
June 24, 1976	Nestle wins its libel suit (Chetley 1986)
July 1977	Nestle boycott begins (Chetley 1986)
May 1978	U.S. Senate hearings (Chetley 1986)
July 1978	CBS documentary "Into the Mouths of Babes" (Fazal and Holla 2014)
1978-1979	141 U.S. infants became seriously ill as a result of using soy-based formulas sold with an insufficient amount of chloride (Schuman 2003)
September 1980	U.S. Congress passes Infant Formula Act of 1980 (Carter 1980)
May 1981	WHO adopts International Code of Marketing of Breast-milk Substitutes (WHO 2014)
1989	WIC increased emphases on breastfeeding promotion (USDA 2015)
1991	The Baby-Friendly Hospital Initiative (BFHI) started by the World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) (WHO 2014)
1991	Medela introduces first retail, mass-market breast pump (Lepore 2009)
1992	U.S. Secretary of Agriculture required to establish national breastfeeding promotion program (USDA 2015)

Date	Event
February 5, 1993	U.S. Congress passes Family and Medical Leave Act of 1993 (FMLA) (DOL 2014)
1994/1996	Funding and reporting requirements for WIC breastfeeding promotion revised (USDA 2015)
December 1997	AAP issues recommendations on breastfeeding (AAP 1997)
December 1998	First state (Minnesota) passes workplace lactation support (NCSL 2011)
1998	WIC agencies allowed to use food funds for breast pump purchases or rentals (USDA 2015)

Table 1.4 Breastfeeding Initiation by Decade

By Mother's Characteristics	1940s	1950s	1960s	1970s	1980s	1990s	2000s
Race							
White	52.2	35.0	27.1	34.5	58.3	63.4	72.1
Black	71.0	46.8	26.2	15.8	26.2	36.2	49.3
Education							
<12 years	58.5	37.9	23.6	20.5	34.3	46.8	57.3
12 years	48.6	32.5	23.8	27.3	48.1	51.7	57.5
Some college	56.8	43.7	36.1	43.5	64.9	64.8	71.1
College grad	56.3	44.1	47.3	58.4	77.8	82.0	87.0
Age							
<20	61.4	42.1	25.2	22.0	30.6	44.5	54.4
20-29	53.2	35.8	27.7	34.0	54.8	58.3	66.3
30+	47.4	34.5	27.4	35.6	66.2	71.8	76.2
Marital Status							
Married	54.9	36.7	27.7	34.3	59.6	66.6	75.8
Never married/separated/divorced	58.4	38.3	25.4	27.4	46.2	53.9	62.0

Notes: Breastfeeding initiation in this context means the baby was breastfed for some period. In other words, the mother answered yes to a question asking whether the child was ever breastfed. Each cell reflects the percent of single births where the infant was breastfed for some period. Each decade includes births for all years 19X0-19X9, weighted using survey weights.

Table 1.5 Breastfeeding Duration (breastfed at least 6 months) by Decade

By Mother's Characteristics	1940s	1950s	1960s	1970s	1980s	1990s	2000s
Race							
White	23.1	11.3	6.5	12.8	26.6	30.4	34.2
Black	47.1	23.7	9.9	5.1	8.6	15.4	20.2
Education							
<12 years	34.1	18.5	7.5	6.6	11.9	20.7	23.2
12 years	17.4	8.7	5.2	8.4	19.5	22.7	23.3
Some college	16.8	11.5	9.2	17.7	30.0	31.2	29.1
College grad	17.9	11.3	13.5	27.6	42.4	45.2	53.3
Age							
<20	30.1	14.9	5.6	5.6	9.5	16.2	18.3
20-29	25.0	11.6	7.1	12.8	23.7	27.3	27.7
30+	26.5	20.1	8.9	15.6	34.9	39.4	44.0
Marital Status							
Married	26.5	12.9	7.1	12.8	27.3	33.3	39.0
Never married/separated/divorced	31.7	15.3	7.6	9.9	20.6	23.2	27.8

Notes: Breastfeeding at least 6 months in this context means the baby was breastfed for at least 6 months. For the survey data this meant the mother responded to a question asking how long the child was breastfed with an answer that was greater than or equal to 6 months. If her answer was measured in something other than months, e.g., days, weeks, or years, her answer was recalculated in months. These answers are not a measure of exclusive breastfeeding for at least 6 months as most surveys did not ask about breastfeeding exclusivity. Therefore, the babies may have received other food or formula in addition to breastmilk. Each cell reflects the percentage of single births where the infant was breastfed at least 6 months. Each decade includes births for all years 19X0-19X9, weighted using survey weights.

Appendix Table A1.1 Breastfeeding Initiation Rates

Year	All	Race of Mother		Education of Mother			
		White	Black	Less than High School	High School	Some College	College or More
1939	68.2	64.7	92.1				
1940	72.1	70.6	85.0				
1941	64.0	59.0	97.1				
1942	60.8	58.1	75.8				
1943	66.2	63.7	80.6				
1944	57.0	53.3	80.3				
1945	55.7	52.7	73.8				
1946	57.8	55.6	70.0				
1947	51.7	49.1	67.6				
1948	52.5	49.7	68.4				
1949	48.7	44.9	64.4	52.4	41.7	47.3	62.8
1950	48.4	45.2	62.7	52.1	41.5	53.9	45.3
1951	47.0	44.1	62.6	46.9	45.4	48.0	54.9
1952	42.4	40.6	52.0	42.3	38.7	54.0	45.1
1953	41.3	39.8	50.2	41.4	36.8	49.6	50.2
1954	39.1	37.2	51.3	40.2	34.1	46.2	48.0
1955	35.4	33.0	48.9	37.2	30.4	42.6	41.6
1956	35.0	33.4	44.4	35.4	32.2	39.1	40.1
1957	33.4	31.6	42.4	33.5	28.6	39.2	49.4
1958	32.2	31.1	37.1	32.1	29.1	38.6	40.2
1959	32.1	30.3	40.4	32.5	27.8	44.0	36.1
1960	29.3	28.5	34.1	28.4	26.0	37.3	40.4
1961	29.1	28.0	34.7	27.1	26.2	36.2	49.7
1962	29.1	27.9	33.2	26.6	25.9	36.0	48.9
1963	28.1	27.9	28.0	25.5	25.4	34.5	45.3
1964	27.0	26.7	28.8	24.2	23.5	35.8	46.6
1965	27.6	27.3	27.7	24.7	23.4	37.4	47.8
1966	26.3	26.8	21.0	21.3	23.0	36.9	49.5
1967	26.1	26.9	21.3	19.1	22.3	35.6	52.9
1968	24.2	24.6	18.5	18.6	20.9	33.6	46.6
1969	25.8	27.1	16.4	19.0	22.1	38.2	45.4
1970	24.5	26.0	14.3	18.6	20.9	30.8	48.6
1971	25.0	26.9	13.3	17.0	21.1	33.5	49.6
1972	25.2	26.8	12.5	13.6	23.2	33.4	51.6
1973	28.5	30.7	15.6	21.5	23.4	39.0	54.7
1974	31.3	34.4	16.6	19.0	27.7	43.7	56.0
1975	35.4	38.8	16.1	20.5	33.6	42.7	61.2
1976	37.3	41.2	15.8	23.5	30.4	55.2	61.7
1977	40.6	43.9	20.5	25.6	33.7	52.8	72.8
1978	42.0	46.3	16.7	26.4	35.0	60.0	62.9
1979	46.0	50.6	21.4	30.4	41.1	56.5	73.9
1980	50.2	54.3	26.1	31.9	45.4	65.0	75.8
1981	54.7	59.0	30.9	34.6	49.6	68.4	80.4
1982	53.9	59.3	22.6	35.7	48.6	63.7	76.2
1983	56.3	60.7	29.9	32.9	55.3	60.9	83.2

Year	All	Race of Mother		Education of Mother			
		White	Black	Less than High School	High School	Some College	College or More
1984	54.6	59.8	26.2	34.9	49.3	66.1	77.0
1985	54.4	59.9	20.3	36.8	47.3	65.4	77.6
1986	54.5	59.4	24.8	33.2	45.9	69.1	81.0
1987	54.1	59.1	28.1	32.3	49.3	64.3	75.6
1988	53.9	57.4	27.3	33.4	48.9	63.0	77.1
1989	52.9	57.4	25.2	39.0	43.4	62.0	74.6
1990	54.1	59.4	27.2	39.0	45.6	58.2	82.8
1991	57.5	62.7	28.1	39.0	54.1	66.2	80.9
1992	54.5	60.3	26.7	39.4	49.1	56.0	82.6
1993	55.7	58.5	30.2	38.1	50.0	59.3	82.6
1994	58.6	62.5	35.6	49.2	51.5	64.7	76.3
1995	60.3	64.8	37.7	54.5	48.0	66.2	76.5
1996	60.5	62.2	41.1	41.9	53.8	64.8	82.2
1997	66.3	68.9	45.4	57.1	56.4	73.5	80.9
1998	67.3	68.4	53.3	60.1	55.4	64.4	92.4
1999	68.7	70.4	47.9	56.4	57.9	76.7	82.8
2000	65.7	69.6	49.1	57.0	54.3	71.2	81.8
2001	66.5	69.5	48.4	56.6	54.5	69.3	84.0
2002	68.1	70.4	48.3	59.9	58.9	67.1	85.8
2003	72.9	77.8	47.3	52.7	62.1	77.7	94.4
2004	68.6	73.7	48.3	61.1	59.0	65.3	87.0
2005	67.1	72.5	37.3	50.5	60.5	65.3	86.8
2006	71.3	74.7	52.0	63.8	55.5	76.5	91.0
2007	67.9	69.8	59.1	50.3	55.2	79.5	86.5
2008	70.8	72.8	53.9	58.1	61.7	75.0	89.6
2009	72.7	75.8	60.9	71.6	58.4	77.3	97.2

Notes: These are the underlying data for Figures 1.2, 1.4, and 1.6. All data in the table were weighted using survey weights as described in Section 1.4. Breastfeeding initiation in this context means the baby was breastfed for some period. For the survey data this meant the mother answered yes to a question asking whether the child was ever breastfed. For the comparison survey, Ross Mothers' Survey, the question was whether the child was breastfed in the hospital. Each data point represents the percent of single births where the infant was breastfed.

Appendix Table A1.2 Rates of Breastfeeding at least 6 Months

Year	All	Race of Mother		Education of Mother			
		White	Black	Less than High School	High School	Some College	College or More
1939	40.8	36.1	76.7				
1940	42.5	39.8	69.9				
1941	42.1	36.3	77.7				
1942	34.4	30.7	58.3				
1943	32.4	27.6	62.1				
1944	31.5	27.0	58.6				
1945	29.8	27.0	48.0				
1946	27.5	23.5	51.6				
1947	23.0	19.5	42.5				
1948	23.6	20.1	43.3				
1949	20.6	16.7	36.4	26.0	13.3	18.8	14.5
1950	22.6	19.9	34.7	28.5	14.1	23.8	12.1
1951	18.5	16.1	31.4	21.7	14.7	15.5	20.0
1952	16.3	14.2	27.4	20.2	12.7	16.9	9.9
1953	18.3	16.3	28.2	24.2	12.0	17.1	15.3
1954	15.3	13.3	26.9	22.6	8.3	12.9	12.4
1955	12.8	10.4	24.0	19.4	7.3	9.0	10.0
1956	11.9	9.9	23.6	17.2	7.9	7.3	9.8
1957	11.7	10.0	20.4	15.1	8.1	11.7	14.0
1958	9.3	7.5	19.5	13.4	6.5	7.1	7.9
1959	8.7	7.2	16.2	11.6	5.9	10.0	8.8
1960	7.5	6.2	14.0	9.4	5.0	9.5	9.7
1961	7.8	7.0	12.4	9.2	6.0	6.8	14.3
1962	7.8	6.4	14.6	8.7	6.4	8.0	12.7
1963	7.1	6.4	11.8	8.1	5.3	7.8	11.6
1964	7.4	6.7	11.0	7.9	5.2	10.5	13.2
1965	7.3	6.7	9.2	7.9	4.6	9.8	15.5
1966	6.7	6.1	8.2	6.8	4.9	10.5	10.0
1967	7.1	6.8	6.9	6.6	4.9	9.4	15.1
1968	5.7	5.4	6.3	4.7	4.2	7.1	14.7
1969	7.3	7.5	5.9	5.3	5.2	11.6	16.6
1970	6.4	6.6	4.6	5.0	4.8	8.0	15.0
1971	7.0	7.2	5.3	5.5	4.6	10.3	15.5
1972	7.2	7.5	3.5	4.5	4.9	8.0	22.2
1973	8.3	8.8	4.2	6.5	5.5	11.7	21.1
1974	12.1	13.3	4.5	5.4	8.8	19.2	28.3
1975	12.5	13.8	3.8	6.0	9.9	18.7	26.0
1976	14.7	16.5	5.0	5.3	11.5	23.0	32.2
1977	20.1	21.9	9.2	10.5	15.2	27.4	43.1
1978	20.6	23.3	7.1	10.8	14.9	32.9	36.3
1979	21.8	24.5	6.8	11.8	15.8	27.9	47.7
1980	23.4	26.1	7.7	11.4	19.1	33.6	43.0
1981	23.2	26.3	7.2	7.6	17.9	36.0	45.6
1982	22.5	25.0	7.7	11.8	18.1	26.1	41.6
1983	27.9	30.4	11.8	11.9	26.1	28.9	51.4

Year	All	Race of Mother		Education of Mother			
		White	Black	Less than High School	High School	Some College	College or More
1984	25.1	28.4	8.8	13.3	20.5	32.6	40.9
1985	24.6	27.9	7.7	13.9	18.5	34.1	38.5
1986	24.5	26.4	9.3	13.0	20.4	27.2	44.4
1987	19.6	22.4	8.6	10.8	15.4	21.4	37.8
1988	24.7	27.5	9.7	12.1	21.2	27.3	44.3
1989	24.4	26.5	9.7	15.6	20.6	29.7	35.0
1990	29.3	33.4	8.9	19.7	25.2	26.7	52.0
1991	25.2	27.9	11.4	17.9	19.1	32.5	39.8
1992	24.0	26.7	12.7	16.6	18.8	22.1	46.5
1993	24.5	26.8	9.1	14.5	18.6	29.2	41.1
1994	23.9	24.0	14.9	16.9	22.1	23.4	39.2
1995	27.5	29.1	16.6	25.0	20.0	33.3	33.0
1996	29.9	29.7	15.9	16.5	21.6	34.6	47.3
1997	38.1	39.1	21.3	30.5	35.4	37.6	51.4
1998	34.7	34.1	26.9	31.5	27.4	33.9	47.6
1999	35.9	36.9	22.7	24.3	25.8	41.0	51.7
2000	34.8	36.7	26.4	28.5	27.4	36.0	48.1
2001	33.1	34.1	21.1	25.1	24.9	23.2	57.9
2002	31.4	33.3	16.8	23.3	22.1	27.7	53.5
2003	40.1	42.8	26.1	20.9	28.5	39.2	66.7
2004	35.5	37.7	24.2	28.5	23.6	28.6	59.5

Notes: These are the underlying data for Figures 1.3, 1.5, and 1.7. All data in the table were weighted using survey weights as described in Section 1.4. Breastfeeding at least 6 months in this context means the baby was breastfed for at least 6 months. For the survey data this meant the mother responded to a question asking how long the child was breastfed with an answer that was greater than or equal to 6 months. If her answer was measured in something other than months, e.g., days, weeks, or years, her answer was recalculated in months. These answers are not a measure of exclusive breastfeeding for at least 6 months as most surveys did not ask about breastfeeding exclusivity. Therefore, the babies may have received other food or formula in addition to breastmilk. Each data point represents the percent of single births where the infant was breastfed at least 6 months.

Chapter 2: Breastfeeding Disparities in the United States: Understanding the Role of Changes in Behavior

2.1 Introduction

The percentage of infants born in the U.S. in 2013 that were ever breastfed was over 80 percent (CDC 2016). Without context, this statistic is not informative. The twentieth century witnessed dramatic changes and advances in infant feeding technology, medical understanding, policy, culture, and parenting preferences. Breastfeeding rates shifted drastically over this time period (see Figures 2.1 and 2.2). Breastfeeding was declining by the mid-twentieth century, if not earlier, and the percentage of infants ever breastfed reached a low point in the early 1970s of around 20 percent, rising sharply throughout the 1970s, and then leveling off in the 1980s and rising again in the 1990s (Baker 2016a). Breastfeeding initiation rates today are remarkably high given the low just over 40 years ago, but these trends and statistics mask the large disparities among minorities and across socioeconomic groups. The differences in the percentage of mothers breastfeeding is around 20 percentage points comparing white and Hispanic mothers to black mothers, college graduates to high school graduates, married mothers to unmarried mothers, and those well above to those below the poverty line (CDC 2016).[10] Those groups with the higher rates are close to or exceeding the ever breastfeeding objectives of Healthy People 2020, and hence the

[10] Details of the percentages by socioeconomic characteristics: 84.3% of white mothers and 83.0% of Hispanic mothers breastfeed, but only 66.3% of black mothers breastfeed. 92.2% of college graduates breastfeed, whereas 69.3% of high school graduates do. Married mothers breastfeed at 88.4%, but unmarried mothers at only 69.5%. Those with a poverty income ratio greater than 600 breastfeed at 91.7%, while only 72.8% of those with a ratio less than 100 breastfeed (CDC 2016).

groups with lower rates are far from meeting these same objectives.[11] Current medical initiatives advocate that "breast is best" because medical research suggests that breastfeeding lowers the risk of disease and illness, as well as increases cognitive outcomes early in life. Medical organizations, such as the American Academy of Pediatrics (AAP), stress that "infant feeding should not be considered as a lifestyle choice but rather as a basic health issue" (Eidelman et al. 2012). The AAP's most recent policy statement on breastfeeding "reaffirms its recommendation of exclusive breastfeeding for about 6 months … with continuation of breastfeeding for 1 year or longer" based on "the documented short- and long-term medical and neurodevelopmental advantages of breastfeeding" (Eidelman et al. 2012). Understanding the drivers of the disparities is crucial to formulating effective policies aimed at increasing rates and eliminating such disparities. Economists have linked better health in early life to better health and economic outcomes later in life (Almond and Currie 2011). Thus, if the medical research is correct, disparities in breastfeeding rates could lead not only to short-term disparities in infant health and development, but also long-term disparities in health and economic outcomes. While the evidence for "breast is best" is largely based on observational studies, it drives the considerable effort and expense put forth in breastfeeding promotion.

Many current health policies and programs emphasize the importance of breastfeeding and target increased rates and duration, and elimination of disparities. Healthy People 2020 includes goals for increased breastfeeding rates and duration in the U.S., and the Baby-friendly Hospital Initiative recognizes hospitals that are supportive of breastfeeding (HHS 2012 and WHO 2014).

[11] Healthy People 2020 is an initiative of the Department of Health and Human Services launched in December 2010 to provide "science-based, 10-year national objectives for improving the health of all Americans." Among its numerous objectives are targets for increasing the proportion of infants who are breastfed (ever, at 6 months, at 1 year, and exclusively at 3 and 6 months), as well as reducing formula supplementation for newborns, increasing "the proportion of live births that occur at facilities that provide recommended care for lactating mothers and their babies," and increasing "the proportion of employers that have worksite lactation support programs" (HHS 2012).

Furthermore, the Patient Protection and Affordable Care Act and the Reconciliation Act of 2010 included requirements for U.S. employers to provide support for breastfeeding employees and insurers to cover breastfeeding supplies and support (DOL 2014). The IRS has reversed its stance to now include breast pumps and associated accessories as eligible medical expenses for tax breaks, and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) provides breastfeeding participants with education and support (Kocieniewski 2011 and USDA 2012). All of these policies are aimed at increasing breastfeeding rates overall and reducing disparities across different groups of mothers, but they assume that what prevents women from breastfeeding (and breastfeeding longer) and contributes to the disparities are hospital practices, lack of information, and high economic costs, all of which have changed dramatically over the past century. Validating these assumptions has been hindered by data limitations.

There has been little work done in the field of economics on the subject of breastfeeding. The bulk of the literature on this subject is in the health fields. In the economics literature, the focus has been women's labor market decisions as they relate to breastfeeding behavior. In terms of characterizing the decision to breastfeed and explaining the historical trends, the work has been largely descriptive in nature with little statistical analysis. Because of this, the work is limited in its ability to address selection bias adequately.

My research makes novel use of retrospective reports of breastfeeding behavior to address the gap in the literature. Understanding the selection mechanisms that drove the shifts in breastfeeding behavior over time is essential to providing a solid foundation for future analyses. Without a proper sense of who selects into breastfeeding and how that profile has evolved, it is impossible to address selection bias in other research on breastfeeding. Using the historical data set described in Chapter 1, I decompose the changes in breastfeeding participation into changes

due to behavior versus those due to characteristics. I find that the historical shifts in breastfeeding were largely driven by changes in behavior, rather than changes in characteristics. These results suggest that even the most private, personal choices, like deciding how to feed a baby, can be influenced by external forces; behavior is malleable. My work to characterize selection into breastfeeding over time is the first step towards identifying which policies and events translate into changes in breastfeeding behavior.

The rest of the paper is structured as follows. Section 2.2 discusses the data used and methodology for decomposing the data. Section 2.3 presents results and robustness checks, and Section 2.4 concludes.

2.2 Data and Methodology

2.2.1 Data

Historical data on breastfeeding behavior are very limited. In Chapter 1, I compile survey data from a number of historical surveys to create a rich data set with demographics and breastfeeding information for nearly 150,000 single, live births from 1939 to 2009 to close to 75,000 women. The *National Health Examination Survey* (NHES), the *National Fertility Surveys* (NFS), the *National Health and Nutrition Examination Surveys* (NHANES), the *National Surveys of Family Growth* (NSFG), and the *National Health Interview Survey* (NHIS) all are leveraged to generate new, nationally-representative estimates of breastfeeding (breastfeeding initiation and breastfeeding duration) overall and by subgroups (maternal age at birth, race, and education level at time of survey) spanning much of the twentieth century. Over time, the likelihood of mothers with certain characteristics to engage in breastfeeding and breastfeed for long durations has changed. In the early part of the time period (mid-twentieth century) it was lower socioeconomic

mothers who had higher breastfeeding initiation and duration. More recently, it has been the opposite, with mothers of higher socioeconomic status breastfeeding at higher rates.

The question remains as to what drove the shifts in who selected into breastfeeding. In some cases, shifts in breastfeeding correspond to historical events, but in other cases the timing is not aligned. Economic theory predicts behavioral responses when incentives change, so events and policy changes related to breastfeeding would be expected to induce changes in behavior. Additionally, characteristics of mothers have changed over time: women have been increasing education and labor force participation, and having children later. These characteristics are correlated with breastfeeding choices, so changes in the characteristics would be expected to translate into changes in breastfeeding choices as well. I use the historical data to run simulations that enable me to break down the shifts in breastfeeding participation into changes due to characteristics versus changes due to behavior. I use historical accounts to provide context for the results of the decomposition analysis.

2.2.2 Methodology

Following the methodology used by Hotchkiss (2006), I decompose the changes in breastfeeding participation into changes due to behavior versus those due to characteristics using the following model:[12]

$$Prob(Breastfeed_i) = \beta_0 + \sum \beta_X X_i + \varepsilon_i$$

The *X* includes maternal characteristics (race, marital status, education, and age at child's birth), as well as whether the child was firstborn. The equation above is estimated separately for each year from 1950 to 2000. The data and resulting coefficients are used to decompose the changes in

[12] In her 2006 paper, Julie Hotchkiss decomposes women's labor force participation into changes due to behavior and characteristics. I apply her technique to historical breastfeeding data to decompose changes in breastfeeding rates over time.

breastfeeding participation. To do this, I first use the average characteristics for each year to generate predicted breastfeeding participation. As expected, the predicted breastfeeding rates are nearly identical to the actual breastfeeding rates generated by the survey data. Small differences result from using average characteristics in the predicted estimates. I next simulate breastfeeding participation for each year using estimated coefficients from that year and average characteristics for all other years. Taking 1950 as an example, I take the coefficients from the probit model run for 1950. I multiply the coefficients for each characteristic by the mean of each characteristic for each year between 1950 and 2000. This results in a simulation of how breastfeeding rates would have looked from 1950 to 2000, if mothers in each of those years behaved as those with the same characteristics did in 1950. I run the same simulation for each year and show selected years in Figures 2.3-2.8. The vertical distance between any two lines in the figures represents the difference in breastfeeding rates due to differences in behavior in those two years, holding characteristics fixed to match those in a particular year. Comparing values between two points along a line in the figures reveals the difference in breastfeeding rates due to differences in characteristics across those years, holding behavior fixed at a particular year (Hotchkiss 2006). This strategy is employed for the following outcomes of interest: breastfeeding initiation and breastfeeding duration at least 6 months.

In addition to the analysis of the full sample, I also include an analysis of racial disparities and how these changed over time using the same methodology. To test the sensitivity of the results, the analyses are rerun using the alternative weighting method, restricting the sample to those surveyed closer to the birth, limiting the sample to only surveys of mothers, and using data from only one survey series (NSFG).

2.3 Results

Table 2.1 shows the weighted sample means of various characteristics over the decades covered in this paper. Across all of the maternal characteristics available in the data, shifts in demographics are evident. Progressing from 1950 to 2000, more mothers are non-white, older, more educated, and not married. Additionally, Tables 2.2 and 2.3 list the coefficients from selected years' probit estimates of breastfeeding initiation and breastfeeding at least 6 months, respectively. The coefficients are a measure of responsiveness of the outcome variable, breastfeeding initiation or breastfeeding at least 6 months, to changes in included characteristics. Work described in Chapter 1 establishes that mothers with some of those demographics were more likely to breastfeed in the 1950s and less likely to breastfeed in the 2000s (non-white, unmarried), and vice versa for other demographics (older, more educated). Taking black mothers as an example, the percent of black mothers in the sample increases over time and we know these mothers were more likely to breastfeed in the 1950s and less likely to breastfeed in the 2000s (Baker 2016a). Additionally, the sign of the coefficients goes from positive to negative from the 1960s to the 1970s, meaning black mothers are less responsive over time, in terms of breastfeeding initiation and duration. The outcome of interest, breastfeeding initiation and breastfeeding at least 6 months, is simulated using a common set of coefficients to determine how much of the observed shifts in breastfeeding (initiation and at least 6 months) is due to changes in characteristics versus changes in behavior.

2.3.1 Decomposition

The results of the decomposition analyses show that, by and large, the changes in breastfeeding rates over the second half of the twentieth century were driven by changes in behavior rather than changes in characteristics. That is not to say that there were no changes in maternal/child characteristics, but rather characteristic changes were not the driving force in the

shifts in breastfeeding. Figures 2.3-2.8 and Tables 2.4-2.9 show the results of the simulations by decade for each outcome. In Figures 2.3-2.8, the solid line labeled "XB" is the predicted breastfeeding rates generated by multiplying the coefficients from each year by the average characteristics for that same year. Thus, the decade lines have the same value as the XB line when the year is equal to the decade shown. The vertical distance between any two lines in the figures corresponds to the difference in breastfeeding rates due to differences in behavior in those two years, holding characteristics fixed to match those in a particular year. Comparing values between two points along a line in the figures shows the difference in breastfeeding rates due to differences in characteristics across those years, holding behavior fixed at a particular year (Hotchkiss 2006). Tables 2.4-2.9 summarize the results shown in the figures. The first column of each table presents the overall change in breastfeeding rates between the points in time listed (e.g., between 1950 and 1960 for the first row) and is the sum of the other two columns. The middle column shows the change due to characteristics holding behavior constant, and the last column shows the change due to behavior holding characteristics constant (Hotchkiss 2006).

2.3.1.1 The 1950s-1970s

Looking at the overall sample for breastfeeding initiation, as shown in Figure 2.3, the overall change in breastfeeding initiation was almost entirely the result of changes in behavior from the 1950s to 1970s. The difference between the lines b1950 and b1970 at x50 shows how behavioral changes contributed to the decline in breastfeeding initiation from 1950 to 1970, holding characteristics constant at 1950 values. In this case, changes in behavior reduced breastfeeding initiation from 48.5% to 20.9% (a 27.6 percentage-point decline). At the same time, changes in characteristics had the opposite effect of increasing breastfeeding initiation, holding behavior constant at 1970 levels. Looking at movement along the b1970 line between x50 and x70,

breastfeeding initiation starts at 20.9% (1970 mothers having the characteristics of 1950 mothers) and ends at 23.7% (a 2.8 percentage-point increase). The combination of both forces (from behavior and characteristics) yielded an overall decline in breastfeeding initiation between 1950 and 1970 of 24.8 percentage points. Chapter 1 describes how this time period was marked by tremendous change in cultural attitudes towards breastfeeding, policies, and events (Baker 2016a). Therefore, it is not surprising to see that the shifts in breastfeeding at this time were not due to changes in mother's characteristics, but rather the behavior those mothers were choosing in light of all the outside influences of the times.

Looking at duration, Figure 2.4 shows a similar pattern of behavior being the driving factor in the decline in breastfeeding at least 6 months for the overall sample. The difference between the lines b1950 and b1970 at x50 shows how behavioral changes contributed to the decline in breastfeeding at least 6 months from 1950 to 1970, holding characteristics constant at 1950 values. To be more exact, changes in behavior reduced breastfeeding at least 6 months from 21.4% to 3.0% (an 18.4 percentage-point decline). At the same time, changes in characteristics had the opposite effect and actually worked to increase breastfeeding at least 6 months, holding behavior constant at 1970 levels. Looking at movement along the b1970 line between x50 and x70, breastfeeding at least 6 months begins at 3.0% (1970 mothers having the characteristics of 1950 mothers) and ends at 5.3% (a 2.3 percentage-point increase). The combination of both forces (from behavior and characteristics) yielded an overall decline in breastfeeding at least 6 months between 1950 and 1970 of 16.1 percentage points.

Mothers of different races exhibited a similar pattern to the overall sample with changes in behavior being the main influence in the decline in breastfeeding during the 1950s and 1960s. The one noticeable difference is the severity of the decline. For white mothers, the decline was not as

severe as it was for black mothers, primarily because white mothers started at a lower rate and began to level out sooner, whereas black mothers were still breastfeeding at high rates in the 1950s and their decline continued into the 1970s. White mothers saw a 22.3 percentage-point decline due to behavioral changes, holding characteristics constant at 1950 values (see Figure 2.5), while for black mothers that same measure was 49.3 percentage points (see Figure 2.6). Looking at racial disparities in the duration measure of breastfeeding at least 6 months, similar patterns are evident (see Figures 2.7 and 2.8).

2.3.1.2 The 1970s

The 1970s saw a dramatic turnaround in breastfeeding rates, both in terms of initiation and duration. And, like the period before, Figures 2.4 and 2.5 and Tables 2.4 and 2.7 show the changes were driven by shifts in behavior rather than changes in characteristics. The difference between the lines b1970 and b1980 at x70 shows how behavior changed so as to increase breastfeeding initiation from 1970 to 1980, holding characteristics constant at 1970 values. Indeed, changes in behavior increased breastfeeding initiation from 23.7% to 49.3% (a 25.6 percentage-point increase). Changes in characteristics also led to increases in breastfeeding initiation, holding behavior constant at 1970 levels. Looking at movement along the b1980 line between x70 and x80, breastfeeding initiation begins at 49.3% (1980 mothers having the characteristics of 1970 mothers) and ends at 50.4% (a 1.1 percentage-point increase). The combination of both forces (from behavior and characteristics) yielded an overall increase in breastfeeding between 1970 and 1980 of 26.7 percentage points.

Breastfeeding duration also saw an overall increase, but changes in behavior and characteristics actually worked in opposite directions. The difference between the lines b1970 and b1980 at x70 in Figure 2.5 shows how behavior changed so as to increase breastfeeding at least 6

months from 1970 to 1980, holding characteristics constant at 1970 values. From 1970 to 1980, behavior changed so as to increase breastfeeding at least 6 months from 5.3% to 23.0% (a 17.7 percentage-point increase, holding characteristics constant at 1970 values). Changes in characteristics, on the other hand, put downward pressure on breastfeeding at least 6 months, holding behavior constant at 1970 levels. Looking at movement along the b1980 line between x70 and x80, breastfeeding at least 6 months starts at 23.0% (1980 mothers having the characteristics of 1970 mothers) and ends at 20.7% (a 2.3 percentage-point decrease). The combination of both forces (from behavior and characteristics) resulted in an overall increase in breastfeeding between 1970 and 1980 of 15.4 percentage points.

Mothers of different races exhibited a similar pattern to the overall sample, with changes in behavior being the main influence in the increase in breastfeeding during the 1970s. The one noticeable difference is the magnitude of the increase. For white mothers, the increase was much more dramatic than it was for black mothers. The rise of information promoting breastfeeding and villainizing infant formula was likely absorbed more by higher socioeconomic status mothers, and, even if lower-socioeconomic-status mothers internalized this information, they had a competing incentive to use formula from the introduction of the Special Supplemental Nutrition Program for Women, Infants, and Children providing free infant formula (Baker 2016a). White mothers saw a 27.6 percentage-point increase due to behavioral changes, holding characteristics constant at 1970 values (see Figure 2.5 and Table 2.5), whereas, for black mothers, that same measure was only 11.0 percentage points (see Figure 2.6 and Table 2.6). Looking at racial disparities in the duration measure of breastfeeding at least 6 months, similar patterns are evident (see Figures 2.7 and 2.8 and Tables 2.8 and 2.9).

2.3.1.3 The 1980s

In the 1980s, the contribution of characteristics to changes in the predicted breastfeeding rate was more pronounced. The 1980s were characterized by a stagnation in breastfeeding rates, as can be seen in Figures 2.1 and 2.2. Table 2.4 shows that the small increase in breastfeeding initiation that did occur was actually hindered by changes in behavior. Of the overall increase of 4.4 percentage points, changes in behavior contributed 10.9 percentage points and characteristics pulled that down by 6.5 percentage points.

Changes in behavior and characteristics together resulted in only a small increase in breastfeeding at least 6 months in the 1980s because they worked to counter each other. Table 2.7 shows that the 1980s saw an overall increase of 6.1 percentage points, but this masks the larger shifts attributable to changes in behavior and characteristics, respectively. Similar to breastfeeding initiation at this time, behavior provided a positive influence of 11.7 percentage points, while changes due to characteristics pushed rates lower by 5.6 percentage points.

Mothers of different races exhibited similar patterns in both initiation and duration during the 1980s, but with different magnitudes. In terms of breastfeeding initiation, Table 2.5 shows that white mothers experienced an overall increase of 6.3 percentage points, with large changes in behavior partially cancelled out by negative effects of changes in characteristics. For black mothers, Table 2.6 shows that changes in behavior worked to increase breastfeeding initiation rates, but this increase was almost entirely cancelled out by a decrease due to changes in characteristics, leading to only a 1.4 percentage-point net change.

Looking at racial disparities in the duration measure of breastfeeding at least 6 months, white and black mothers experienced similar patterns (see Tables 2.7 and 2.8). Both races saw increases in breastfeeding at least 6 months, 8.0 percentage points for white mothers and 2.7 for

black mothers. In both groups, changes in behavior alone would have led to much higher rates (13.7 percentage points for white mothers and 4.9 for black mothers), but were lowered by downward pressure from changes in characteristics (-5.8 percentage points for white mothers and -2.2 for black mothers).

2.3.1.4 The 1990s

Figures 2.1 and 2.2 show a second resurgence in breastfeeding initiation and duration in the 1990s, but it was markedly different across racial groups. Overall, there was an increase of 12.2 percentage points in breastfeeding initiation, as shown in Table 2.4. Changes in behavior contributed the most to this increase, 11.8 percentage points, and changes in characteristics had a negligible impact, contributing just 0.4 percentage point to the overall increase. For white mothers, the overall increase was smaller, only 10.2 percentage points, and the composition of the increase was similar, with nearly all of the increase driven by changes in behavior rather than characteristics. Table 2.6 shows that black mothers saw a notably larger overall increase, but again it was driven mostly by changes in behavior. The 1990s were a period when more family-friendly policies were adopted to give mothers a better hospital experience and work-life balance. These policies coincide with the larger resurgence in breastfeeding among black mothers, suggesting that these mothers may have benefited more than others in terms of breastfeeding.

Table 2.7 shows that the increase in breastfeeding duration over the 1990s was driven primarily by changes in behavior. Differences in racial experiences are evident though, as seen in Tables 2.8 and 2.9. For white mothers, the contribution of changes in characteristics and behavior are more balanced. Characteristics add 1.3 percentage points and behavior 2.3 percentage points, leading to an overall increase of only 3.6 percentage points. For black mothers, changes in both characteristics and behavior combined forces to lead to a larger 17.7 percentage point increase in

breastfeeding at least 6 months, with the bulk of the increase due to changes in behavior. This again suggests there was something in the 1990s that influenced the behavior of black mothers more substantially than that of white mothers. One hypothesis is that workplace protections disproportionately benefited black mothers, thereby leading to the large behavioral changes that positively impacted this group to a greater extent.

2.3.2 Robustness Checks

While the creation of a historical data set enables the study of the long-run evolution of breastfeeding in the United States, the pooled data do have several limitations. As mentioned in Chapter 1, weighting the data to ensure a nationally representative sample of births is challenging. The surveys used are nationally representative of the population sampled when using survey weights, but they each have a unique target population and over- or under-sample particular groups differently. The results described above use the preferred weighting method discussed in Chapter 1, which involves the existing survey weights. To ensure that the results are not confounded by that weighting method, I also run the analyses using weights derived using vital statistics data. The results are largely unchanged.

Another potential source of concern might be the use of multiple surveys confounding the results. To examine this, I restrict the sample to only include NSFG surveys. Again, the results are similar to those using the entire pooled sample.

Finally, one might be worried about recall bias, since all surveys are retrospective and in some cases include mothers who gave birth decades before being surveyed. To explore this concern, I limit the sample to include only mothers surveyed within 10 years of birth. Still, the results are not notably different.

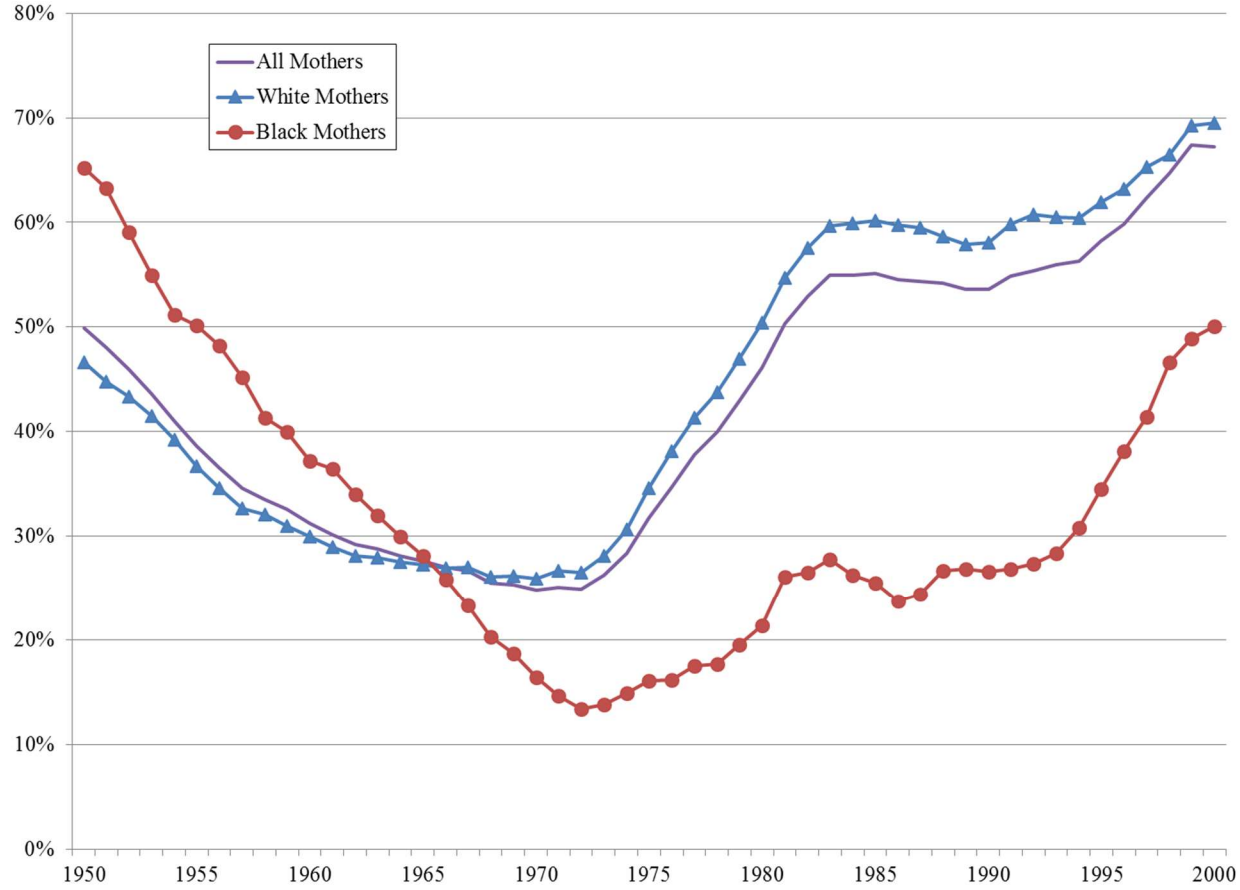
2.4 Conclusion

Breastfeeding policy in the United States is largely created in response to anecdotal evidence and recent experiences, without the benefit of historical knowledge; this is mainly due to data limitations. However, by using a new, historical data set, I can provide much needed evidence that demonstrates convincingly how breastfeeding rates evolved and identify the differential impacts across racial groups.

The results show that shifts in breastfeeding initiation and duration were driven largely by changes in behavior, not characteristics. Even as the composition of the mothers surveyed was changing, it was the behavior of mothers with certain characteristics that drove the shifts in breastfeeding, and not simply that more mothers had those characteristics. This holds true for both white and black mothers, although the magnitudes are different.

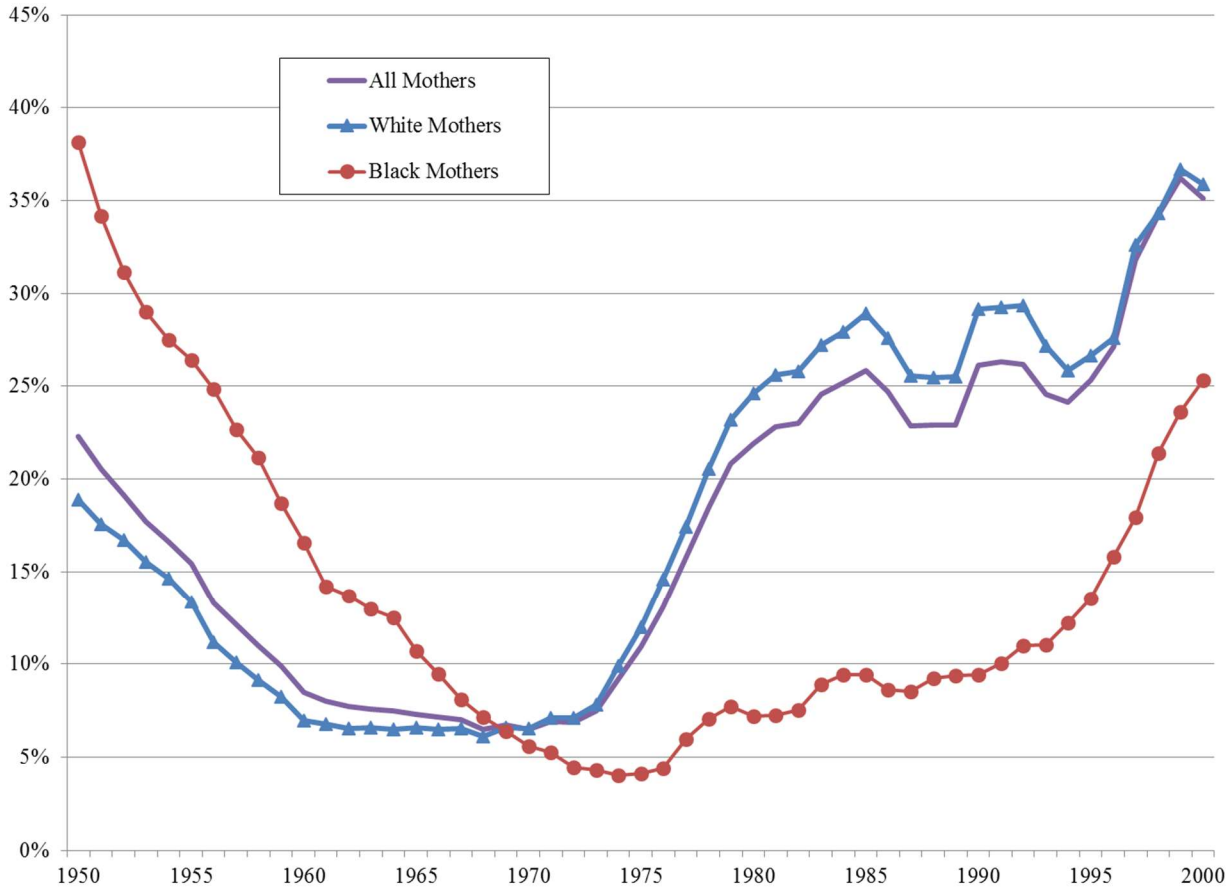
By decomposing the shifts and looking across racial groups, this chapter provides convincing statistical evidence that the contribution of behavior and characteristics to shifts in breastfeeding (in terms of initiation and breastfeeding at least 6 months) varied over time and across groups. Coupling this evidence with historical accounts of policy and cultural changes over time provides valuable insight into what effect these types of changes have on breastfeeding initiation and duration overall and across racial groups. Thus, this analysis sets the foundation for future work to address the impacts of breastfeeding on children's health outcomes, maternal employment decisions, and policy related to breastfeeding promotion.

Figure 2.1 Breastfeeding Initiation Rates, 1950-2000



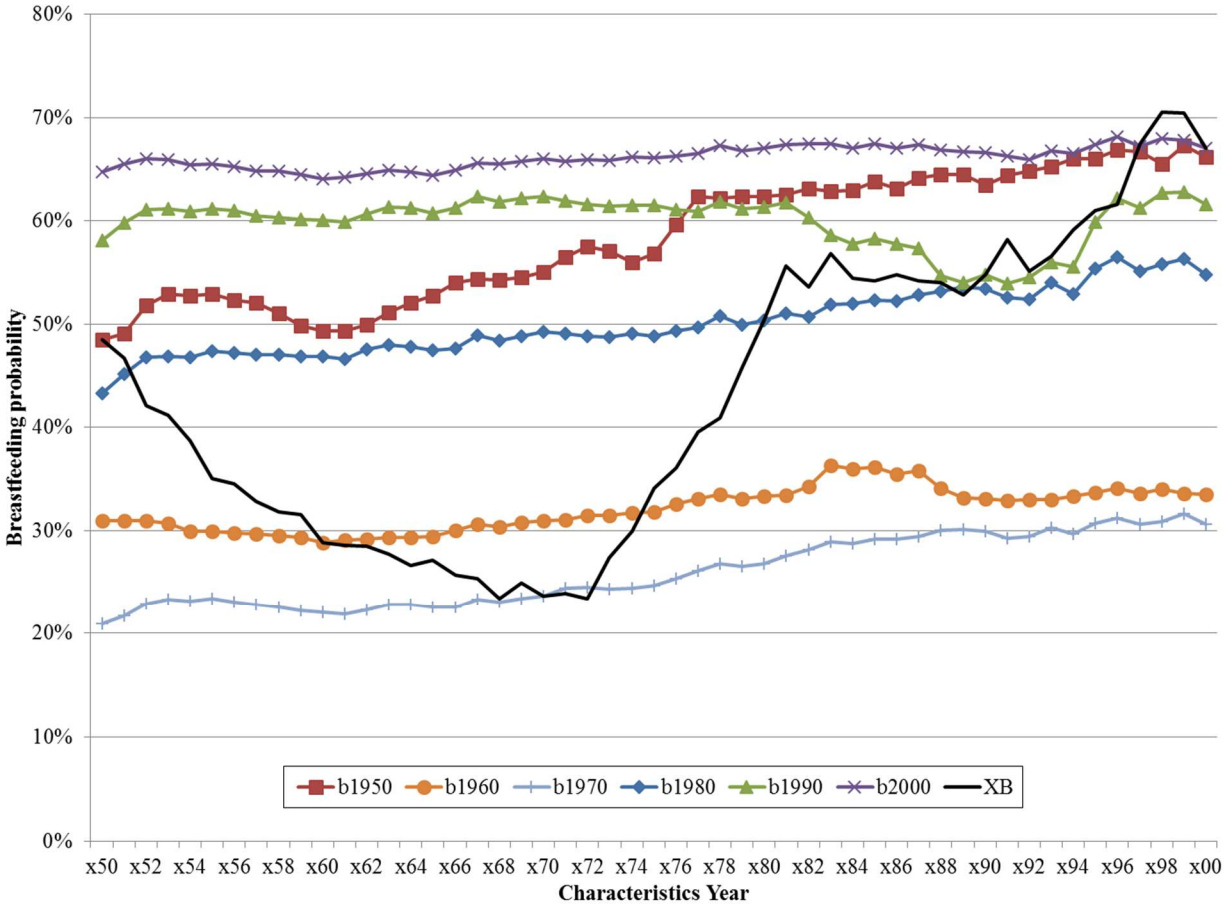
Notes: Data shown are a 3 year moving average of actual annual rates. Breastfeeding initiation in this context means the baby was breastfed for some period. For the survey data this meant the mother answered yes to a question asking whether the child was ever breastfed. Each data point represents the percent of single births where the infant was breastfed (Baker 2016a).

Figure 2.2 Rates of Breastfeeding at Least 6 Months, 1950-2000



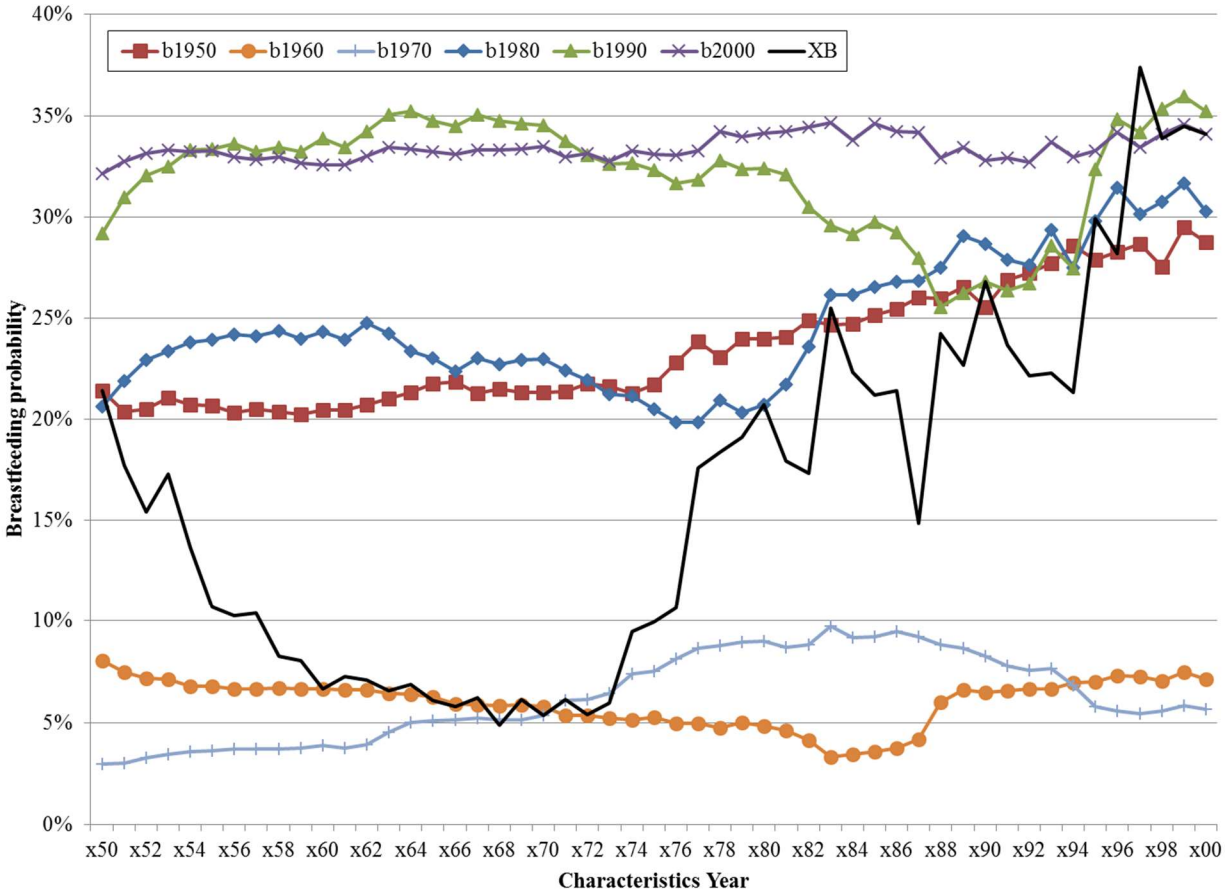
Notes: Data shown are a 3 year moving average of actual annual rates. Breastfeeding at least 6 months in this context means the baby was breastfed for at least 6 months. For the survey data this meant the mother responded to a question asking how long the child was breastfed with an answer that was greater than or equal to 6 months. If her answer was measured in something other than months, e.g., days, weeks, or years, her answer was recalculated in months. These answers are not a measure of exclusive breastfeeding for at least 6 months as most surveys did not ask about breastfeeding exclusivity. Therefore, the babies may have received other food or formula in addition to breastmilk. Each data point represents the percent of single births where the infant was breastfed at least 6 months (Baker 2016a).

Figure 2.3 Predicted and Simulated Breastfeeding Initiation for Select Years



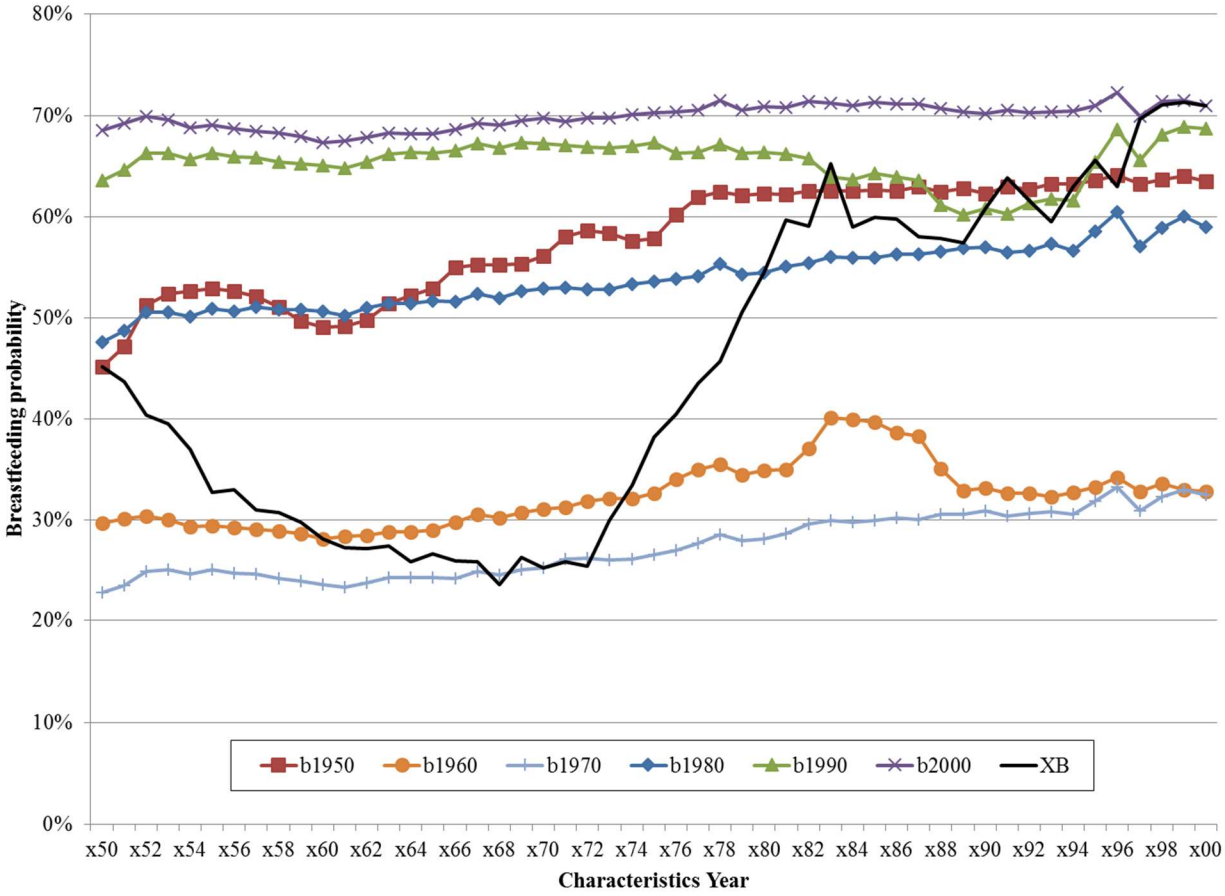
Notes: As described by Hotchkiss (2006), "the 'x' corresponds to which year characteristics and the 'b' corresponds to which year parameter coefficients (betas) are used in the calculation of the average predicted [breastfeeding probability]. 'XB' means that the characteristics and parameter coefficients for the same year are used to construct the breastfeeding probability." Differences between two lines correspond to differences due to behavior holding characteristics fixed. Moving along a line shows the importance of changes in characteristics across years in determining breastfeeding rates (Hotchkiss 2006).

Figure 2.4 Predicted and Simulated Rates of Breastfeeding at Least 6 Months for Select Years



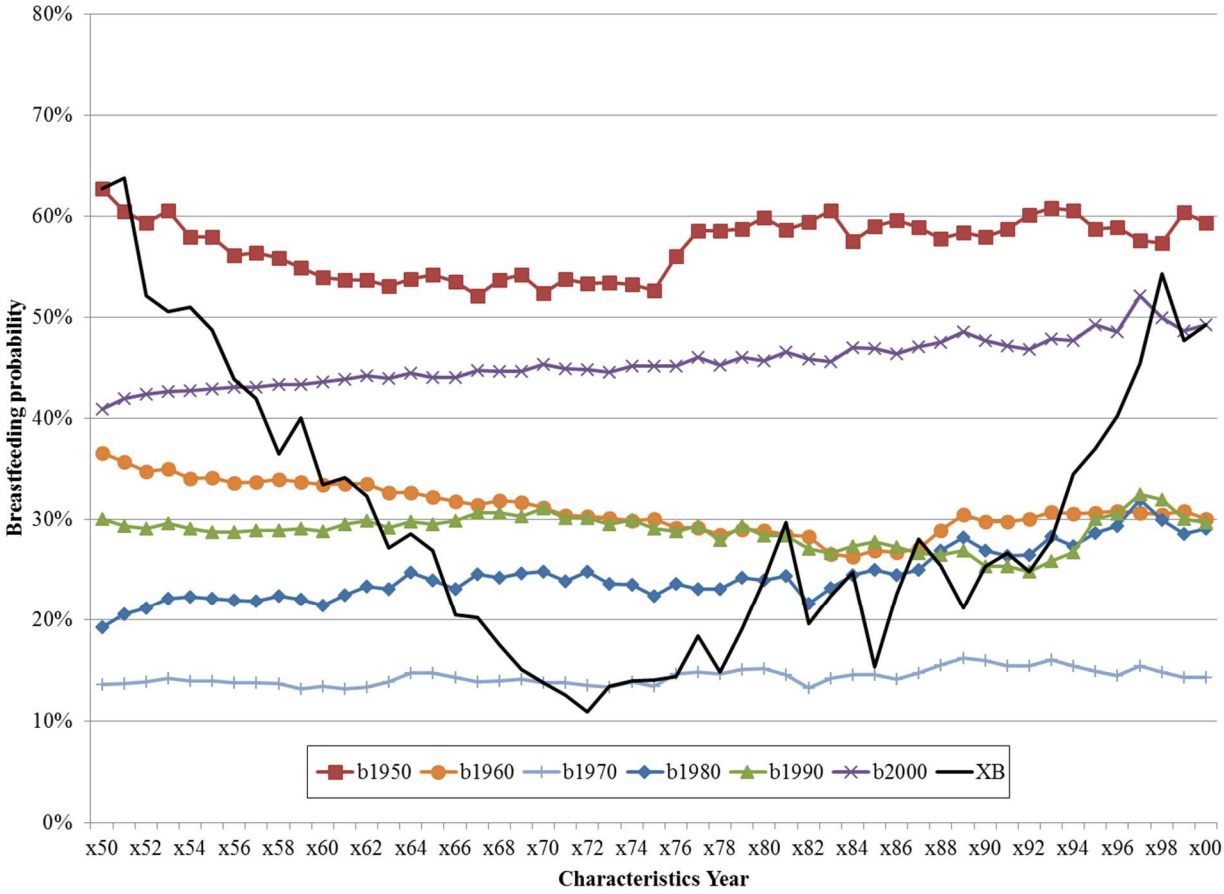
Notes: As described by Hotchkiss (2006), "the 'x' corresponds to which year characteristics and the 'b' corresponds to which year parameter coefficients (betas) are used in the calculation of the average predicted [breastfeeding probability]. 'XB' means that the characteristics and parameter coefficients for the same year are used to construct the breastfeeding probability." Differences between two lines correspond to differences due to behavior holding characteristics fixed. Moving along a line shows the importance of changes in characteristics across years in determining breastfeeding rates (Hotchkiss 2006).

Figure 2.5 Predicted and Simulated Breastfeeding Initiation for Select Years (White Mothers)



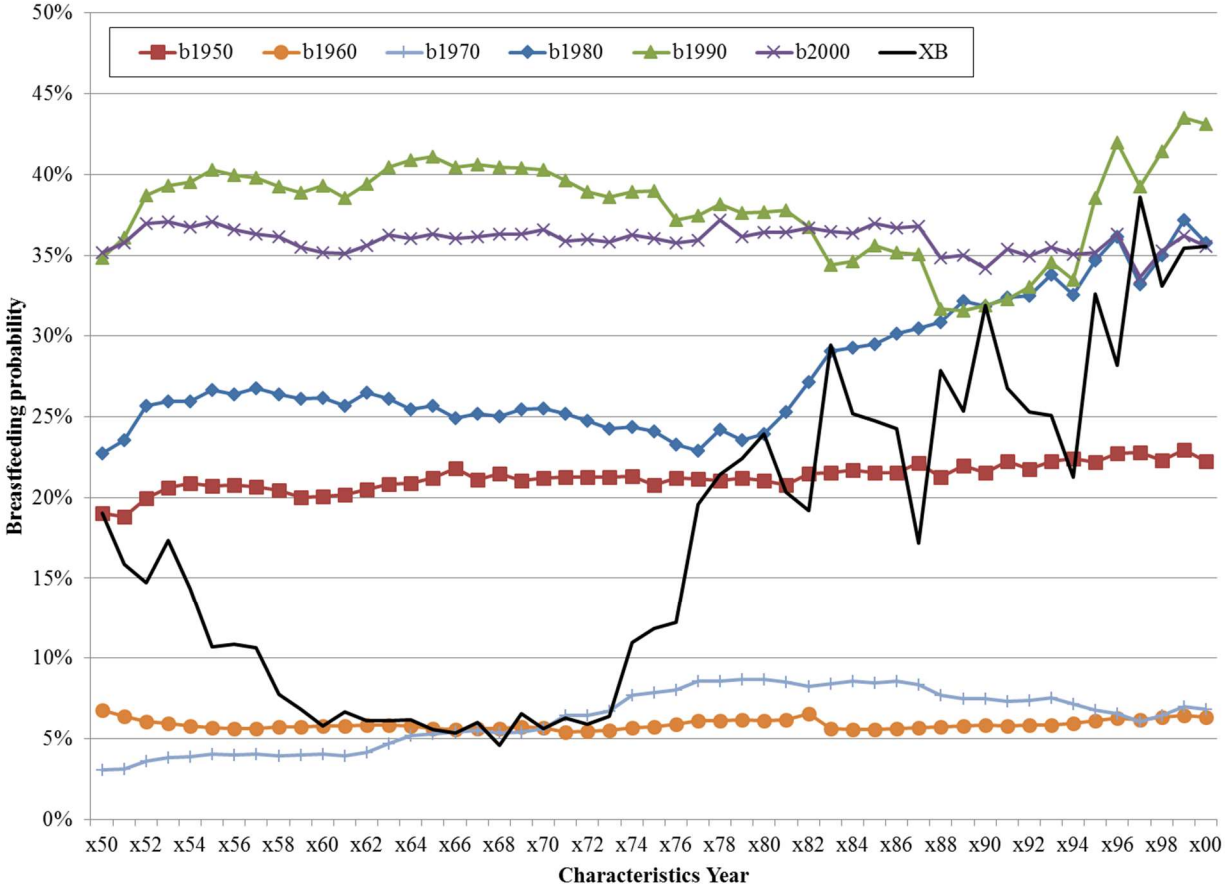
Notes: As described by Hotchkiss (2006), "the 'x' corresponds to which year characteristics and the 'b' corresponds to which year parameter coefficients (betas) are used in the calculation of the average predicted [breastfeeding probability]. 'XB' means that the characteristics and parameter coefficients for the same year are used to construct the breastfeeding probability." Differences between two lines correspond to differences due to behavior holding characteristics fixed. Moving along a line shows the importance of changes in characteristics across years in determining breastfeeding rates (Hotchkiss 2006).

Figure 2.6 Predicted and Simulated Breastfeeding Initiation for Select Years (Black Mothers)



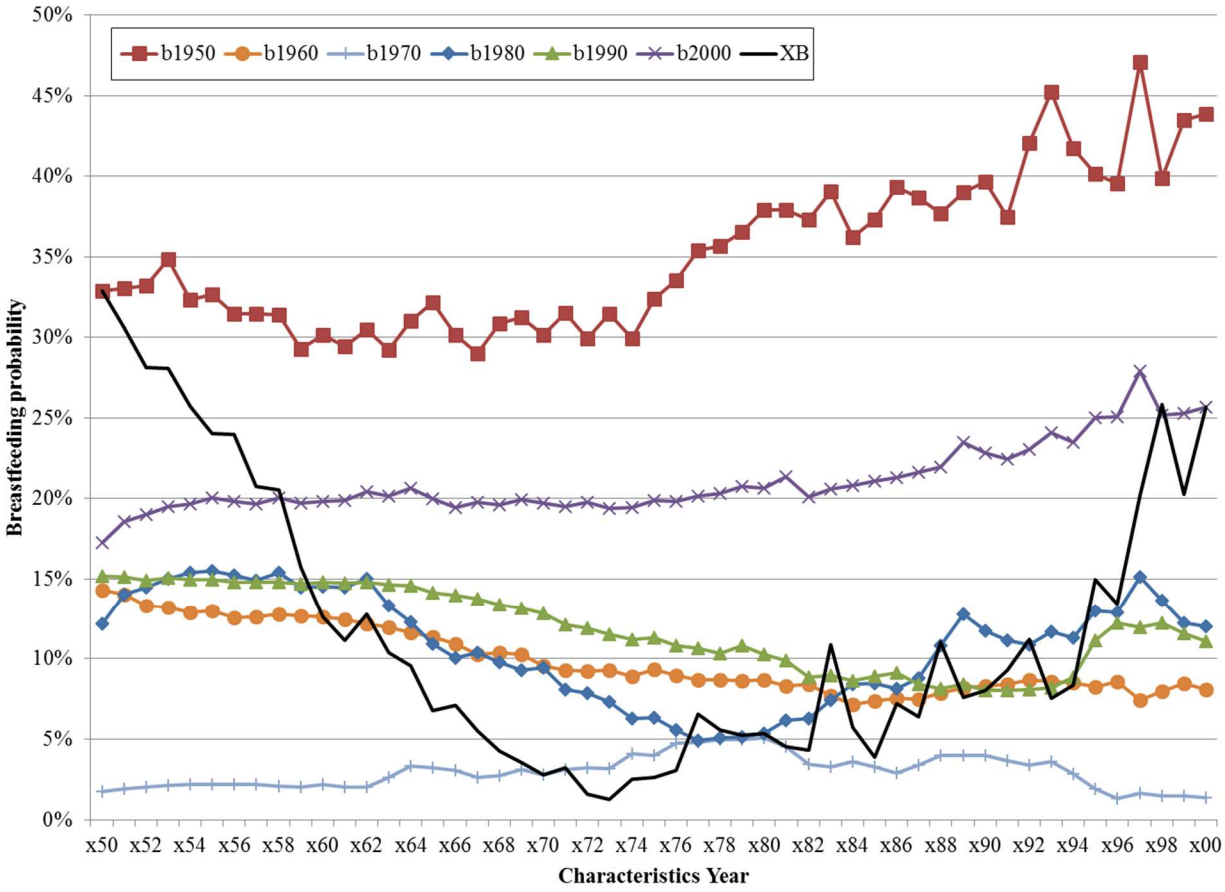
Notes: As described by Hotchkiss (2006), "the 'x' corresponds to which year characteristics and the 'b' corresponds to which year parameter coefficients (betas) are used in the calculation of the average predicted [breastfeeding probability]. 'XB' means that the characteristics and parameter coefficients for the same year are used to construct the breastfeeding probability." Differences between two lines correspond to differences due to behavior holding characteristics fixed. Moving along a line shows the importance of changes in characteristics across years in determining breastfeeding rates (Hotchkiss 2006).

Figure 2.7 Predicted and Simulated Rates of Breastfeeding at Least 6 Months for Select Years (White Mothers)



Notes: As described by Hotchkiss (2006), "the 'x' corresponds to which year characteristics and the 'b' corresponds to which year parameter coefficients (betas) are used in the calculation of the average predicted [breastfeeding probability]. 'XB' means that the characteristics and parameter coefficients for the same year are used to construct the breastfeeding probability." Differences between two lines correspond to differences due to behavior holding characteristics fixed. Moving along a line shows the importance of changes in characteristics across years in determining breastfeeding rates (Hotchkiss 2006).

Figure 2.8 Predicted and Simulated Rates of Breastfeeding at Least 6 Months for Select Years (Black Mothers)



Notes: As described by Hotchkiss (2006), "the 'x' corresponds to which year characteristics and the 'b' corresponds to which year parameter coefficients (betas) are used in the calculation of the average predicted [breastfeeding probability]. 'XB' means that the characteristics and parameter coefficients for the same year are used to construct the breastfeeding probability." Differences between two lines correspond to differences due to behavior holding characteristics fixed. Moving along a line shows the importance of changes in characteristics across years in determining breastfeeding rates (Hotchkiss 2006).

Table 2.1 Weighted Sample Means for Select Years

	Weighted Percent of Sample					
Characteristic	1950	1960	1970	1980	1990	2000
Firstborn	43.8	29.2	41.0	44.4	39.5	39.4
Maternal Race						
White	82.8	84.6	83.4	81.4	77.6	72.9
Black	15.9	13.6	14.1	15.1	15.9	17.4
Other	1.3	1.8	2.5	3.5	6.6	9.7
Maternal Age at Birth						
<20	33.6	18.0	17.8	15.7	13.8	12.2
20-29	55.1	69.7	66.3	69.1	65.1	57.4
30+	11.3	12.3	16.0	15.1	21.1	30.5
Maternal Education						
Less than high school	53.9	37.2	28.1	24.8	23.5	23.7
High school	33.6	43.8	46.0	40.4	33.1	27.5
Some College	8.3	11.4	16.0	19.9	24.6	24.6
College or more	4.2	7.6	9.9	14.9	18.7	24.3
Maternal marital status						
Married	89.4	87.2	82.1	75.7	66.6	63.9
Widowed/divorced/separated	10.4	12.0	14.8	14.6	20.9	15.7
Never Married	0.2	0.8	3.1	9.7	12.5	20.4

Notes: All means are weighted using survey weights.

Table 2.2 Maximum Likelihood Probit Estimates for Select Years (Breastfeeding Initiation)

	Dependent variable=probability of breastfeeding initiation											
Characteristic	1950		1960		1970		1980		1990		2000	
Firstborn	0.1591	*	0.2855	***	0.1386	**	0.1706	***	0.2861	***	0.3457	***
	(0.0964)		(0.0622)		(0.0561)		(0.0648)		(0.0930)		(0.1148)	
Maternal Race (omitted group: white)												
Black	0.4393	***	0.1926	***	-0.3463	***	-0.5679	***	-0.6270	***	-0.3041	**
	(0.1081)		(0.0621)		(0.0729)		(0.0871)		(0.1161)		(0.1188)	
Other	1.0210	***	-0.0069		0.2378		0.1572		-0.1011		-0.0532	
	(0.3857)		(0.1906)		(0.1612)		(0.1646)		(0.1650)		(0.2069)	
Maternal Age at Birth (omitted group: 20-29)												
<20	-0.0700		0.1107		-0.1643	**	-0.1911	**	-0.1495		-0.1411	
	(0.1154)		(0.0743)		(0.0808)		(0.0961)		(0.1300)		(0.1423)	
30+	0.1008		-0.0037		0.0583		0.0855		0.2161	*	0.1393	
	(0.1681)		(0.0810)		(0.0703)		(0.0939)		(0.1123)		(0.1296)	
Maternal Education (omitted group: high school)												
Less than high school	0.2294	**	0.0510		-0.0234		-0.2601	***	-0.1057		0.1503	
	(0.0986)		(0.0612)		(0.0644)		(0.0831)		(0.1172)		(0.1335)	
Some College	0.2798		0.3185	***	0.3016	***	0.4715	***	0.2410	**	0.4005	***
	(0.1742)		(0.0820)		(0.0688)		(0.0805)		(0.1163)		(0.1364)	
College or more	0.1034		0.3979	***	0.7406	***	0.6958	***	0.8843	***	0.5583	***
	(0.2448)		(0.1008)		(0.0816)		(0.0938)		(0.1363)		(0.1684)	
Maternal marital status (omitted group: married)												
Widowed/divorced/Separated	-0.2840	*	-0.0452		-0.0152		-0.1943	**	-0.0519		-0.1306	
	(0.1574)		(0.0838)		(0.0754)		(0.0906)		(0.1158)		(0.1404)	
Never Married	0.0063		-0.1500		-0.1109		-0.2622	**	-0.4242	***	-0.3371	***
	(0.4855)		(0.2379)		(0.1663)		(0.1296)		(0.1369)		(0.1179)	
Constant	0.0502		-0.7312	***	-0.7458	***	-0.0055		0.2142		0.1857	
	(0.1488)		(0.0628)		(0.0633)		(0.0797)		(0.1528)		(0.1384)	

Notes: all data are weighted using survey weights. ***p<0.01; **p<0.05; *p<0.1.

Table 2.3 Maximum Likelihood Probit Estimates for Select Years (Breastfed at least 6 months)

	Dependent variable=probability of breastfeeding at least 6 months											
Characteristic	1950		1960		1970		1980		1990		2000	
Firstborn	-0.1708		0.0326		-0.1845	**	-0.0476		0.0496		0.2287	**
	(0.1092)		(0.0835)		(0.0874)		(0.0716)		(0.1023)		(0.1111)	
Maternal Race (omitted group: white)												
Black	0.3732	***	0.4347	***	-0.1942	*	-0.6250	***	-0.7656	***	-0.0738	
	(0.1148)		(0.0796)		(0.1177)		(0.1075)		(0.1408)		(0.1269)	
Other	0.7156	**	0.5611	***	0.0348		0.0010		-0.1681		0.0124	
	(0.3258)		(0.2128)		(0.2190)		(0.1849)		(0.1794)		(0.1739)	
Maternal Age at Birth (omitted group: 20-29)												
<20	0.1437		0.2135	**	-0.1719		-0.3394	***	-0.5492	***	-0.3574	**
	(0.1261)		(0.0970)		(0.1276)		(0.1169)		(0.1554)		(0.1735)	
30+	0.2838		0.1844	*	0.0896		0.1857	*	0.2996	**	0.2484	**
	(0.1809)		(0.1018)		(0.1000)		(0.1004)		(0.1169)		(0.1192)	
Maternal Education (omitted group: high school)												
Less than high school	0.4058	***	0.2131	**	0.0400		-0.2409	**	-0.1194		0.1481	
	(0.1136)		(0.0838)		(0.0957)		(0.0984)		(0.1340)		(0.1459)	
Some College	0.3654	*	0.3021	***	0.2756	***	0.4211	***	-0.0457		0.1865	
	(0.2009)		(0.1147)		(0.1014)		(0.0874)		(0.1288)		(0.1373)	
College or more	-0.1478		0.3907	***	0.6295	***	0.5887	***	0.4999	***	0.3136	**
	(0.2980)		(0.1447)		(0.1106)		(0.0961)		(0.1437)		(0.1516)	
Maternal marital status (omitted group: married)												
Widowed/divorced/separated	-0.2895	*	-0.0710		0.1021		-0.3188	***	-0.0701		-0.3478	**
	(0.1732)		(0.1093)		(0.1054)		(0.1040)		(0.1331)		(0.1490)	
Never Married	0.4664		-0.1395		0.0731		-0.2065		-0.1233		-0.1943	
	(0.4727)		(0.2184)		(0.2475)		(0.1566)		(0.1665)		(0.1276)	
Constant	-0.9318	***	-1.8692	***	-1.7494	***	-0.5021	***	-0.2408		-0.5320	***
	(0.1655)		(0.0943)		(0.1038)		(0.0849)		(0.1639)		(0.1377)	

Notes: all data are weighted using survey weights. ***p<0.01; **p<0.05; *p<0.1.

Table 2.4 Decomposition of Changes in Predicted Breastfeeding Initiation

Years	Change in predicted breastfeeding initiation	Change due to characteristics	Change due to behavior
	(percentage points)	(percentage points)	(percentage points)
1950-1960	-19.6	-2.1	-17.5
1960-1970	-5.2	1.6	-6.8
1970-1980	26.7	1.1	25.6
1980-1990	4.4	-6.5	10.9
1990-2000	12.2	0.4	11.8

Notes: As described by Hotchkiss (2006), the first column shows the overall change in breastfeeding rates between the points in time listed (e.g., between 1950 and 1960 for the first row) and is the sum of the other two columns. The middle column shows the change due to characteristics holding behavior constant and the last column shows the change due to behavior holding characteristics constant.

Table 2.5 Decomposition of Changes in Predicted Breastfeeding Initiation (White Mothers)

Years	Change in predicted breastfeeding initiation	Change due to characteristics	Change due to behavior
	(percentage points)	(percentage points)	(percentage points)
1950-1960	-17.0	-1.6	-15.5
1960-1970	-2.8	1.7	-4.5
1970-1980	29.2	1.6	27.6
1980-1990	6.3	-5.5	11.8
1990-2000	10.2	0.8	9.4

Notes: As described by Hotchkiss (2006), the first column shows the overall change in breastfeeding rates between the points in time listed (e.g., between 1950 and 1960 for the first row) and is the sum of the other two columns. The middle column shows the change due to characteristics holding behavior constant and the last column shows the change due to behavior holding characteristics constant.

Table 2.6 Decomposition of Changes in Predicted Breastfeeding Initiation (Black Mothers)

Years	Change in predicted breastfeeding initiation	Change due to characteristics	Change due to behavior
	(percentage points)	(percentage points)	(percentage points)
1950-1960	-29.3	-3.2	-26.2
1960-1970	-19.6	0.4	-20.0
1970-1980	10.1	-0.9	11.0
1980-1990	1.4	-3.1	4.5
1990-2000	23.9	1.6	22.3

Notes: As described by Hotchkiss (2006), the first column shows the overall change in breastfeeding rates between the points in time listed (e.g., between 1950 and 1960 for the first row) and is the sum of the other two columns. The middle column shows the change due to characteristics holding behavior constant and the last column shows the change due to behavior holding characteristics constant.

Table 2.7 Decomposition of Changes in Predicted Rates of Breastfeeding at least 6 Months

Years	Change in predicted breastfeeding initiation	Change due to characteristics	Change due to behavior
	(percentage points)	(percentage points)	(percentage points)
1950-1960	-14.7	-1.4	-13.4
1960-1970	-1.3	1.5	-2.8
1970-1980	15.4	-2.3	17.6
1980-1990	6.1	-5.6	11.7
1990-2000	7.3	1.3	6.0

Notes: As described by Hotchkiss (2006), the first column shows the overall change in breastfeeding rates between the points in time listed (e.g., between 1950 and 1960 for the first row) and is the sum of the other two columns. The middle column shows the change due to characteristics holding behavior constant and the last column shows the change due to behavior holding characteristics constant.

Table 2.8 Decomposition of Changes in Predicted Rates of Breastfeeding at least 6 Months (White Mothers)

Years	Change in predicted breastfeeding initiation	Change due to characteristics	Change due to behavior
	(percentage points)	(percentage points)	(percentage points)
1950-1960	-13.2	-1.0	-12.3
1960-1970	-0.2	1.5	-1.7
1970-1980	18.4	-1.6	19.9
1980-1990	8.0	-5.8	13.7
1990-2000	3.6	1.3	2.3

Notes: As described by Hotchkiss (2006), the first column shows the overall change in breastfeeding rates between the points in time listed (e.g., between 1950 and 1960 for the first row) and is the sum of the other two columns. The middle column shows the change due to characteristics holding behavior constant and the last column shows the change due to behavior holding characteristics constant.

Table 2.9 Decomposition of Changes in Predicted Rates of Breastfeeding at least 6 Months (Black Mothers)

Years	Change in predicted breastfeeding initiation	Change due to characteristics	Change due to behavior
	(percentage points)	(percentage points)	(percentage points)
1950-1960	-20.2	-1.7	-18.6
1960-1970	-9.8	0.6	-10.5
1970-1980	2.6	-4.1	6.6
1980-1990	2.7	-2.2	4.9
1990-2000	17.7	2.9	14.8

Notes: As described by Hotchkiss (2006), the first column shows the overall change in breastfeeding rates between the points in time listed (e.g., between 1950 and 1960 for the first row) and is the sum of the other two columns. The middle column shows the change due to characteristics holding behavior constant and the last column shows the change due to behavior holding characteristics constant.

Appendix Table A2.1 Simulated Results for Breastfeeding Initiation 1950-1962

	b1950	b1951	b1952	b1953	b1954	b1955	b1956	b1957	b1958	b1959	b1960	b1961	b1962
x50	48.5	47.8	43.5	43.3	39.5	37.6	37.5	35.0	32.9	33.5	31.0	30.1	29.4
x51	49.1	46.7	43.0	42.7	39.5	37.1	37.0	34.6	32.9	32.8	31.0	30.4	29.8
x52	51.8	43.4	42.2	41.8	39.7	36.3	35.9	34.3	32.7	30.9	30.9	30.8	30.2
x53	52.9	42.0	41.5	41.1	39.4	35.8	35.3	34.0	32.5	30.0	30.7	30.6	30.0
x54	52.7	41.0	40.9	40.2	38.7	34.9	34.8	33.0	31.8	29.3	29.9	29.8	29.3
x55	52.9	41.0	40.9	40.3	38.7	35.1	34.6	33.2	32.0	29.4	30.0	30.0	29.5
x56	52.3	41.2	40.9	40.1	38.7	34.9	34.5	32.8	31.7	29.5	29.8	29.7	29.1
x57	52.1	41.8	41.0	40.3	38.4	35.0	34.6	32.8	31.7	29.8	29.7	29.6	29.0
x58	51.0	43.2	41.2	40.8	37.8	35.5	34.8	32.8	31.8	30.8	29.5	29.3	28.8
x59	49.9	44.7	41.6	41.5	37.2	36.0	35.0	32.8	31.8	31.6	29.4	29.1	28.6
x60	49.3	44.5	40.6	41.2	36.1	35.8	34.4	32.5	31.3	31.2	28.9	28.5	28.2
x61	49.4	44.6	41.0	41.4	36.2	36.0	34.7	32.6	31.3	30.9	29.1	28.6	28.2
x62	49.9	44.3	41.0	41.6	36.0	36.2	34.7	32.9	31.3	30.6	29.2	28.7	28.5
x63	51.1	44.1	41.4	41.6	36.1	36.2	35.5	32.9	31.5	30.0	29.3	28.9	28.7
x64	52.1	44.1	41.3	41.6	35.9	36.4	35.8	33.0	31.6	29.8	29.3	29.1	28.9
x65	52.8	44.3	41.8	41.4	36.7	36.4	36.2	33.0	31.4	29.3	29.5	29.2	29.0
x66	54.0	44.8	41.8	41.9	36.4	36.8	36.2	33.4	31.3	28.5	30.0	29.4	29.3
x67	54.3	45.6	42.1	42.6	36.3	37.3	36.3	34.1	31.6	28.6	30.6	30.1	30.3
x68	54.3	45.3	41.2	42.5	35.5	37.2	35.6	33.9	31.4	28.3	30.4	29.7	29.9
x69	54.6	46.0	41.1	43.0	35.4	37.6	35.6	34.4	31.6	28.4	30.8	30.2	30.5
x70	55.1	46.0	41.5	43.3	35.1	37.7	35.7	34.6	31.6	27.9	31.0	30.3	30.6
x71	56.5	46.2	42.2	43.0	35.0	37.3	35.9	34.5	31.4	26.6	31.1	30.3	30.4
x72	57.5	46.9	42.4	43.6	34.7	37.9	36.2	35.1	31.5	26.1	31.5	30.5	30.9
x73	57.1	46.7	41.9	43.5	34.4	37.7	35.6	35.1	30.9	25.2	31.5	30.2	30.7
x74	56.0	46.2	40.7	43.9	33.7	38.3	34.0	35.5	29.7	23.1	31.7	30.0	30.7
x75	56.8	47.1	40.1	44.5	32.8	38.8	33.9	36.0	29.8	23.3	31.8	30.3	31.3
x76	59.7	48.1	39.5	45.0	31.1	39.0	35.2	36.0	29.7	22.2	32.6	30.3	32.0
x77	62.3	49.2	38.1	45.6	29.1	39.6	35.7	36.5	29.6	21.4	33.1	30.5	32.9
x78	62.2	49.1	38.9	45.7	30.0	39.7	36.3	36.7	29.6	20.8	33.5	30.9	33.4
x79	62.4	48.8	37.9	45.0	30.3	39.5	36.1	36.8	30.1	21.7	33.1	31.1	33.2
x80	62.4	48.6	38.6	44.6	31.5	39.3	36.7	36.8	29.9	21.2	33.4	31.3	33.3
x81	62.5	48.5	37.2	45.0	29.8	39.8	35.6	37.2	29.1	19.6	33.5	31.1	33.7
x82	63.1	48.6	36.7	45.7	29.4	40.6	35.3	37.9	26.4	15.4	34.3	30.5	34.0
x83	62.9	48.1	48.0	41.7	44.4	37.9	44.8	36.9	24.0	12.2	36.3	30.8	34.0
x84	63.0	48.3	48.3	41.7	44.4	37.8	44.8	36.7	24.9	13.7	36.0	31.0	33.9
x85	63.8	48.4	48.6	41.9	45.0	38.5	45.2	37.5	25.6	14.0	36.1	31.7	34.7
x86	63.2	47.6	47.2	40.9	44.8	37.7	44.6	37.0	26.0	14.8	35.4	31.7	34.1
x87	64.1	48.2	47.9	41.3	45.8	38.6	45.1	37.8	27.5	16.6	35.8	32.8	35.0
x88	64.5	49.7	48.4	41.8	46.3	39.1	45.4	38.6	35.5	30.1	34.2	36.2	36.3
x89	64.5	48.8	47.7	41.3	46.3	38.7	45.2	38.3	38.7	36.2	33.2	37.1	36.0
x90	63.5	48.8	47.7	41.5	45.8	38.4	45.0	37.8	38.1	35.8	33.1	36.7	35.7
x91	64.5	48.5	47.4	41.1	45.9	38.7	45.0	38.1	38.6	35.7	32.9	36.9	35.7
x92	64.8	49.2	46.8	40.6	46.8	38.7	45.1	38.7	38.8	36.0	33.0	37.4	36.2
x93	65.2	48.4	46.6	40.3	47.2	38.8	44.9	38.9	39.2	36.2	33.0	37.8	36.6
x94	66.0	49.3	47.2	40.8	47.5	39.3	45.4	39.6	39.6	36.7	33.3	38.1	36.9
x95	66.0	49.2	48.3	41.6	47.4	39.8	45.8	40.1	40.0	37.2	33.7	38.6	37.8
x96	66.9	49.3	49.8	42.7	47.4	40.8	46.5	40.9	40.7	37.9	34.1	39.0	38.5
x97	66.7	49.2	48.2	41.6	47.4	40.2	45.9	40.7	40.3	37.2	33.6	38.9	38.2
x98	65.5	48.5	47.8	41.9	47.6	40.1	45.8	40.4	40.0	36.6	34.0	39.2	37.9
x99	67.3	48.8	47.8	41.3	48.0	40.5	46.1	41.4	40.7	37.2	33.6	39.6	38.9
x00	66.2	48.5	46.3	40.5	48.5	39.8	45.5	40.6	40.0	36.5	33.5	39.4	38.0

Appendix Table A2.1 (cont.): Simulated Results for Breastfeeding Initiation 1963-1975

	b1963	b1964	b1965	b1966	b1967	b1968	b1969	b1970	b1971	b1972	b1973	b1974	b1975
x50	28.0	25.4	26.0	24.4	20.4	19.9	21.2	20.9	16.4	18.7	26.5	28.0	29.8
x51	28.6	25.8	26.6	25.0	21.5	20.7	21.8	21.7	17.2	19.8	27.2	29.3	31.3
x52	29.1	26.5	27.8	25.9	22.7	21.8	22.7	22.9	18.4	20.7	28.0	30.2	32.5
x53	29.1	26.6	28.0	26.0	22.7	22.1	22.9	23.3	18.8	20.8	28.2	30.2	32.6
x54	28.6	26.1	27.7	25.6	22.4	22.0	22.7	23.1	18.7	20.7	27.9	29.9	32.6
x55	28.8	26.4	28.0	25.9	22.8	22.4	23.0	23.4	19.1	21.1	28.0	30.2	33.0
x56	28.6	26.2	27.8	25.6	22.7	22.2	22.8	23.1	18.9	21.0	27.8	30.0	32.9
x57	28.4	26.2	27.6	25.5	22.6	22.2	22.7	22.8	18.7	20.9	27.6	29.8	32.8
x58	28.3	26.0	27.4	25.5	22.6	22.1	22.7	22.5	18.5	20.9	27.4	29.7	32.7
x59	28.0	25.9	27.1	25.3	22.6	22.1	22.6	22.2	18.4	20.9	27.0	29.5	32.6
x60	27.6	25.7	26.8	25.2	22.6	22.2	22.7	22.0	18.3	21.0	27.1	29.3	32.8
x61	27.5	25.6	26.6	25.0	22.3	21.9	22.5	21.8	18.2	20.8	26.8	29.2	32.5
x62	27.7	26.0	27.0	25.6	22.8	22.5	23.2	22.3	18.8	21.4	27.4	29.8	33.3
x63	27.8	26.4	27.2	25.8	23.6	22.7	23.8	22.8	19.9	21.8	27.6	30.0	33.3
x64	27.6	26.7	27.2	25.8	24.0	22.7	24.1	22.8	20.5	21.9	27.3	29.8	33.0
x65	27.7	26.9	27.1	25.6	24.0	22.5	24.0	22.6	20.4	21.7	26.9	29.4	32.6
x66	27.9	27.6	27.3	25.7	24.4	22.6	24.2	22.5	20.7	21.8	26.9	29.5	32.8
x67	28.6	28.5	28.0	26.6	25.3	23.6	24.9	23.3	21.4	22.8	27.7	30.5	34.0
x68	28.4	28.3	27.8	26.3	25.0	23.4	24.6	23.0	21.2	22.4	27.4	30.1	33.6
x69	28.8	29.2	28.2	26.8	25.6	24.0	24.9	23.4	21.4	22.9	27.8	30.5	34.1
x70	28.8	29.7	28.4	27.1	25.9	24.4	25.3	23.7	22.1	23.3	27.9	30.8	34.4
x71	28.9	31.1	28.9	27.3	26.0	25.2	25.3	24.4	23.9	23.2	27.6	30.4	34.3
x72	29.1	32.0	29.0	27.6	26.3	25.7	25.4	24.5	24.0	23.4	27.6	30.3	34.2
x73	28.9	32.4	28.6	27.6	26.4	25.7	25.6	24.3	24.4	23.4	27.4	30.0	34.1
x74	28.8	34.6	28.4	28.3	28.1	26.9	26.4	24.4	25.5	23.8	27.2	30.0	34.0
x75	29.1	34.9	28.8	28.7	28.6	27.5	26.6	24.7	25.6	24.1	27.5	29.9	34.1
x76	29.6	37.1	28.8	29.5	30.1	28.6	27.6	25.4	26.4	25.2	28.5	30.6	34.6
x77	30.2	38.7	29.1	30.4	31.3	29.8	28.6	26.1	27.1	26.2	29.4	30.9	35.1
x78	30.9	40.1	29.4	31.2	32.6	30.8	29.2	26.8	27.8	27.1	30.0	31.9	36.0
x79	30.7	40.2	29.4	31.0	32.2	30.3	28.6	26.6	27.5	26.2	29.5	31.0	35.4
x80	31.0	40.9	29.4	31.2	32.6	30.4	28.8	26.8	27.7	26.3	29.7	31.2	35.7
x81	31.4	42.9	29.6	32.4	33.9	32.4	29.5	27.5	28.0	27.3	30.5	31.7	37.0
x82	32.1	48.0	29.3	34.4	35.9	35.9	30.1	28.1	27.6	28.0	31.5	31.4	38.1
x83	33.8	53.3	28.0	36.2	37.9	37.1	30.9	28.9	28.5	28.3	32.1	32.2	38.6
x84	33.7	51.4	28.3	35.7	36.9	36.2	30.6	28.8	28.0	27.9	32.0	32.2	38.6
x85	34.3	51.9	28.9	36.3	37.4	36.8	30.9	29.2	28.3	28.2	32.2	32.4	38.8
x86	33.9	53.0	28.7	36.5	37.7	36.8	30.6	29.2	28.2	27.8	32.2	32.1	38.9
x87	34.5	53.8	29.5	37.2	38.2	37.2	30.8	29.4	28.3	27.8	32.3	32.5	39.1
x88	34.7	58.1	31.5	40.6	40.7	39.4	30.3	30.0	27.4	27.5	33.2	32.9	39.6
x89	34.5	58.2	32.3	41.0	40.7	39.1	29.9	30.1	26.9	27.0	33.4	33.4	39.6
x90	34.2	55.5	32.2	39.7	39.5	37.8	29.5	30.0	26.6	26.8	33.4	33.5	39.7
x91	33.9	55.1	31.8	39.3	38.4	36.9	28.9	29.3	26.0	25.8	32.4	32.5	39.0
x92	34.5	53.9	32.4	38.7	37.4	36.2	28.5	29.4	25.9	25.6	32.3	32.1	39.1
x93	35.1	53.0	33.2	39.0	37.4	36.3	29.2	30.3	26.6	26.1	33.0	33.0	40.3
x94	35.0	51.4	33.3	38.2	35.7	35.1	28.6	29.7	26.0	25.3	32.5	32.2	39.4
x95	35.7	41.0	35.5	35.5	31.5	31.6	28.8	30.7	26.3	26.0	33.8	34.2	41.4
x96	36.0	35.4	36.9	34.3	29.1	29.9	29.2	31.2	26.4	26.3	34.8	35.3	42.0
x97	35.7	35.2	36.2	33.5	28.1	29.0	28.2	30.6	25.7	25.2	33.8	33.8	41.4
x98	35.8	35.3	36.3	33.2	28.9	28.7	28.3	30.9	26.1	25.3	34.1	34.7	41.8
x99	36.4	36.2	37.1	34.6	29.1	30.0	29.0	31.6	26.6	26.0	34.7	34.4	42.5
x00	36.0	35.7	36.3	32.9	28.5	28.5	27.6	30.6	25.6	24.4	33.1	33.2	41.2

Appendix Table A2.1 (cont.): Simulated Results for Breastfeeding Initiation 1976-1988

	b1976	b1977	b1978	b1979	b1980	b1981	b1982	b1983	b1984	b1985	b1986	b1987	b1988
x50	29.6	33.4	33.7	36.3	43.3	46.5	43.9	67.1	38.6	41.6	43.0	22.8	56.3
x51	31.2	35.2	35.1	38.5	45.2	48.4	45.9	69.3	41.1	43.8	45.3	24.4	59.2
x52	32.8	37.0	36.3	40.1	46.8	50.4	47.6	70.9	43.8	45.3	48.3	26.2	61.9
x53	32.9	37.3	36.5	40.2	46.9	50.5	47.9	70.8	44.3	45.6	48.8	26.4	62.1
x54	32.9	37.1	36.4	40.1	46.8	50.3	48.1	70.9	44.8	45.7	49.1	26.7	62.4
x55	33.4	37.7	36.9	40.6	47.4	50.9	48.6	71.1	45.5	46.2	49.8	27.2	63.1
x56	33.4	37.5	36.8	40.5	47.2	50.7	48.6	71.1	45.4	46.0	49.7	27.1	62.9
x57	33.3	37.2	36.8	40.1	47.1	50.5	48.3	70.5	45.1	45.6	49.4	27.0	62.5
x58	33.5	37.2	36.9	40.2	47.1	50.4	48.3	69.6	45.1	45.9	49.3	27.0	62.5
x59	33.5	37.0	36.8	40.1	46.9	50.2	48.1	68.5	44.8	45.5	49.0	27.0	62.3
x60	33.7	37.0	37.0	40.1	46.9	50.3	48.5	67.7	45.3	45.6	49.5	27.4	62.4
x61	33.2	36.6	36.7	39.8	46.6	50.1	48.1	67.5	44.6	45.3	48.9	27.1	62.0
x62	34.1	37.5	37.6	40.6	47.6	51.1	49.1	67.8	45.9	46.3	50.3	28.2	63.1
x63	34.1	38.0	37.9	41.2	48.0	51.4	49.7	68.3	46.7	46.8	51.2	28.8	63.8
x64	33.6	37.9	37.6	41.1	47.9	51.2	49.6	68.0	46.7	46.4	51.3	28.9	63.9
x65	33.2	37.4	37.2	40.7	47.5	50.7	49.2	67.9	46.3	45.8	50.8	28.8	63.4
x66	33.5	37.5	37.4	41.3	47.6	51.0	49.3	66.6	46.1	46.2	50.7	29.2	63.2
x67	34.9	38.8	38.6	42.8	48.9	52.4	50.5	66.8	47.3	47.7	52.0	30.5	64.5
x68	34.6	38.4	38.2	42.4	48.4	52.0	50.0	65.2	46.9	47.4	51.4	30.2	63.9
x69	35.1	38.9	38.5	42.9	48.8	52.4	50.3	64.6	47.2	47.8	51.6	30.7	64.0
x70	35.5	39.2	38.9	43.3	49.3	52.9	50.6	64.0	47.6	48.3	52.0	31.4	64.2
x71	35.6	39.0	38.8	43.4	49.1	52.6	50.4	61.8	47.3	48.2	51.5	32.0	63.1
x72	35.4	38.7	38.6	43.3	48.8	52.5	50.0	60.0	47.0	48.1	50.9	32.3	62.4
x73	35.4	38.5	38.7	43.3	48.7	52.3	50.1	59.0	46.8	48.1	50.8	32.7	61.9
x74	35.9	38.9	39.0	44.0	49.1	52.9	50.6	55.5	47.8	48.8	51.4	34.8	61.2
x75	36.0	39.1	38.9	44.1	48.9	52.8	50.5	53.9	47.7	48.7	51.4	34.8	61.2
x76	36.1	39.3	39.7	44.7	49.4	53.2	51.2	51.1	48.9	49.7	52.0	37.2	60.7
x77	36.5	39.6	40.3	45.4	49.7	53.5	51.7	47.3	49.8	50.6	52.7	38.9	60.6
x78	37.3	40.8	41.0	46.6	50.8	54.9	52.7	49.1	51.4	51.9	53.7	40.7	61.5
x79	36.5	40.1	39.9	45.8	49.9	53.8	51.7	48.5	50.2	50.6	52.9	39.3	60.6
x80	36.7	40.3	40.1	46.1	50.4	54.2	52.1	50.0	50.7	51.1	53.2	40.1	60.6
x81	38.0	41.3	40.9	47.3	51.1	55.7	53.2	46.9	52.3	52.4	54.4	42.8	60.9
x82	38.8	41.1	41.4	47.3	50.7	56.9	53.6	40.4	53.4	53.0	54.4	47.9	57.5
x83	37.9	40.5	42.7	47.0	51.9	57.1	55.1	56.9	54.9	54.2	54.2	54.0	53.4
x84	38.2	40.5	42.9	46.9	52.0	56.9	55.0	58.6	54.5	53.9	54.4	54.0	53.5
x85	38.4	41.1	42.8	47.3	52.4	57.4	55.1	59.2	54.9	54.2	55.0	54.3	54.4
x86	38.2	41.1	42.3	47.1	52.3	57.1	54.9	59.2	54.8	53.7	54.8	54.1	53.5
x87	38.8	41.7	42.5	47.4	52.8	57.5	54.7	60.0	54.9	53.8	55.2	54.2	54.2
x88	39.3	43.2	41.7	47.0	53.1	56.7	53.2	63.4	53.5	52.0	54.9	51.7	54.0
x89	39.7	44.0	41.4	46.8	53.6	56.7	52.7	65.6	53.5	51.5	55.5	50.4	54.5
x90	39.6	43.9	41.5	46.8	53.4	56.7	52.9	66.7	53.0	51.2	55.6	49.6	54.9
x91	38.5	42.7	40.3	45.8	52.6	55.9	51.9	66.1	51.9	50.1	54.5	48.6	54.6
x92	38.3	42.7	39.8	45.7	52.5	55.4	51.4	67.0	51.1	49.5	54.2	46.7	55.3
x93	40.0	44.3	41.1	47.4	54.1	57.0	52.9	68.8	52.9	51.4	56.4	47.9	57.7
x94	38.9	43.2	40.2	46.1	53.0	55.8	51.7	68.4	50.9	50.1	54.8	45.7	56.8
x95	41.3	45.8	42.9	48.5	55.4	58.3	54.1	75.3	52.2	52.3	58.7	44.9	62.8
x96	42.5	47.3	44.4	49.3	56.5	59.6	55.3	78.3	52.8	53.4	60.8	43.8	66.2
x97	41.0	45.7	42.7	48.2	55.2	58.2	54.1	77.6	51.0	51.7	59.1	42.6	64.6
x98	41.5	46.5	42.9	49.0	55.8	59.3	54.5	78.3	51.8	52.0	59.9	42.5	65.4
x99	42.1	47.2	43.5	49.3	56.4	59.3	55.1	78.5	52.5	52.8	60.8	42.8	66.7
x00	40.5	45.5	41.2	48.1	54.8	58.0	53.3	77.7	50.9	50.5	58.9	41.1	64.9

Appendix Table A2.1 (cont.): Simulated Results for Breastfeeding Initiation 1989-2000

	b1989	b1990	b1991	b1992	b1993	b1994	b1995	b1996	b1997	b1998	b1999	b2000
x50	47.3	58.1	57.1	50.9	43.1	58.9	57.4	46.2	58.6	62.3	60.8	64.8
x51	48.8	59.8	58.7	52.6	44.9	59.7	58.6	47.7	59.6	63.1	62.0	65.5
x52	50.4	61.1	60.6	53.9	46.5	60.6	59.7	49.4	60.8	64.1	63.4	66.0
x53	50.9	61.2	61.0	54.4	46.8	60.9	60.0	49.6	61.0	64.5	63.5	66.0
x54	51.0	60.9	61.1	54.6	46.7	60.8	59.7	49.6	60.6	64.1	63.2	65.4
x55	51.4	61.2	61.6	55.0	47.2	61.0	59.8	50.2	60.8	64.4	63.6	65.5
x56	51.2	61.0	61.4	54.8	47.0	60.8	59.6	50.1	60.6	64.0	63.2	65.2
x57	50.8	60.5	61.2	54.4	46.7	60.5	58.9	50.1	60.2	63.4	62.9	64.9
x58	51.0	60.4	61.0	54.4	46.6	60.4	58.9	50.0	60.1	63.3	62.9	64.8
x59	50.6	60.1	60.8	54.1	46.5	60.1	58.3	50.2	59.8	62.7	62.6	64.5
x60	50.9	60.1	61.2	54.3	46.7	60.2	58.1	50.5	59.8	62.7	62.5	64.1
x61	50.4	59.9	61.0	53.9	46.4	60.1	57.9	50.1	59.7	62.3	62.5	64.2
x62	51.4	60.7	62.1	54.8	47.3	60.8	58.4	51.0	60.4	63.0	63.3	64.6
x63	51.9	61.3	62.7	55.3	47.9	61.2	59.0	51.5	60.9	63.5	63.8	65.0
x64	51.6	61.3	62.9	55.1	48.0	61.1	58.7	51.7	60.9	63.4	63.8	64.8
x65	51.2	60.7	62.4	54.6	47.6	60.7	58.3	51.5	60.5	63.1	63.5	64.4
x66	51.1	61.3	62.4	54.5	47.9	60.8	58.5	51.7	60.9	63.1	63.7	64.9
x67	52.1	62.3	63.3	55.3	49.2	61.3	59.1	52.9	61.8	63.8	64.6	65.6
x68	51.8	61.9	62.9	55.0	48.7	61.1	59.1	52.3	61.5	63.5	64.3	65.5
x69	52.0	62.2	62.9	55.2	49.2	61.2	59.2	52.8	61.7	63.9	64.5	65.8
x70	52.2	62.4	63.2	55.4	49.6	61.4	59.3	53.1	62.0	64.0	64.9	66.0
x71	51.9	61.9	62.6	55.1	49.5	61.0	58.9	53.2	61.8	63.8	64.4	65.8
x72	51.6	61.6	62.1	54.8	49.6	60.7	58.9	53.0	61.7	64.0	64.5	65.9
x73	51.6	61.5	62.1	54.6	49.6	60.7	58.7	53.1	61.8	63.7	64.5	65.8
x74	51.9	61.5	62.1	55.0	50.4	60.8	59.2	53.5	62.2	64.3	64.8	66.2
x75	51.9	61.5	61.9	54.9	50.6	60.7	59.1	53.9	62.3	64.8	64.9	66.1
x76	52.1	61.1	61.9	54.9	51.2	60.6	59.3	54.2	62.6	64.2	65.3	66.3
x77	52.7	60.9	62.0	54.9	51.9	60.8	59.7	54.7	63.1	64.3	65.9	66.5
x78	53.5	61.9	62.6	56.3	53.2	61.2	60.7	55.4	63.7	65.6	66.6	67.3
x79	52.9	61.1	61.9	55.5	52.4	60.9	60.2	54.8	63.3	65.4	66.0	66.8
x80	53.1	61.3	62.2	55.7	52.8	61.1	60.5	54.9	63.5	65.5	66.3	67.0
x81	54.0	61.7	62.8	56.7	54.3	61.5	61.1	56.0	64.2	66.5	67.1	67.4
x82	53.8	60.3	61.8	56.3	55.4	61.0	61.2	56.5	64.6	66.8	67.5	67.5
x83	53.6	58.6	60.5	56.6	56.5	60.4	61.3	56.8	64.8	66.9	67.5	67.5
x84	53.5	57.8	60.4	56.2	55.9	60.0	60.7	57.1	64.8	66.4	67.4	67.1
x85	53.9	58.3	60.8	56.8	56.6	60.3	61.3	57.5	65.2	67.5	68.1	67.5
x86	53.7	57.7	60.5	56.9	56.5	60.1	61.0	57.2	65.0	67.4	67.5	67.1
x87	53.8	57.3	60.5	56.5	56.7	60.0	61.1	57.6	65.3	67.5	68.1	67.4
x88	52.7	54.7	58.1	55.6	57.3	58.4	60.3	58.3	65.6	67.6	67.8	66.9
x89	52.8	54.0	58.0	56.0	57.1	58.3	60.4	58.2	65.5	67.9	67.6	66.7
x90	52.6	54.8	58.4	56.0	56.5	58.3	60.1	58.3	65.5	67.4	67.2	66.6
x91	51.9	53.9	58.2	55.1	55.9	58.1	59.5	57.5	65.1	66.9	67.2	66.3
x92	52.0	54.5	58.4	55.1	55.6	58.2	59.2	57.6	64.7	67.5	66.8	66.0
x93	53.9	56.0	60.3	56.4	56.6	59.5	60.6	58.5	66.0	68.3	68.2	66.8
x94	53.0	55.5	59.7	55.5	55.5	59.2	59.9	57.8	65.5	68.4	67.7	66.5
x95	56.0	59.9	64.3	58.1	55.8	61.6	61.0	60.4	67.2	69.9	69.3	67.4
x96	57.8	62.2	67.0	59.5	55.9	63.2	62.0	61.6	68.3	71.2	70.5	68.2
x97	56.5	61.2	66.0	58.4	55.0	62.5	60.8	60.9	67.5	70.6	69.5	67.3
x98	56.8	62.7	66.7	58.9	55.1	62.9	61.6	60.8	67.8	70.5	69.5	68.0
x99	58.1	62.8	67.6	59.7	56.5	63.7	61.9	61.9	68.2	72.1	70.5	67.8
x00	56.0	61.6	66.0	58.0	54.4	62.3	60.8	60.2	66.9	70.5	68.8	67.0

Appendix Table A2.2 Simulated Results for Breastfeeding at Least 6 Months 1950-1962

	b1950	b1951	b1952	b1953	b1954	b1955	b1956	b1957	b1958	b1959	b1960	b1961	b1962
x50	21.4	18.3	15.5	17.4	13.9	11.4	11.4	11.0	8.7	9.4	8.0	7.8	6.9
x51	20.4	17.7	14.9	16.6	13.0	10.7	10.8	10.5	8.4	8.9	7.5	7.6	6.9
x52	20.5	18.2	15.4	16.9	13.4	10.9	11.2	11.2	9.1	9.2	7.2	7.6	7.0
x53	21.1	18.6	15.7	17.3	14.1	11.4	11.7	11.6	9.6	9.4	7.2	7.7	7.1
x54	20.7	18.0	15.2	16.7	13.7	11.0	11.2	11.2	9.4	9.1	6.8	7.5	6.9
x55	20.7	17.7	15.1	16.4	13.3	10.7	10.9	11.0	9.3	9.0	6.8	7.5	7.0
x56	20.3	16.9	14.5	15.8	12.8	10.1	10.3	10.5	8.9	8.6	6.6	7.4	6.9
x57	20.5	16.8	14.5	15.6	12.5	9.9	10.0	10.4	8.8	8.6	6.7	7.4	6.9
x58	20.4	16.0	13.9	14.9	11.7	9.4	9.3	9.8	8.2	8.3	6.7	7.4	6.9
x59	20.2	15.4	13.6	14.5	11.1	9.0	8.7	9.3	7.9	8.0	6.7	7.3	6.9
x60	20.5	15.1	13.2	14.2	10.7	9.0	8.4	9.3	7.8	7.9	6.7	7.4	7.0
x61	20.5	15.0	13.5	14.3	10.8	9.0	8.5	9.3	7.9	7.9	6.6	7.3	6.9
x62	20.7	14.8	13.4	14.1	10.6	9.0	8.3	9.4	7.9	8.0	6.6	7.3	7.1
x63	21.0	14.7	13.2	13.7	10.4	9.1	8.3	9.2	8.2	8.0	6.4	7.4	7.2
x64	21.3	14.7	13.1	13.5	10.2	9.2	8.2	9.2	8.4	8.0	6.4	7.5	7.4
x65	21.8	14.7	13.2	13.3	10.3	9.1	8.3	9.1	8.5	8.0	6.2	7.4	7.5
x66	21.8	14.3	13.0	12.8	9.7	8.6	7.8	8.7	8.4	7.8	5.9	7.3	7.4
x67	21.3	14.4	12.8	12.5	9.2	8.4	7.5	8.6	8.3	7.8	5.9	7.2	7.7
x68	21.5	14.3	12.9	12.5	9.1	8.4	7.5	8.6	8.3	7.8	5.8	7.2	7.6
x69	21.3	14.6	12.8	12.4	8.8	8.2	7.4	8.6	8.2	7.8	5.9	7.3	7.8
x70	21.3	14.3	12.8	12.2	8.6	8.0	7.2	8.4	8.2	7.7	5.8	7.1	7.8
x71	21.4	14.1	12.5	11.4	8.4	7.2	7.1	7.8	8.3	7.5	5.3	6.8	7.6
x72	21.7	14.4	12.8	11.5	8.3	7.3	7.2	7.9	8.5	7.7	5.3	6.8	7.8
x73	21.6	14.3	12.8	11.5	8.1	7.1	7.0	7.9	8.3	7.6	5.2	6.6	7.8
x74	21.3	14.0	12.8	11.6	8.0	6.9	6.9	8.1	8.2	7.5	5.1	6.6	8.2
x75	21.7	14.7	12.8	11.7	7.7	7.2	6.8	8.3	8.4	7.8	5.3	6.7	8.7
x76	22.8	15.5	12.4	10.9	6.9	7.6	6.5	8.0	8.6	8.0	5.0	6.5	9.2
x77	23.9	16.2	12.2	10.6	6.4	8.0	6.2	8.0	8.8	8.3	5.0	6.6	9.7
x78	23.1	15.9	12.0	10.4	6.4	7.8	6.2	7.8	8.7	8.1	4.8	6.5	9.9
x79	24.0	16.2	12.0	10.4	6.7	8.2	6.5	8.0	9.1	8.2	5.0	7.0	9.8
x80	24.0	16.1	12.0	10.3	6.8	8.1	6.6	7.9	9.1	8.2	4.8	6.9	9.8
x81	24.0	16.3	11.9	10.2	6.3	8.1	6.3	8.1	9.1	8.2	4.6	6.7	10.6
x82	24.9	16.6	12.1	10.6	7.1	8.7	6.8	8.5	9.6	8.6	4.1	6.3	11.6
x83	24.7	16.1	11.9	10.5	10.1	8.9	8.5	7.8	10.2	8.6	3.3	5.6	11.2
x84	24.7	16.2	12.0	10.6	10.1	8.9	8.5	7.8	10.1	8.7	3.5	5.6	10.8
x85	25.2	16.4	12.2	10.7	10.3	9.3	8.7	8.1	10.5	8.9	3.6	5.9	11.3
x86	25.4	16.3	11.9	10.4	10.3	9.2	8.7	7.9	10.5	8.6	3.7	6.3	10.7
x87	26.0	16.7	12.3	10.5	10.4	9.3	8.9	8.1	10.8	8.9	4.2	6.8	10.6
x88	26.0	17.5	12.4	11.0	10.5	9.7	9.2	8.3	11.0	9.2	6.0	8.5	9.1
x89	26.5	17.1	12.3	10.7	10.7	9.7	9.1	8.3	11.1	9.1	6.6	9.3	8.7
x90	25.5	16.9	12.0	10.8	10.5	9.4	8.9	8.2	10.7	9.0	6.5	9.0	8.4
x91	26.9	17.1	12.7	10.8	10.6	9.9	9.3	8.5	11.3	9.1	6.5	9.2	8.5
x92	27.2	17.7	12.5	10.6	10.8	9.9	9.4	8.4	11.5	9.1	6.7	9.6	8.7
x93	27.7	17.4	12.4	10.4	10.7	10.0	9.3	8.5	11.6	9.2	6.6	9.8	8.9
x94	28.6	18.2	13.0	10.9	11.2	10.4	9.8	8.7	12.0	9.5	6.9	9.9	8.9
x95	27.9	17.8	12.6	10.9	10.9	10.3	9.4	8.8	11.7	9.6	7.0	9.8	9.2
x96	28.3	17.5	12.8	11.3	11.1	10.8	9.3	9.2	11.8	10.0	7.3	9.8	9.5
x97	28.7	17.9	12.8	11.1	11.1	11.0	9.6	9.2	12.1	9.9	7.2	10.1	9.4
x98	27.5	17.3	12.4	10.8	10.8	10.3	9.4	9.0	11.8	9.5	7.0	10.2	9.2
x99	29.5	18.0	12.6	11.0	11.4	11.4	9.7	9.5	12.6	10.0	7.5	10.8	10.0
x00	28.7	17.9	12.4	10.5	11.2	10.7	9.8	9.2	12.5	9.6	7.2	10.9	9.6

Appendix Table A2.2 (cont.): Simulated Results for Breastfeeding at Least 6 Months 1963-1975

	b1963	b1964	b1965	b1966	b1967	b1968	b1969	b1970	b1971	b1972	b1973	b1974	b1975
x50	6.3	6.1	3.9	4.7	4.1	3.2	4.0	3.0	4.0	3.3	0.8	13.2	13.0
x51	6.1	6.0	4.1	4.7	4.2	3.3	4.1	3.0	4.0	3.4	0.9	13.9	13.8
x52	6.1	6.2	4.6	4.7	4.4	3.5	4.4	3.3	4.3	3.5	1.0	14.5	14.2
x53	6.1	6.3	4.8	4.8	4.5	3.6	4.5	3.5	4.4	3.7	1.0	14.8	14.4
x54	6.0	6.1	4.8	4.7	4.5	3.6	4.5	3.6	4.4	3.8	1.1	14.7	14.5
x55	6.0	6.2	4.9	4.7	4.6	3.7	4.6	3.6	4.4	3.8	1.2	14.5	14.2
x56	6.1	6.1	5.1	4.7	4.7	3.8	4.7	3.7	4.5	3.9	1.3	14.2	14.0
x57	6.1	6.1	5.1	4.7	4.7	3.8	4.6	3.7	4.5	3.8	1.3	14.1	13.9
x58	6.1	6.1	5.1	4.8	4.8	3.8	4.7	3.7	4.5	3.9	1.3	14.2	13.9
x59	6.1	6.1	5.1	4.7	4.8	3.8	4.7	3.7	4.5	3.8	1.4	13.5	13.2
x60	6.2	6.1	5.3	4.8	5.0	3.9	4.8	3.9	4.6	4.1	1.5	13.6	13.4
x61	6.1	6.1	5.0	4.7	4.8	3.8	4.7	3.8	4.5	3.9	1.5	13.3	13.1
x62	6.2	6.2	5.2	4.8	5.0	4.0	4.9	3.9	4.7	4.1	1.6	13.8	13.5
x63	6.6	6.6	5.6	5.2	5.4	4.3	5.6	4.5	5.2	4.6	2.1	13.8	13.5
x64	7.0	6.9	5.9	5.6	5.8	4.7	6.0	5.0	5.6	5.0	2.6	13.3	13.2
x65	7.0	7.0	6.1	5.8	5.9	4.8	6.1	5.1	5.6	5.0	2.7	12.9	12.8
x66	6.9	7.1	6.7	5.8	6.0	4.8	6.1	5.1	5.7	4.9	3.2	12.1	12.0
x67	6.8	7.5	6.8	5.9	6.2	5.0	6.3	5.2	5.8	5.0	3.4	12.6	12.6
x68	6.8	7.5	6.8	5.8	6.2	4.9	6.1	5.1	5.7	4.9	3.4	12.3	12.3
x69	6.7	7.9	7.0	5.8	6.3	5.0	6.2	5.1	5.8	5.0	3.4	12.5	12.6
x70	6.7	8.1	7.1	5.8	6.4	5.0	6.3	5.3	5.9	5.1	3.8	12.4	12.4
x71	6.3	8.8	7.2	5.5	6.4	5.0	6.2	6.1	6.1	5.3	4.6	11.3	11.5
x72	6.3	9.6	7.5	5.7	6.6	5.0	6.3	6.1	6.2	5.4	4.9	11.2	11.4
x73	6.4	10.0	7.5	6.0	7.0	5.1	6.5	6.4	6.4	5.6	5.9	10.3	10.7
x74	6.7	12.2	8.3	6.7	8.3	5.6	7.4	7.4	7.2	6.4	8.8	9.5	9.7
x75	6.9	12.8	8.7	7.0	8.6	6.0	7.6	7.5	7.4	6.6	9.0	9.6	9.9
x76	7.0	15.8	9.5	8.2	9.9	6.7	8.6	8.1	8.0	7.8	9.5	10.9	12.0
x77	7.1	17.8	10.3	9.1	10.8	7.4	9.3	8.6	8.6	8.6	9.9	11.9	13.6
x78	6.9	19.1	10.6	9.3	11.2	7.5	9.7	8.8	8.7	9.1	10.2	12.7	14.2
x79	7.3	19.3	11.1	9.4	11.4	7.6	9.5	8.9	8.8	9.0	10.2	12.3	14.0
x80	7.1	20.0	11.1	9.5	11.5	7.5	9.5	9.0	8.8	9.1	10.2	12.5	14.2
x81	6.3	23.3	11.4	9.4	12.4	7.6	9.2	8.7	8.6	9.5	9.9	13.0	14.9
x82	5.2	31.4	11.7	10.6	14.3	7.6	9.6	8.8	8.8	10.7	10.0	14.1	16.0
x83	4.2	38.6	11.4	13.5	15.9	7.1	10.7	9.7	9.7	12.4	10.2	15.8	17.6
x84	4.2	35.0	10.9	12.6	14.7	6.9	10.1	9.2	9.2	11.3	8.7	16.0	17.9
x85	4.3	35.1	11.2	12.8	14.8	7.1	10.2	9.2	9.3	11.5	8.7	16.4	18.2
x86	4.5	37.6	12.6	13.0	15.6	7.0	10.1	9.5	9.4	11.7	8.6	16.6	18.6
x87	4.7	39.4	14.1	13.2	15.8	7.0	9.8	9.2	9.3	11.1	8.1	17.1	19.1
x88	5.7	45.1	20.7	13.7	16.9	6.7	9.2	8.8	9.3	10.5	6.6	19.6	21.2
x89	6.1	43.2	22.0	13.1	16.3	6.5	8.9	8.6	9.2	10.3	5.6	21.1	22.5
x90	6.0	38.6	19.8	11.9	14.9	6.4	8.5	8.3	8.8	9.6	5.0	20.9	22.3
x91	6.0	37.2	19.1	11.6	14.0	6.1	7.9	7.8	8.3	8.8	4.5	20.2	21.7
x92	6.1	33.6	18.1	10.8	13.1	6.1	7.5	7.6	8.1	8.3	3.9	19.8	21.7
x93	6.1	31.2	17.6	10.5	12.7	6.3	7.5	7.6	8.2	8.2	3.7	21.2	23.1
x94	6.2	26.0	15.5	9.5	10.9	5.9	6.7	6.8	7.4	7.0	2.9	19.8	21.7
x95	6.2	11.6	9.9	6.5	6.9	5.8	5.8	5.8	6.4	5.3	1.5	21.9	23.5
x96	6.4	8.4	8.5	5.9	5.9	5.9	5.9	5.6	6.3	5.2	1.2	23.5	24.5
x97	6.4	8.3	8.3	5.7	5.8	5.7	5.4	5.4	6.1	4.8	1.1	22.2	23.8
x98	6.4	8.2	8.2	5.4	5.8	5.7	5.5	5.6	6.1	4.9	1.1	22.8	24.0
x99	6.6	8.6	8.9	6.0	6.2	6.2	5.7	5.8	6.4	5.3	1.2	23.4	25.0
x00	6.6	8.4	8.5	5.5	6.0	5.9	5.3	5.6	6.1	4.8	1.1	22.2	23.9

Appendix Table A2.2 (cont.): Simulated Results for Breastfeeding at Least 6 Months 1976-1988

	b1976	b1977	b1978	b1979	b1980	b1981	b1982	b1983	b1984	b1985	b1986	b1987	b1988
x50	9.8	16.3	18.6	18.6	20.6	17.5	17.4	28.3	10.6	20.2	19.1	20.0	27.4
x51	10.3	17.2	19.1	19.5	21.9	19.0	18.5	29.8	11.4	20.9	19.8	20.8	28.7
x52	10.4	18.1	19.8	20.2	22.9	20.3	19.6	31.1	12.2	21.3	20.7	21.7	29.9
x53	10.5	18.5	20.2	20.7	23.4	20.4	19.9	31.4	12.6	21.5	21.1	22.3	30.2
x54	10.3	18.8	20.4	20.9	23.8	20.7	20.4	32.1	13.0	21.6	21.5	23.0	30.7
x55	9.9	19.0	20.4	20.9	23.9	21.0	20.4	32.4	13.1	21.6	21.6	23.0	30.9
x56	9.4	19.2	20.8	21.2	24.2	21.3	20.7	32.8	13.3	21.6	22.0	23.5	31.2
x57	9.3	19.1	20.7	21.0	24.1	21.3	20.3	32.8	13.2	21.5	21.9	23.3	31.1
x58	9.4	19.3	20.9	21.3	24.4	21.6	20.1	33.1	13.5	21.8	22.1	23.6	31.2
x59	8.7	19.0	20.6	20.9	24.0	21.3	19.6	33.0	13.4	21.6	22.1	23.4	31.2
x60	8.9	19.3	21.0	21.3	24.3	21.5	19.8	33.6	13.8	21.7	22.7	24.1	31.8
x61	8.6	18.8	20.6	20.8	23.9	21.2	19.4	33.1	13.5	21.6	22.2	23.2	31.5
x62	9.0	19.4	21.3	21.5	24.7	22.0	20.0	33.9	14.2	22.2	23.0	23.8	32.3
x63	9.4	19.6	21.1	21.1	24.2	19.0	20.5	34.3	14.6	22.5	23.3	24.1	33.0
x64	9.5	19.3	20.6	20.4	23.4	16.5	20.6	34.6	14.7	22.2	23.6	24.1	33.2
x65	9.1	19.1	20.3	20.0	23.0	15.9	20.5	34.1	14.5	21.7	23.1	23.4	32.8
x66	8.3	18.5	19.8	19.7	22.4	15.7	19.8	33.5	14.3	21.5	22.7	22.2	32.7
x67	8.8	19.1	20.2	20.4	23.0	17.0	20.0	34.2	14.8	21.9	23.2	22.2	33.4
x68	8.6	18.8	19.9	20.1	22.7	16.9	19.3	33.6	14.6	21.7	22.7	21.8	32.9
x69	8.9	19.0	20.0	20.5	22.9	17.7	19.0	33.7	14.7	21.7	22.8	21.7	32.8
x70	8.8	18.9	20.0	20.4	23.0	17.8	18.8	33.8	14.9	22.0	22.8	21.4	32.9
x71	7.8	18.6	19.6	20.2	22.4	17.6	18.0	33.1	14.8	21.3	22.3	20.5	32.1
x72	7.9	18.2	19.1	19.8	21.9	17.3	17.5	32.2	14.6	21.1	21.8	19.5	31.5
x73	7.1	17.7	18.7	19.3	21.2	16.1	17.0	31.7	14.6	20.8	21.5	18.7	31.2
x74	6.1	17.9	18.7	19.4	21.2	15.7	16.6	31.2	15.5	20.9	21.5	18.2	31.0
x75	6.7	17.7	18.2	19.2	20.5	15.1	16.0	30.9	15.3	20.4	21.4	17.8	30.8
x76	10.7	17.4	17.9	18.5	19.9	13.3	15.7	30.2	16.2	20.7	21.3	17.0	30.3
x77	13.8	17.6	17.9	18.7	19.8	13.0	15.4	30.1	17.0	21.0	21.6	16.6	30.5
x78	14.5	18.4	18.4	19.5	20.9	14.2	16.3	30.7	17.9	21.6	21.7	17.0	30.9
x79	13.9	18.1	18.0	19.1	20.3	13.1	15.9	30.5	17.4	20.9	21.5	17.2	30.3
x80	14.0	18.1	18.2	19.2	20.7	13.6	16.4	30.3	17.7	20.8	21.3	16.9	30.1
x81	14.7	18.1	18.2	20.1	21.7	17.9	15.8	29.4	18.8	20.5	21.2	15.7	29.6
x82	15.8	18.3	19.2	21.3	23.6	24.9	17.3	26.9	20.8	20.5	20.8	13.4	28.3
x83	16.4	19.5	21.2	22.1	26.2	27.2	24.5	25.5	23.0	21.1	20.7	12.4	27.4
x84	16.4	19.5	21.3	22.0	26.2	27.3	24.5	26.1	22.3	21.1	21.1	12.9	27.5
x85	16.5	19.9	21.2	22.3	26.5	27.4	24.8	26.6	22.4	21.2	21.2	13.1	27.9
x86	16.5	20.1	21.6	22.5	26.8	27.2	24.6	27.2	22.6	21.0	21.4	14.2	27.0
x87	16.5	20.2	21.6	22.3	26.8	27.3	24.0	27.8	22.0	20.8	21.3	14.9	26.0
x88	17.0	21.6	22.9	23.5	27.5	27.3	23.9	31.7	21.0	21.6	23.9	20.6	24.2
x89	17.8	22.9	24.3	24.7	29.0	28.0	24.3	33.9	21.3	22.6	25.0	23.8	24.7
x90	17.9	22.7	24.3	24.5	28.7	28.0	24.4	34.3	20.7	22.5	25.3	23.9	25.6
x91	17.0	21.6	23.1	23.4	27.9	26.7	23.5	33.6	19.8	21.7	24.3	22.6	25.1
x92	16.6	21.6	22.9	23.3	27.6	26.5	23.1	33.9	18.8	20.7	23.9	22.5	25.3
x93	17.6	22.8	24.0	24.5	29.4	28.2	24.2	35.4	19.8	21.7	24.7	23.3	26.8
x94	16.3	21.5	22.7	23.2	27.5	26.2	22.7	34.1	17.5	20.5	23.5	21.8	26.2
x95	18.1	23.4	24.7	25.2	29.8	29.0	24.7	38.4	16.9	21.9	25.8	23.8	32.2
x96	19.4	25.0	26.2	26.8	31.4	30.3	26.1	40.5	17.3	23.7	27.5	25.5	35.3
x97	18.3	23.6	24.9	25.6	30.1	28.9	25.2	39.7	16.4	22.1	26.6	24.3	34.2
x98	19.0	24.0	25.5	26.1	30.8	29.8	25.6	40.3	16.9	22.5	26.7	25.0	35.0
x99	19.1	25.0	25.9	27.0	31.6	30.0	26.3	41.2	17.3	22.5	27.6	25.5	35.4
x00	18.2	23.7	24.6	25.5	30.3	28.9	25.1	40.0	16.5	20.9	25.9	24.6	34.1

Appendix Table A2.2 (cont.): Simulated Results for Breastfeeding at Least 6 Months 1989-2000

	b1989	b1990	b1991	b1992	b1993	b1994	b1995	b1996	b1997	b1998	b1999	b2000
x50	21.9	29.2	28.8	23.4	20.8	26.0	31.6	18.3	32.9	34.0	24.5	32.1
x51	22.5	31.0	29.3	23.9	21.7	27.2	31.4	18.9	33.5	33.9	25.4	32.8
x52	23.1	32.1	29.9	24.5	22.3	28.1	31.7	19.5	34.1	33.9	26.4	33.1
x53	23.5	32.5	30.4	25.2	22.6	28.4	32.4	19.9	34.6	34.3	26.7	33.3
x54	23.9	33.3	30.5	25.8	22.8	28.8	32.5	20.0	35.1	34.2	26.7	33.2
x55	24.0	33.4	30.5	25.8	22.9	29.0	32.4	20.3	35.1	34.2	26.9	33.3
x56	24.1	33.6	30.6	26.2	22.9	29.1	32.5	20.5	35.2	33.8	26.8	33.0
x57	24.1	33.2	30.4	26.0	22.8	29.0	32.4	20.6	35.1	33.7	26.7	32.8
x58	24.3	33.5	30.7	26.2	23.1	29.2	32.6	20.9	35.2	33.8	26.9	32.9
x59	24.2	33.2	30.4	26.1	22.9	29.0	32.4	20.7	35.2	33.6	26.7	32.6
x60	24.8	33.9	30.9	27.0	23.1	29.4	33.0	21.2	35.8	33.8	26.8	32.6
x61	24.5	33.4	30.6	26.4	23.0	29.1	32.6	20.8	35.5	33.8	26.7	32.6
x62	25.2	34.2	31.3	27.1	23.6	29.7	33.2	21.5	36.3	34.2	27.4	33.0
x63	25.6	35.1	31.7	27.6	24.0	30.2	33.5	21.6	36.8	34.6	27.9	33.4
x64	25.7	35.2	31.6	27.7	23.9	30.4	33.4	21.6	37.0	34.6	28.0	33.4
x65	25.4	34.7	31.3	27.5	23.6	30.2	33.1	21.5	36.7	34.5	27.9	33.2
x66	25.1	34.5	31.1	26.8	23.5	29.9	32.6	21.4	36.3	34.1	27.6	33.1
x67	25.4	35.0	31.4	26.8	24.0	30.3	32.4	22.1	36.5	34.0	28.2	33.3
x68	25.1	34.7	31.2	26.5	23.8	29.9	32.4	21.8	36.3	33.9	28.0	33.3
x69	25.0	34.6	31.2	26.4	23.9	29.8	32.2	22.1	36.2	33.8	28.1	33.4
x70	25.1	34.5	31.2	26.3	24.0	29.7	32.2	22.4	36.2	33.9	28.3	33.5
x71	24.6	33.7	30.6	25.9	23.5	28.8	31.8	22.5	35.8	33.3	27.8	33.0
x72	24.2	33.0	30.2	25.3	23.3	28.3	31.5	22.4	35.5	33.4	27.8	33.1
x73	24.1	32.6	29.9	24.9	23.0	27.8	31.4	22.4	35.4	33.2	27.5	32.8
x74	24.1	32.6	30.0	25.1	23.1	27.1	31.7	22.8	35.7	33.4	28.0	33.3
x75	23.8	32.3	29.6	25.1	22.9	27.1	31.5	22.9	35.6	33.4	28.0	33.1
x76	23.8	31.7	29.0	24.4	22.7	25.8	31.5	23.1	35.6	33.1	28.2	33.0
x77	24.2	31.8	29.4	24.4	23.0	25.7	32.0	23.8	36.1	33.3	28.8	33.3
x78	24.4	32.8	29.5	24.8	23.6	25.9	32.1	24.1	36.5	33.7	29.6	34.2
x79	24.1	32.4	29.4	24.9	23.1	25.5	32.2	23.8	36.4	33.7	29.1	33.9
x80	24.1	32.4	29.4	24.8	23.1	25.2	32.2	23.8	36.5	33.7	29.3	34.1
x81	24.0	32.1	28.7	24.6	22.9	24.3	32.3	24.3	36.9	33.8	29.6	34.2
x82	23.7	30.5	27.7	24.0	22.2	21.6	33.0	24.9	37.4	34.3	30.3	34.4
x83	23.7	29.6	26.5	23.7	22.0	19.4	33.3	25.3	37.9	34.6	30.7	34.6
x84	23.7	29.1	26.2	23.2	22.0	19.9	32.4	25.2	37.2	33.7	30.6	33.8
x85	23.9	29.7	26.5	23.5	22.4	20.6	32.4	25.4	37.6	34.5	31.5	34.6
x86	23.6	29.2	26.1	23.8	21.9	19.5	32.7	25.4	37.7	34.2	30.9	34.2
x87	23.1	28.0	25.3	22.5	21.5	18.8	31.8	25.3	36.9	33.8	31.1	34.2
x88	22.1	25.5	22.9	20.9	20.2	16.5	30.4	25.3	36.1	32.9	30.8	32.9
x89	22.7	26.2	23.7	21.9	20.9	17.0	31.0	25.7	36.6	33.3	31.5	33.4
x90	22.8	26.8	23.9	22.2	20.9	17.8	30.6	25.4	36.3	32.6	30.9	32.8
x91	22.7	26.4	23.7	21.4	20.7	18.0	30.1	24.8	36.2	32.9	30.9	32.9
x92	22.5	26.7	24.3	22.2	20.8	19.0	30.1	25.1	35.9	32.8	30.4	32.7
x93	23.8	28.6	25.9	23.1	22.3	20.6	30.9	26.1	36.9	33.4	31.8	33.7
x94	23.1	27.5	25.7	22.5	21.7	21.3	29.9	25.2	35.7	33.1	30.9	33.0
x95	26.1	32.4	30.1	25.8	25.3	29.1	29.9	27.0	36.6	33.3	32.8	33.2
x96	28.0	34.8	32.7	27.8	27.3	32.8	31.1	28.2	37.8	34.6	34.5	34.2
x97	27.3	34.2	31.8	27.4	26.4	32.1	30.3	27.4	37.4	34.1	33.3	33.4
x98	27.3	35.4	32.6	28.0	26.7	32.4	30.7	27.1	37.5	33.9	33.5	34.1
x99	28.3	35.9	33.4	29.1	27.5	33.5	31.8	28.8	38.9	35.4	34.5	34.6
x00	26.9	35.2	32.4	28.4	26.2	32.5	30.7	27.1	37.5	34.0	33.1	34.1

Chapter 3: Breastfeeding and Employment in the United States: Do Workplace Lactation Support Laws affect Behavior?

3.1 Introduction

The medical consensus on infant feeding is that "breast is best." The marginal benefit of breastfeeding over formula feeding may not be as dramatic as what is implied by the observational studies in terms of health outcomes, especially in the context of a developed country such as the U.S., but boosting breastfeeding initiation rates and duration is nonetheless a focus of public health organizations, both nationally and globally. While breastfeeding rates in the U.S. are at historically high levels (Baker 2016a), they still fall short of government targets, such as the U.S. Department of Health and Human Services' *Healthy People 2020* objectives (2015).[13]

One commonly cited barrier to breastfeeding is maternal employment. During a maternity leave, if the mother is the primary caregiver, the time commitment for breastfeeding and formula-feeding are similar. While a mother is working and any other time a mother must be away from her baby for feedings, the difference in time commitment for exclusively breastfeeding versus formula-feeding becomes more significant. A mother who is exclusively breastfeeding has to take the time to pump milk for every feeding she misses, something she would not have to do if the baby received formula for missed feedings instead. Interruptions to the workday for pumping could

[13] *Healthy People 2020* targets 81.9% for breastfeeding initiation, 60.6% for breastfed at 6 months, 34.1% for breastfed at 1 year, 46.2% for breastfed exclusively through 3 months, and 25.5% for breastfed exclusively through 6 months (DHHS 2015).

be costly for some mothers, particularly those without flexible schedules, private spaces, or paid break time. Additionally, some work environments and colleagues might be more supportive of breastfeeding than others.

Mothers of higher socioeconomic status may make breastfeeding and work decisions simultaneously (Mandal et al. 2012). Additionally, breastfeeding varies with work intensity: women working part-time are more likely to initiate breastfeeding and breastfeed for longer than those working full-time (Lindberg 1996). Furthermore, Chatterji and Frick (2005) find that returning to work within the first 3 months after birth lowers the likelihood of breastfeeding initiation and shortens duration. Evidence from Canada suggests that longer maternity leave does not affect breastfeeding initiation, but does increase breastfeeding duration, suggesting that mothers find it more difficult to continue breastfeeding after returning to work (Baker and Milligan 2008). Additionally, "[c]ompared with women who formula-feed or breastfeed for short durations, women who breastfeed for at least 6 months have greater earnings losses after birth and have partners who report less involvement in infant care" (Noonan and Rippeyoung 2011). More and more American women are remaining in the labor force after childbirth, with almost 60 percent of mothers with a child younger than 12 months participating in 2014 (BLS 2015). Furthermore, of the mothers returning to work in 2001-2002, over 40 percent returned within the first 3 months after birth and over half returned by 6 months (Johnson 2008). Over the past 17 years, a number of states have enacted laws designed to facilitate breastfeeding for working mothers.

In this chapter, I investigate how these workplace lactation support laws have influenced breastfeeding decisions. The intent of the laws is to facilitate continued breastfeeding after returning to work by requiring employers to provide break time and/or private space to pump milk. However, there are several reasons these laws may have little impact: workplace support was

voluntarily implemented by some employers, some employees have sufficient flexibility to pump even in the absence of a law, and the recourse for employees complaining about employer violations can be onerous. My results do rule out large effects for breastfeeding initiation and most measures of duration for the full sample. However, breastfeeding at 3 months, approximately the duration of job-protected leave under the Family and Medical Leave Act (FMLA), notably increased by 2 percentage points for those giving birth in a state with a supportive law. Relative to the overall trend, with an increase of 10.6 percentage points from 2000-2012, this is substantial, roughly equal to the average percentage gain over three years.

The promise of legal protection at work may encourage a woman who already is breastfeeding to continue through her maternity leave or into the start of their return to work. Once back to work, however, the legal protections may not be sufficient to overcome the challenges of pumping and working in the long-run, particularly for some groups of mothers. I find differential impacts of the laws by age of mother at birth for long-run breastfeeding.

Breastfeeding data in the U.S. are scarce, which is one reason policies' efficacy at improving rates is largely unstudied.[14] I address the research question by pooling together restricted samples of the National Immunization Surveys (NIS), which began asking breastfeeding questions in 2003. By pooling the surveys, I generate a large sample of births from 2000 to 2012, and can use the variation within and across states to identify the effects on breastfeeding initiation and duration. I am able to use the rich set of demographics included in the surveys to control for

[14] A 2011 medical study by Dozier and McKee in *Breastfeeding Medicine* looks at this subject, but only uses data from the public-use file of only one cross-section and one outcome. The results from their study suggest an increase in the likelihood of breastfeeding at 6 months, but not one that is statistically significant. A 2013 medical study by Hawkins et al. in the *Journal of Epidemiology and Community Health* looks at the effects of various types of breastfeeding promotion laws, including workplace-related laws. They use a different data set covering only 32 states. For workplace lactation support laws, they do find a statistically significant and positive effect on initiation and a weaker, but also positive, effect on duration (measured only as breastfeeding for at least 4 weeks). The effects are stronger for low-income and minority mothers.

many observable maternal and child characteristics that are associated with breastfeeding and maternal employment.

Workplace lactation support laws differ across states in terms of existence and timing, and these differences are the sources of exogenous variation supporting my empirical strategy. From 1998-2008, 15 states and the District of Columbia enacted laws requiring employers to provide direct or indirect lactation support for employees, and, as of March 2010, this is also federal law (see Tables A3.1 and A3.2 for more detail on the timing and language of these laws). The variation allows me to identify whether, and by how much, these laws impact breastfeeding behavior (initiation and duration) using a difference-in-differences (DD) methodology. Identification of the model hinges on the plausibility that the variation in state laws is exogenous to factors that might simultaneously impact breastfeeding behavior, such as other laws that might directly or indirectly influence breastfeeding or shifts in attitudes towards breastfeeding. In researching the laws, I have not found any evidence to weaken that assumption.

Using birth dates of children and effective dates for state laws, I identify treatment and control groups in my data set and look for impacts on outcomes of interest in two categories: breastfeeding initiation and breastfeeding duration. The duration measures on which I focus are tied to policies and recommendations related to breastfeeding. For the short- and long-run, I look at binary outcomes measuring whether the particular breastfeeding goal was achieved. In terms of the short-run, the barriers to breastfeeding are considerably lower while a mother is on maternity leave than after she has returned to work. After childbirth, many women are covered by temporary disability insurance (TDI), which can provide up to 6 weeks of paid leave (SSA 1997), and are covered by FMLA, which provides up to 12 weeks of unpaid job protection (DOL 2015). To evaluate effects at these potentially pivotal times, I look at the following outcomes: breastfed at

least 6 weeks and at least 3 months.[15]

In the long-run, I look at two milestones, 6 and 12 months, because they can be tied to the recommendations of medical and public health organizations to breastfeed exclusively for 6 months, and in conjunction with other food for a minimum of 12 months (AAP 2012). The final duration measure is a level measuring months breastfed. This outcome variable allows me to look at overall changes in duration. I look at these measures of breastfeeding duration conditional and unconditional on ever breastfed. I assess the sensitivity of the results to alternative specifications and additional covariates, as well as explore whether the laws had differential impacts on particular groups of mothers.

This paper brings together data from multiple surveys to reveal empirical evidence relevant to policymakers interested in understanding the implications of workplace lactation support laws. State and federal laws have been enacted to protect working mothers by removing barriers to breastfeeding. The motivation is that the benefits to mothers, babies, and employers exceed the costs to employers for complying with the laws. This is not something that has been well studied, and I present evidence suggesting impacts on short-run measures of breastfeeding duration overall and on long-run measures for particular groups, both important inputs for the cost-benefit analysis of relevant policies.

The paper is structured as follows. Section 3.2 discusses breastfeeding incentives and the legal and institutional background. I also present a model of the breastfeeding decision in the context of employment. Section 3.3 describes the data challenges that have been an issue in studying breastfeeding policies and how I use multiple data surveys to approach the research

[15] All breastfeeding duration measures are measures of any breastfeeding. For example, a mother who was exclusively breastfeeding for 4 months and a mother who breastfed and supplemented with formula for 4 months would both be counted as having breastfed at least 3 months for the purposes of this study. I cannot explore exclusive breastfeeding because the question was not consistently asked across all survey years.

question and overcome these challenges. Section 3.4 discusses my empirical strategy and reasons why it is reasonable to assume the laws are a source of exogenous variation. Section 3.5 presents results. I explore differential impacts in section 3.6, and then section 3.7 concludes.

3.2 Background

3.2.1 Laws Promoting Breastfeeding for Working Mothers

From 1998 to 2009, a number of states enacted legislation related to breastfeeding and the workplace. For 15 states and the District of Columbia, the language of these laws is strong, with employer requirements rather than only encouragement.[16] Additionally, the Patient Protection and Affordable Care Act and the Reconciliation Act of 2010 signed by the President in March 2010 amend the Fair Labor Standards Act of 1938 to include similar language. Therefore, going forward, all states are required to:

> … provide reasonable break time for an employee to express breast milk for her nursing child for one year after the child's birth each time such employee has need to express milk. The employer is not required to compensate an employee receiving reasonable break time for any work time spent for such purpose. The employer must also provide a place, other than a bathroom, for the employee to express breast milk. If these requirements impose undue hardship, an employer that employs less than 50 employees is not subject to these requirements. Furthermore, these requirements shall not preempt a state law that provides greater protections to employees (NCSL 2011).

Figure 3.1 shows the percent of the sample of births covered by these laws in each year. The strong state laws vary in terms requirements, coverage, and recourse, but, in general, these laws require one or more of the following:

1. Employers provide reasonable break time to an employee who needs to pump

[16] I focus on the states with laws that had a requirement, as opposed to those with laws that encouraged or recognized employers as "breastfeeding-friendly." There is one state, Montana, that has a law applying only to public employees and there are seven states that had laws encouraging employers to provide break time and/or space for mothers to pump. These eight states were categorized the same as states with no laws for the main analyses. Section 3.5.6 discusses the alternative specifications that include a dummy variable for states with "weak" laws. See Appendix Tables A3.1 and A3.2 for a timeline and details about state laws pertaining to breastfeeding and the workplace and when they were enacted.

breast milk,
2. Employers make reasonable efforts to provide a private room to do so (not a bathroom stall), and/or
3. Employers cannot "discriminate against" breastfeeding employees or job applicants.

Out of those with requirements, only two states have explicit exemptions for small employers or for employers for which it would be an undue burden, and only three specify penalties for noncompliance. The federal law does not cover salaried employees and exempts small employers (NCSL 2011). While some employers provided these benefits voluntarily before the laws, others have been less cooperative, even some required by law to provide accommodations. As of 2009, a survey by the Society for Human Resource Management indicated that only 25 percent of employers had on-site lactation/mother's rooms. In some cases, violations can be reported to a state or federal commission for mediation, but for the most part the laws do not specify penalties or fines for noncompliance. Because most laws do not explicitly outline the penalties and fines for noncompliance, the primary recourse for employees is through the legal system, where the courts can render a judgment and award damages if the employee was legally harmed. Working through the legal system is far more costly than mediation, though there have been several high-profile cases where the employee has been awarded significant damages (Yarrow 2014).

The legal changes do not appear to be motivated in ways that would systematically bias the results. One might hypothesize that legislation was enacted only in states with strong support for breastfeeding or where policymakers were concerned that rates were too low, but both low and high breastfeeding states passed laws: California had initiation rates above 85 percent during the 2000s, while Mississippi was closer to 50 percent. A systematic pattern of high or low breastfeeding states being early or late adopters is not evident.

Motivation for these laws seems to stem from renewed emphasis in the medical community

on the importance of breastfeeding (Tyler 2000). In 1997, the American Academy of Pediatrics (AAP) issued their first new statement on breastfeeding in 15 years, emphasizing recommendations for exclusive breastfeeding for 6 months and continued breastfeeding for 1 year (Gartner 1998, AAP 1997). As the statement came before the legal changes, a shift in behavior would not have been coincidental with legal changes and the two effects would not be entangled. With focus on breastfeeding for a full year, balancing work and breastfeeding became more of an issue, thus prompting legislation.

In the case of the federal law, it was a somewhat unnoticed addition to the Affordable Care Act. The language is similar to the Breastfeeding Promotion Act, a bill that, despite being introduced and re-introduced in every session of Congress for the preceding twelve years, never made it out of committee. The nursing mothers amendment in the Affordable Care Act was one of many special interests tacked onto the bill in a sort of "congressional tradition [of] adding pet interests that otherwise might not pass to a big bill that at least will be put up for a vote," and in this instance made it into law (Carey et al. 2009). At the state level, motivations and methods for securing passage varied, but review of records of individual state legislatures regarding these laws and news articles in the period surrounding their passage suggest there was little opposition.

3.2.2 Breastfeeding Incentives

A new mother faces two decisions with regard to breastfeeding: whether to initiate, and, if initiated, how long to continue.[17] The medical community recommends exclusive breastfeeding for 6 months and continued breastfeeding with complementary foods for one year or more (AAP

[17] If a mother chooses breastfeeding, she must also decide whether to breastfeed directly, pump and feed expressed breastmilk, or attempt some combination of the two. The health benefits of direct breastfeeding versus breastmilk in a bottle or cup have not been well studied in the medical literature. Existing evidence and theory does suggest that direct breastfeeding may be more beneficial, particularly in the extreme case of exclusively pumping. There does appear to be a consensus that breastmilk in either form is superior to formula (Campbell 2014).

2012). Employment makes meeting these breastfeeding goals more difficult because it requires mothers to take regular breaks to pump while away from their babies. Pumping is generally unpleasant, and having break time and a private location in which to pump are not easy to obtain in many occupations/workplaces. Failure to pump at regular intervals leads to decreased milk supply and increased risk for infection and complications. Moreover, finding adequate milk storage and cleaning supplies can be challenging. Workplace lactation support laws are designed to facilitate breastfeeding for working mothers by preventing discrimination against employees using break time to pump breast milk; they require employers to provide reasonable break time to an employee who needs to pump breast milk and/or make reasonable efforts to provide a private room to do so.

The theory is ambiguous on whether workplace lactation support laws would influence both breastfeeding initiation and duration decisions, only duration, or neither. Depending on personal preferences and cost-benefit analysis, a mother's initiation of breastfeeding may or may not be influenced by expectations about later support at work. If feeding routine and consistency are a priority, any anticipated return to work, regardless of expected breastfeeding support, may mean a mother forgoes breastfeeding altogether. Similarly, if the health benefits of breastfeeding are a priority, she may choose to initiate breastfeeding despite an anticipated return to work. In both of these scenarios, the mother feels so strongly about her feeding choice that the implementation of workplace support does not alter her cost function enough to cause her to change that decision. However, if the mother is returning to work and her preferences are such that she values both routine and breastfeeding, she may be influenced by anticipated breastfeeding support at work. If she believes she will have the necessary support at work, she may choose to initiate breastfeeding with the hope that she will be able to continue that means of feeding even

after she returns to work. On the other hand, if she anticipates little support at work, she may opt not to initiate if she believes the disruption to her routine would be more costly than losing the benefits of breastfeeding during her leave from work.

The relationship between workplace lactation support laws and duration is more straightforward. Employment makes continuation of breastfeeding difficult, particularly if the employer is not supportive. If the support at work does indeed lower costs of combining breastfeeding and employment, breastfeeding duration should increase due to the implementation of workplace lactation support laws. The amount of the increase is dependent on the degree to which the costs were lowered. However, the impact could be complicated by the interrelationship with the maternity-leave decision. For example, anticipated support at work may encourage mothers to return to work sooner than they otherwise would. If anticipated support matches the realized support, breastfeeding duration should be unaffected by an earlier return to work. On the other hand, if realized support is less than anticipated, mothers may end up breastfeeding for less time than had they taken longer leave.

3.2.3 A Model of the Breastfeeding Decision

To illustrate the mechanisms by which laws might impact breastfeeding decisions, I present a model that depicts a hypothetical mother's costs and benefits related to breastfeeding and employment. For simplicity, I focus on a model that allows only for exclusive breastfeeding or formula feeding and ignores the possibility of supplementing breastfeeding with some formula feeding. Thus, a mother has the initial decision of whether or not to breastfeed and the subsequent decision of whether to continue breastfeeding in the next period, given she chose to breastfeed in the previous period. In order to make this decision, the mother must look at the relative fixed and marginal costs and benefits of the two options. In terms of marginal costs, the mother considers

the net marginal benefit: the marginal benefit net of marginal cost of breastfeeding relative to formula feeding, or $(MB_{bf} - MC_{bf}) - (MB_{form} - MC_{form})$. For simplicity, this will be referred to simply as the net marginal benefit or $MB - MC$. Figure 3.2 shows the net marginal benefit curve for a hypothetical mother who returns to work during her baby's first year.

Immediately after birth, a mother (consciously or subconsciously) evaluates the overall costs and benefits of breastfeeding relative to formula feeding and chooses one or the other. One way for a workplace support law to impact the decision to initiate is by lowering the mother's fixed costs. For example, there may be value in establishing a feeding routine, and returning to work naturally would disrupt the routine. In the case of breastfeeding, it might mean switching from direct breastfeeding to bottle-feeding pumped milk or to bottle-feeding formula. In the case of formula feeding, it might only mean switching the caregiver offering the bottle. If having workplace lactation support at work means less of a disruption to the routine, this might alter the total costs such that initiating breastfeeding is less costly than formula feeding during maternity leave. In this case, the law would induce greater breastfeeding initiation.

The law also could impact initiation by lowering costs after the return to work. If the problem is solved using backwards induction, the mother can compare total net benefits with the fixed cost. First, she determines how long she would continue to breastfeed assuming she starts (until $MB < MC$). If she breastfeeds this long, she can calculate the net benefit, $\int_0^T (MB - MC)$. If the total net benefit exceeds the fixed cost, then she chooses to breastfeed. The law could alter this by reducing the cost over the interval that begins when she returns to work. In other words, marginal cost increases discretely at $t = R$, where R is the time at which she returns to work. The law reduces, but does not eliminate, this discrete jump. The net benefit in the period before work, $\int_0^R (MB - MC)$, would not be affected, but the net benefit in the period after work, $\int_R^T (MB - MC)$,

would increase. If the total net benefit, $\int_0^R (MB - MC) + \int_R^T (MB - MC)$, goes from being less than the fixed cost to greater than the fixed cost, the law would induce greater breastfeeding initiation.

Assuming breastfeeding is established, then the mother must look at the marginal costs and benefits of continuing to breastfeed for another period versus the alternative to wean. Looking at the first year after birth, the minimum recommended time a baby's main source of nutrition is breastmilk or formula, I consider an example where the mother has a positive initial net marginal benefit, and in the absence of a law still breastfeeds for some period of time. From the mother's perspective, the marginal benefits of breastfeeding relative to formula-feeding are an enhanced bond with the baby, lower financial costs, and lower health risks for herself and the baby. The marginal costs of breastfeeding relative to formula feeding are complications, such as difficulty establishing breastfeeding, infections, pain, more frequent feedings, and the inability to outsource feeding to others cost-free (mothers must pump to provide milk for a missed feeding, maintain supply, and prevent complications from engorgement).

For simplicity, the net marginal benefit line is shown as linear, though one could relax this assumption without loss of generality. The net marginal benefit begins very high and is diminishing over time, as the two types of feeding approach equality from the mother's perspective. Both the marginal benefit and the marginal cost of breastfeeding relative to formula feeding approach zero as the baby gets older. For example, the baby's dependence on breastmilk or formula for nutrition decreases with age as complementary foods are introduced. Additionally, as the baby's immune system becomes more robust and mature, the marginal health improvement from breastmilk is smaller. Both of these factors, among others, drive the marginal benefits of breastfeeding and formula closer to equality.

There may also be changes to the marginal cost of breastfeeding relative to formula over time. The marginal cost of breastfeeding may be high initially due to potential difficulties establishing a breastfeeding relationship, difficulty outsourcing feedings, and the frequency of feedings. Once breastfeeding is established, however, the marginal cost is likely to decrease over time. As the baby grows and a routine is developed, breastfeeding is easier for the mother and requires less time as the baby progressively requires less frequent feedings. The marginal cost of formula feeding includes the time to feed the baby, maintenance of equipment, and purchase of the formula. This may rise initially as the baby grows and increases formula consumption, but, at a certain point during the first year, the baby will take fewer bottles, thus requiring less cleaning and less formula as other foods are introduced.

As long as the net marginal benefit is positive, that is, the marginal benefit of breastfeeding relative to formula exceeds the relative marginal cost, a mother will opt to breastfeed. Once this value becomes negative, meaning the relative marginal cost is greater than the relative marginal benefit, the mother will switch to formula. The time when this occurs, of course, varies by a mother's personal preferences and value of time, among other factors. The return to work certainly affects the benefits and costs of breastfeeding. While at work, a mother may not be able to breastfeed her baby directly, so the bonding benefits that would be included in the marginal benefit of breastfeeding are lower. Also, the mother's marginal cost of breastfeeding is higher because pumping milk is costly in terms of the unpleasantness of pumping, time away from work, and cost of maintaining equipment, e.g., cleaning bottles and pump pieces. The decrease in marginal benefit and increase in marginal cost lead to a downward shift of the net marginal benefit curve and an earlier predicted weaning age.

Workplace lactation support laws are designed to lower the costs of continuing breastfeeding while working. If the requirement of break time and a private location lower the marginal cost of breastfeeding, the net marginal benefit curve would shift up, as shown in Figure 3.2; thus, an older weaning age would be predicted. As discussed in Section 3.2.2, the law might shift both the fixed cost of breastfeeding and the part of the marginal cost curve after the mother returns to work, or only the latter. In the first case of shifting the fixed and marginal cost curves, the model predicts a potential impact on both initiation and duration, whereas an impact on only the marginal cost would affect duration and not initiation.

3.3 Data: National Immunization Surveys

In this section, I describe the surveys used in my data analyses: the National Immunization Surveys (NIS). The NIS ask questions about breastfeeding beginning with the 2003 survey. Ultimately, I combine the evidence from all available survey waves, 2003 and later, to address the research questions. I create a variable to account for the adoption of workplace lactation support laws. For each birth in the data set, the variable equals 1 if the birth occurred in a state with a law in effect that requires employers not discriminate against lactating employees, provide break time, and/or provide a private location for nursing employees.

Pooling the restricted NIS samples from multiple years yields a large, nationally-representative sample covering the implementation periods for relevant state-level policies. The resulting data set can be used to assess the impact of these state-level policies on breastfeeding rates. In addition to asking about breastfeeding initiation and duration, the NIS include questions regarding relevant demographics.

The NIS have an ideal target population for studying breastfeeding because questions about breastfeeding are retrospective and the time between weaning and the interview is short.

Respondents are asked about children in the household between the ages of 19 and 35 months, a population that is not typically still breastfeeding. Extended breastfeeding is rare (only 0.04 percent of 19-35 month olds in the sample were still breastfeeding at the time of survey), so top-coding of breastfeeding duration levels is not a significant issue.[18]

While retrospective surveys are good from the perspective of data-censoring, misreporting is a concern. Innocent misremembering and reporting what the respondent feels is the "correct" answer can be sources of measurement error in breastfeeding data. The validity and reliability of breastfeeding recall has not been widely studied, but a summary of the existing literature by Li et al. (2005) suggests that validity and reliability of breastfeeding recall is better after short periods, especially less than three years.[19] Since the survey is asking about children younger than three years of age, recall bias in the responses to the NIS is less likely to be a significant concern.

I maximize the coverage of the time period in question by pooling together restricted data from NIS waves 2003-2013 with breastfeeding questions.[20] I access the restricted version of the NIS data in the Michigan Census Research Data Center to gain greater detail on maternal and child characteristics, breastfeeding data, states of birth, and accurate dates of birth and interview, all of which are essential variables in my model. All variables are harmonized across surveys and respondents, creating a nationally-representative data set covering births from 2000 to 2012. These

[18] While the breastfeeding duration questions are open-ended and thus are not top-coded, top-coding becomes an issue for respondents who are still breastfeeding at the time of survey. They are considered having breastfed for a period equal to the baby's age at time of survey. Durations longer than 1 year were considered, but the top-coding does bias the months breastfed measure downward. For example, a 19 month old may be breastfed for 24 months, but because the mother is surveyed when the baby is 19 months, her breastfeeding duration is coded as 19 months and not 24 months. As mentioned in the text, only a very small number of observations are affected, so the results are not substantially biased.

[19] Li et al. (2005) define *validity* as "the degree to which recall compares with a validation standard or reference" and *reliability* is "the degree to which the breastfeeding practices obtained by recall are repeatable over time."

[20] The restricted data file for the 2004 survey was corrupted and not viable for analysis. Surveys from later years overlap in coverage of birth years, so there are observations for birth years from 2000 to 2012; however, the missing 2004 survey data does reduce the sample size for some birth years.

surveys do not include information about maternal employment. While the data cannot be used to look at the effects of the state workplace lactation support laws explicitly in terms of working mothers, they can provide evidence of changes in breastfeeding rates after legislative change.

The sample is restricted to exclude multiple births, but includes siblings or children living in the same household. I focus on single births because the cost functions and decision process is likely very different for a mother of twins or higher multiples. The survey asks for all children within 19-35 months in the household, so the data do include closely-spaced siblings and/or other children living in the same household in the sample, but these cases account for less than 5 percent of the sample. Robustness checks show that excluding the small fraction of siblings in the sample does not alter the results of the analyses.

Table 3.1 presents summary statistics for the whole sample, as well as the treatment and control groups, to show the proportion of the full sample in each group and identify differences across the groups. The treatment group includes children born in a state with a law in effect at the time of their birth, along with those born after the national law went into effect. The control group includes those children born before state and/or national laws went into effect. Characteristics are not balanced across treatment and control groups, but both groups have a substantial sample size. The characteristics of the treatment and control groups are significantly different, with the exception of sex of the child, but these characteristics all can be controlled for in the specification using dummy variables to represent mothers in different age groups and of different races/ethnicities.

Figures 3.3 and 3.4 show the average changes in breastfeeding outcomes over the sample period. There is a noticeable, but not dramatic, overall upward trend in all measures, with increases and decreases within the period shown. From 2000-2012, breastfeeding initiation rates showed the

biggest increase, from 69.5% to 80.0%. Conditional measures of breastfeeding duration also reflected increases: breastfeeding at least 6 weeks went from 82.9% to 87.7%, breastfeeding at least 3 months went from 72.4% to 77.8%, breastfeeding at least 6 months went from 52.4% to 56.6%, and breastfeeding at least 1 year went from 25.0% to 26.7%. The conditional measure of breastfeeding in months was unchanged from the start to the end of the period at 7 months. Figure 3.5 shows the percent of the entire sample that stopped breastfeeding by month, and provides evidence that stopping at key medical (6 months and 12 months) and maternity leave milestones (3 months) is more common than other months.[21] Figure 3.6 shows the percent still breastfeeding at each month after birth; it is fairly smooth for all birth years, showing a steep decline in the first few weeks and flattening out after one year. This figure also shows some evidence of larger declines around key maternity-leave and medical milestones, those being at 3, 6, and 12 months.

3.4 Methodology

In this section, I outline my empirical strategy to exploit the exogenous variation in state workplace lactation support laws using difference-in-differences (DD). First, I discuss potential confounders and justify the use of the DD methodology as the appropriate approach to determine the impact of workplace lactation support laws. Second, I explain how I apply the methodology to the NIS data.

3.4.1 Potential Confounders: Other Laws and Pre-trends

Within the DD framework I employ, any policy that plausibly could impact breastfeeding is a threat to the exogeneity assumption if the timing is contemporaneous. While the Family Medical Leave Act (FMLA) preceded the workplace lactation support laws by 5 years, state-level

[21] Note that there are not spikes at every multiple of 3 months; 9 and 15 months do not show spikes, but 18 months and 24 months do.

changes to maternity leave policies occurred during the time period. Four states, California, New Jersey, Rhode Island, and Washington, proposed and, with the exception of Washington, implemented paid family leave programs in the 2000s (see Table A3.3 for a timeline). California also enacted a workplace lactation support law, but the timing of the two laws is sufficiently distant to alleviate concerns of competing influence on breastfeeding. California's paid family leave program began in 2004, while its workplace lactation support law was effective in 2002. Rhode Island had a weaker workplace lactation policy, but again the timing is not coincidental. Rhode Island's paid family leave program began in 2014, and the encouragement for workplace lactation support started in 2003. I did not find any simultaneous adoption of other laws or policies that could impact breastfeeding rates in states that adopted workplace lactation support laws.

In the event that the effects of the parental-leave-related laws lagged their implementation or in other ways confounded the effects of the workplace lactation support laws, I include an alternative specification with dummy variables for the presence of a paid leave policy at the time of birth. Additionally, I also look at temporary disability insurance (TDI) as a potential source of bias. Four states, California, New York, New Jersey, and Rhode Island, enacted state TDI programs in the 1940s, and Hawaii also did so in 1969 (SSA 1997). I modified the model to include a dummy variable for these five states. These alternative specifications are discussed further in Section 3.5, but, for both paid leave and TDI, the results did not change with the inclusion of these covariates.

If, in the period leading up to the implementation of workplace laws, there was a positive trend in breastfeeding rates, one might incorrectly attribute the increasing trend for an increase due to the laws using a DD methodology, and vice versa for a negative trend. In order to rule out this scenario, I run an event study for each of my outcome variables examining the six years prior to

the laws and the two years after with a balanced sample of 42 states and the District of Columbia. I generate indicator variables for each difference *d*=-6 to *d*=2, where the variable takes on a value of 1 if the birth occurred *d* years before/after the law and 0 otherwise. To determine in which time period the birth occurred, I calculate the number of years before or after the law using the following steps:

1. I compare the actual birth date to the date of implementation of the relevant state law or, in the absence of a state law, the national law, and calculate the number of days before or after the relevant law.
2. I take the number of days from the law and round down to the nearest year (*diff* in years). For example, *diff*=0 if the difference is between -364 and 364, *diff*=-1 if the difference is between -729 and -365, *diff*=1 if the difference is between 365 and 729, and so on.

The event study specification is as follows:

$$y_{idstm} = \beta_0 + \sum_{d=-6}^{2} \beta_d * 1\{diff = d\} + \gamma' x_i + \alpha_s + \tau_t + \theta_m + \varepsilon_{idstm} \qquad \text{(Equation 3.1)}$$

The subscripts represent the following: *i* is child/observation, *d* is difference in years between the birth and the law's implementation, *s* is the state of birth, *t* is the year of birth, and *m* is the month of birth. I include dependent variables, y_{idstm}, for breastfeeding initiation, breastfed at least 6 weeks, 3 months, 6 months, and 1 year (binary), and duration in months (all duration measures include conditional and unconditional). $\sum_{d=-6}^{2} 1\{diff = d\}$ is the sum of indicator variables equal to 1 for the difference in years between child *i*'s birth and date the law was implemented. The remaining covariates include x_i (the remaining demographic controls), δ_t (year of birth fixed effects), α_s (state of birth fixed effects), θ_m (month of birth fixed effects), and ε_{idstm}, which is the error term including unobservable characteristics for child *i*. Multiple specifications were run adding covariates sequentially, but the results did not change substantially. In all specifications, the

standard errors are clustered for state of birth and the observations are weighted using survey weights.

Each panel in Figure 3.5 shows the results of the event study run with the preferred specification, including all fixed effects and selected demographics for each outcome of interest. In all cases, except for breastfeeding at 3 months conditional on ever being breastfed, the 95% confidence intervals for the pre-period coefficients include 0. The sign of the slope varies by outcome, with only ever breastfed showing a positive pre-trend and the rest negative to flat. An F-test was performed for each specification and outcome testing joint equality of the pre-period policy indicator coefficients. I can reject the null hypothesis, suggesting at least one coefficient is different, at the less than 1% level for unconditional measures of breastfeeding at 3 months, 6 months, and duration in months. I can reject the null hypothesis at the less than 5% level for unconditional measure of breastfeeding at least 6 weeks and conditional measures of breastfeeding at least 3 and 6 months. The null hypothesis that all pre-period coefficients are jointly equal cannot be rejected at the 10% level or lower for ever breastfed, conditional measures of breastfeeding at least 6 weeks and duration in months and both conditional and unconditional measures of breastfeeding at least 1 year.

The results of the event studies suggest pre-trends can be ruled out for some outcomes but not others. However, the direction of the bias from any pre-trends is opposite that of the results. For example, the pre-trend for breastfeeding initiation appears to be increasing, which would lead to an overestimate of the effect of the laws. My results rule out large effects, so the true effects may actually be even closer to zero. The pre-trends for the other measures are flat to negative, which would lead to no bias in the case of flat and downward bias in the case of decreasing pre-trends. I find a positive effect of the laws at 3 months. I also see a decreasing pre-trend in this

duration measure, so the true impact of the laws may be larger.

3.4.2 Identification Strategy: Difference-in-difference

I use a weighted ordinary least squares (WLS) model applied to the pooled NIS data to look at the impact of workplace lactation support laws on breastfeeding initiation and duration. Identification of the model hinges on the plausible exogenous variation in state laws and absence of pre-trends. As discussed in Section 3.4.1, I have not found any evidence to suggest that there were policies or programs contemporaneously adopted that would confound any causal effects of the laws, and the pre-trends are more of an issue for initiation and unconditional measures of duration.

The model uses the repeated cross-sectional data from the NIS on breastfeeding and demographics, and leverages the variation in terms of existence and implementation date in state-level workplace lactation support laws to identify whether these laws impact the breastfeeding measures. The main regression specification is a WLS model for each dependent variable with an indicator for the existence of supportive state law in the state at the time of birth, along with state, year, and month of birth fixed effects and maternal and child demographics:

$$y_{istm} = \beta_0 + \beta_1 T_{stm} + \gamma' x_i + \alpha_s + \tau_t + \theta_m + \varepsilon_{istm} \qquad \text{(Equation 3.2)}$$

The subscripts represent the following: *i* is child/observation, *s* is the state of birth, *t* is the year of birth, and *m* is the month of birth. I include the dependent variables, y_{istm} , for breastfeeding initiation and duration measures.[22] T_{stm} is a dummy variable equal to 1 if child *i* was born in a state with a workplace lactation support law in place at the time of birth, and x_i contains the remaining demographic controls. The demographic characteristics in my preferred specification include the

[22] Although many of my outcome variables are binary, I focus on a WLS model instead of a probit model for ease of interpretation. I also run all specifications using a probit model, and statistical significance of the coefficients is similar, as are magnitudes of the marginal effects.

following: child's sex, whether the child was firstborn, mother's race/ethnicity, and mother's age at time of birth.[23] Fixed effects for year of birth, δ_t, state of birth, α_s, and month of birth, θ_m, are also included, and ε_{istm} represents unobservable characteristics for child *i*.

The coefficient on the indicator for the presence of a workplace lactation support law at the time of birth, β_1, shows the causal impact of the law. To look at duration questions, five specifications are included in the analysis. For the first four specifications, the dependent variables are binary variables indicating whether the child was breastfed at 6 weeks, 3 months, 6 months, and 12 months of age, conditional and unconditional on the child ever being breastfed. The final specification has a dependent variable of months the child was breastfed, conditional and unconditional on the child ever having been breastfed.[24] The demographics included reflect those available in the survey and those that are correlated with breastfeeding (Baker 2016a). Finally, to account for likely correlation in breastfeeding patterns within states, standard errors for all specifications are clustered by state.

3.5 Results: How Workplace Lactation Support Laws Affect Breastfeeding

This section quantifies how workplace lactation support laws affect breastfeeding behavior. I explore the robustness of these results to inclusion and exclusion of demographic characteristics and fixed effects on the data. Since the NIS does not distinguish between mothers who participate in the labor force and those who do not, the results average over working and non-

[23] Other demographics, including mother's education and marital status, family income at time of survey, and child's participation in WIC, are not included in the preferred specification because of concerns about changes between birth and survey or endogeneity, but were added to the specification sequentially for completeness and are reported in the appended tables.

[24] The restricted data have duration measured in whatever units were used by the survey respondent, e.g., days, weeks, months or years, whereas the unrestricted duration data are recoded in days. Month is the unit predominantly used, so I recode responses initially reported in units other than months to months for the duration level outcome measure. Responses in days are divided by 30.42, weeks divided by 4.33, and years multiplied by 12 to determine the approximate number of months breastfed.

working mothers and therefore likely underestimate the impact of the law on working mothers, the target population of the laws. Tables 3.2a and 3.2b present results for the preferred specification for all outcomes. The preferred specification includes all fixed effects (for state, year of birth, month of birth, and year of survey) and the following characteristics: child's sex and firstborn status, and mother's age at birth and race/ethnicity. Appendix Tables A3.4a-A3.4k show more detailed regression results, including alternative specifications for each outcome.

3.5.1 Breastfeeding Initiation

The first columns of Tables 3.2a and A3.4a present the results from Equation 3.2 with the dependent variable of whether the child was ever breastfed. The magnitude in all specifications is small and positive, and, while not statistically significant, large effects can be ruled out. This is not surprising: for the workplace laws to influence initiation, they must lower costs for the mother during maternity leave to overcome the fixed cost of initiating, which is not likely. While the costs of starting to breastfeed may be lower if a mother believes she will have support at work upon return, it does not seem likely that this would shift marginal cost enough to affect initiation.

The magnitude of the coefficient of interest, while small, does vary somewhat across specifications as seen in Table A3.4a. In comparing the base specification, which only includes fixed effects for state and year of birth, to the other specifications, the coefficient goes from small and positive to small and negative, suggesting that differences in demographic characteristics across treatment and control groups explain some of the variation in breastfeeding initiation across those groups.

3.5.2 Short-run Duration Measures

Looking at short-run duration milestones at 6 weeks and 3 months tells us whether mothers persist in breastfeeding through their maternity leave. 6 weeks is often the duration of temporary

disability after which mothers can be cleared by their doctor to return to work, and 12 weeks or 3 months is the time the FMLA offers job-protected leave to some workers. Columns 2 and 3 of Table 3.2a and columns 1 and 2 in Table 3.2b show impacts at these milestones conditional on ever being breastfed. Complete results can be found in Tables A3.4b-e in the appendix.

3.5.2.1 Breastfeeding at Least 6 Weeks

As with breastfeeding initiation, for breastfeeding at least 6 weeks conditional and unconditional on ever breastfed, the coefficient of interest is small and positive, but not statistically significant for all specifications. Again, large effects can be ruled out. Also, the coefficient is smaller going from the specification with only state and year of birth fixed effects to one with a full set of demographic covariates. This, too, points to the importance of the demographics in explaining breastfeeding behavior.

The dependent variable measured in weeks is less precise than some of the other duration measures. Most responses for breastfeeding duration were recorded in integer months. If mothers answered in units of months, only values of 1 are less than the monthly equivalent of 6 weeks, 1.5 months. Thus, the measure of breastfed at least 6 weeks may underestimate the true effect.

3.5.2.2 Breastfeeding at Least 3 Months

Most specifications for breastfed at least 3 months conditional on ever being breastfed show positive and statistically significant coefficients of interest. The magnitude falls, but not by much, as covariates are added and the statistical significance weakens. The preferred specification includes demographics that are unchanged between time of birth and time of survey. In the preferred specification, the impact of the laws on breastfed at least 3 months conditional on ever breastfed is nearly 2 percentage points. The unconditional measure is smaller, 1.5 percentage points, which is not surprising since this measure includes all of the mothers who did not initiate.

Other demographics are included in the survey, including income and mother's education and marital status, but, with 19-35 months having passed between the birth and survey, these values may not accurately reflect the values for the mother at the time of birth. Specifications including these additional demographics do yield similar magnitudes for the coefficient of interest. However, not all observations have values recorded for these questions, so the sample size is smaller, which is likely a contributing factor in the lack of statistical significance for the coefficient of interest in these alternative specifications.

The magnitude of the effect of the laws on breastfeeding at 3 months conditional on initiation is substantial, given the overall trend. From 2000 to 2012, breastfeeding at 3 months increased 10.6 percentage points, so the 2 percentage point gain resulting from the law is roughly equivalent to the average percentage gain over three years. Thus, the laws play an important role in supporting breastfeeding in the short-run.

3.5.3 Long-run Duration Measures

Long-run duration milestones, at 6 months and 1 year, tell us about whether mothers continue to breastfeed according to these medical recommendations. The medical community recommends that infants be breastfed exclusively for at least the first 6 months and that breastfeeding continue, along with complementary foods, for at least one year. Columns 4 and 5 in Table 3.2a and columns 3 and 4 in Table 3.2b show results for these measures. Appendix Tables A3.4f-i present the results for covariates and alternative specifications.

For both long-run dependent variables, the results are similar to those for the short-run measure of breastfed at least 6 weeks. The coefficient of interest is small and positive, and not statistically significant, but I also can rule out large effects at these long-run milestones. Again, the conditional and unconditional are similar in terms of sign and statistical significance, with the

conditional measures having higher magnitudes.

3.5.4 Breastfeeding Duration in Months

The final specification examines breastfeeding duration in months. The level measure of months breastfed includes children who were still breastfed at the time of the survey. They are coded as having breastfed for however many months old they were at the time of survey. Only a small number of observations, 0.04 percent of the sample, are affected by the top-coding. Additionally, the age of the children surveyed, the youngest being 19 months, is such that they would be beyond the public health objectives for breastfeeding. The women still breastfeeding at 19 months or more are likely very dedicated such that they would persevere in breastfeeding regardless of special workplace accommodations. Therefore, the specification was not adjusted for the top-coding. Because months is the mode unit of report for breastfeeding duration, I recode other responses into months to create a common duration measure.

The last columns of Table 3.2a and 3.2b show a small, positive, but not statistically significant, result for the continuous duration measure. I can rule out large effects of the law on this measure, though. It is surprising that the increase at 3 months does not manifest itself in an increase in overall duration, but there are plausible explanations. For example, if some mothers are increasing breastfeeding from more than 2 but less than 3 months to more than 3 but less than 6 months, while other mothers are decreasing breastfeeding in the 3-6 month range, the increases might be canceled out by the decreases, resulting in no detectable effect in the overall duration measure and no changes to the 6-month measure.

3.5.5 Demographics

The Tables A3.4 in the Appendix show the full set of coefficients for all specifications, including those of the covariates. Looking at my preferred specification in column 2 of each table,

the coefficients that are statistically significant have the expected signs. The mother being older at the time of birth is associated with positive effects on breastfeeding initiation and duration measures. Relative to white mothers, black mothers experience smaller effects, whereas Hispanic mothers and mothers of other races/ethnicities experience greater impacts. There is not a statistically significant difference in the impact on male versus female children.

Columns 3-6 in Table A3.4 show alternative specifications with additional demographic covariates. These are not in the preferred specification because of concerns of endogeneity or changes in values between time of birth and time of survey. The mother being married or having more education and a higher family income are associated with higher rates of breastfeeding. Children receiving WIC benefits are breastfed at lower rates. These patterns carry across outcomes and specifications.

The one covariate that has a different sign for initiation and duration measures identifies whether the child is firstborn. For initiation the sign is positive, and for duration measures it is negative. It is plausible that a mother would be more likely to attempt breastfeeding a firstborn child, and also be more likely to breastfeed subsequent children longer.

3.5.6 Robustness of the Results to Changes in Specification

In addition to looking at how the results change with modifications to the demographics included, as discussed earlier in this section, I also explore the relevance of other state policies. I create dummy variables for the presence of weak lactation support laws, TDI, and/or paid family leave laws at the time of birth and add them to Equation 3.2 sequentially. The coefficients for these dummy variables are statistically significant in some instances, but they change neither the magnitude nor significance of the coefficient of interest.

3.6 Differential Impacts

The second half of the twentieth century exhibited dramatic shifts in breastfeeding rates, both in terms of initiation and duration. These shifts were driven primarily by changes in behavior rather than changes in characteristics. Behavioral responses varied by maternal characteristics, so it is conceivable that responses to workplace lactation support laws would vary by characteristics as well (Baker 2016b). To explore this possibility, I run the preferred specification separately by subgroups to test for differential impacts. I focus on maternal age at birth and race/ethnicity, since these are the maternal characteristics in my preferred specification. Tables 3.3 and 3.4 show the results that suggest that some groups experienced greater impact from the laws than others, but pre-trends confound some of the results.

As with the overall sample, pre-trends within subgroups are a potential source of bias in the results. To identify pre-trends and determine the direction of any resulting bias, I run an event study for each group and outcome following the method outlined in Section 3.4.1. The results of the event study run with the preferred specification, including all fixed effects and selected demographics for each outcome of interest, show evidence of pre-trends for some outcomes, but not all. Whether the 95% confidence intervals for the pre-period coefficients include 0 varies by group and outcome, as does the sign of the slope. An F-test was performed for each group and outcome to test joint equality of the pre-period policy indicator coefficients. In some cases, I can reject the null hypothesis with high confidence (at the less than 1%, 5% or 10% levels), suggesting at least one coefficient is different, but in many cases the null hypothesis that all pre-period coefficients are jointly equal cannot be rejected at the 10% level or lower.

The results of the event studies suggest pre-trends can be ruled out for some outcomes, but not others. Therefore, it is important to consider whether the direction of the bias from the pre-

trends supports or confounds the results. Tables 3.3 and 3.4 show the results of the subgroup analyses for maternal age at birth and race, respectively. For initiation, only black mothers show a statistically significant impact from the law, but the result is negative. Coupled with the downward bias from a negative pre-trend, this result is not reliable, as the true effect may be closer to zero. Looking at duration measures, the results suggest the law affected the following outcomes: breastfeeding at least 3 months and at least one year, and duration measured in months.

Mothers age 20-29 at birth show a 2.4 percentage point increase in breastfeeding at least 3 months conditional on ever breastfeeding. The pre-trend in this case is decreasing, which would lead to underestimating the effect, so in this case the result is plausibly positive and potentially lower than the true impact. Hispanic mothers also show a positive impact from the law on breastfeeding at least 3 months of 4-6 percentage points. Again, the pre-trends for this group and outcome are negative, so the true impact may be higher.

For several groups, the law impacted rates of breastfeeding at least 1 year. Teen mothers and mothers age 40 and above had a positive impact (5 percentage points and 6-8 percentage points, respectively), and mothers age 30-39 and black mothers had a negative impact (about 3 percentage points and 4-5 percentage points, respectively). Teen mothers had a negative pre-trend for breastfeeding at least 1 year, mothers age 30-39 exhibited a positive pre-trend, and mothers 40 and above and black mothers did not show evidence of a pre-trend for this outcome. Therefore, in the case of teen mothers, the impact may be underestimated, while the impact on mothers age 40 and above and black mothers should not be biased by pre-trends. For mothers age 30-39, the positive pre-trend confounds the negative effect, making it unclear whether there was an impact on rates of breastfeeding at least 1 year for this age group.

The final outcome that seemed to be impacted by the introduction of workplace support

was the overall duration measure of months breastfed. Both black and Hispanic mothers saw a statistically significant impact, roughly -1.0 month and 0.8 month, respectively. Both groups had negative pre-trends for this outcome. Therefore, the true impact on black mothers is ambiguous and the effect on Hispanic mothers is underestimated.

Workplace lactation support laws might impact mothers with different types of jobs differently. The NIS does not include questions about the mother's occupation, so I cannot test for employment-related differential impacts directly. However, different occupations do have different demographic profiles, so testing for interaction effects on the available demographics can reveal these employment-related differential impacts. Due to pre-trends, I cannot conclusively say that differential impacts did not exist for groups that did not show a statistically significant effect. I can, however, comment on a few instances where the bias worked in the opposite direction of the result.

In the overall sample analysis, the laws resulted in an increase in rates of breastfeeding at least 3 months. Looking at subgroups, it seems that the increase may be driven by different groups of mothers, namely mothers age 20-29 and Hispanic mothers. Mothers age 20-29 may be at a point in their careers where workplace support matters more. Their families may be more dependent on their income, such that they cannot afford to take long maternity leaves. Additionally, they are likely to be in early-career roles where they may not have the flexibility and authority to demand break time for pumping, absent a law. My finding suggests that the laws had a positive impact on mothers aged 20-29 in terms of short-term breastfeeding, as measured by rates of breastfeeding at least 3 months. The magnitude of the impact may be more substantial given the downward bias of the pre-trends. The laws had an even larger positive impact on Hispanic mothers of 4-6 percentage points. Again, it might be that Hispanic mothers who work are more likely to

have jobs that do not facilitate breastfeeding, so, with supportive laws in place, they may be in a better position to combine work and breastfeeding.

No detectable effect on overall duration was found in the overall sample analysis despite an increase in rates of breastfeeding at least 3 months. The same is true for mothers age 20-29, but Hispanic mothers do show a notable increase in months breastfed. This may mean that the increase at 3 months is not offset by any decrease at another duration milestone, and thus carries through to yield an overall increase in months breastfed for this group.

In terms of longer durations, the overall sample analysis did not reveal any impact of the laws; however, the response in rates of breastfeeding at least 1 year to the laws varied by age and race. Teenage mothers and mothers age 40 and above saw increases, whereas black mothers saw decreases in rates of breastfeeding at least 1 year. Teenage mothers and older mothers both are positively affected by the laws in terms of long-run breastfeeding, but these mothers generally are employed in different environments. Working teenage mothers are likely employed in low-skilled jobs where schedules are more rigid. Women having children later in life may be more established in their careers and in demanding positions. While the types of jobs held by younger and older mothers may be different, they share a lack of flexibility that can hinder long-run breastfeeding. The laws' requirement that employers be more amenable to breastfeeding employees introduced sufficient conditions to allow these demographic groups to continue breastfeeding longer.

Black mothers, on the other hand, were negatively impacted by the laws when considering long-run duration. As discussed in Section 3.2.2, if anticipated support at work is less than realized support, mothers may be induced to return to work sooner and end up breastfeeding for less time than if they had stayed on maternity leave longer. Black mothers may face additional hurdles in the workplace, such as discrimination, that may make the laws less effective. Additionally, black

mothers may be more likely to need to return to work sooner to support their families, and may opt to return sooner if they believe they will receive a certain level of support. This is one possible explanation for why the laws led to lower rates of breastfeeding at 1 year for black mothers.

3.7 Conclusion

Lack of enforcement mechanisms weakens the efficacy of workplace regulations. In the case of workplace lactation support laws, where the recourse for employees facing a noncompliant employer can be costly, one might expect not to see an effect. Indeed, I rule out large impacts on initiation and most measures of duration. That said, despite lax enforcement, the results show an effect on breastfeeding at 3 months. A 2 percentage point increase in breastfeeding at least 3 months conditional on initiation is a substantial increase. In the context of a 10.6 percentage point increase over the sample period, 2000-2012, the effect of the law is about three times the average annual increase. The laws affected the measure (3 months) that relates most closely to the end of most mothers' maternity leave and their return to work. Of the women returning to work in the first year after birth, the largest percentage return between 6 and 12 weeks, the time between temporary disability and FMLA coverage (Johnson 2008). The promise of support at work may encourage mothers to breastfeed through maternity leave or early on after they return to work.

Once back to work, realized support may affect mothers differently. Depending on occupation and perceived or realized support from superiors and coworkers, the ability and desire to continue breastfeeding after the return to work may differ across mothers. While I do not see effects on the overall sample at 1 year, I do find differential impacts by maternal age and race. The youngest and oldest mothers experience a positive impact and black mothers experience a negative impact for breastfeeding at 1 year.

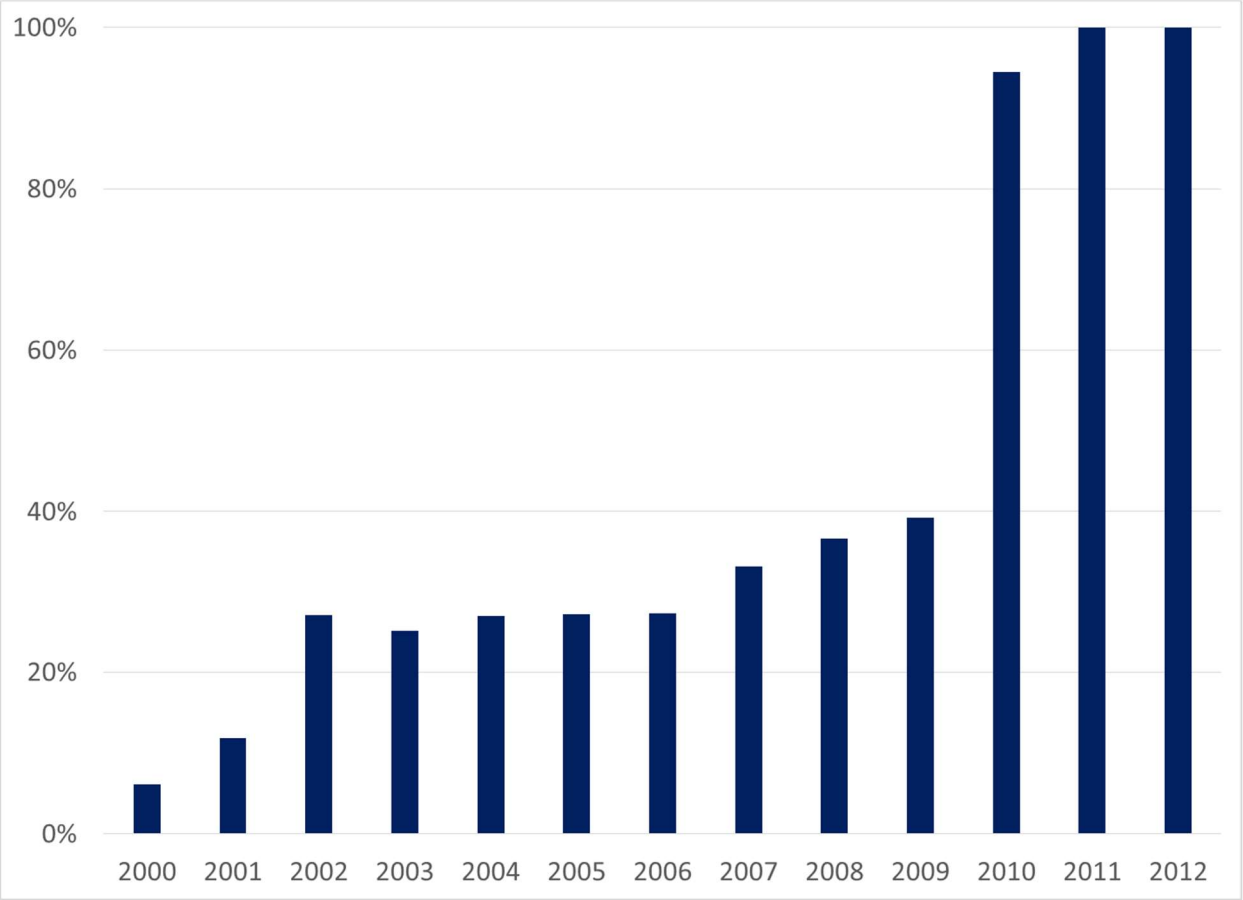
Meeting the requirements of these laws is not costless to the employer. However, the

benefits of breastfeeding cited in medical literature, including healthier infants and less consequent sick leave taken by working mothers, might very well generate a net cost savings for employers. The net savings for employers hinge on the laws actually effecting positive change in breastfeeding behavior. A study conducted by the UCLA Center for Healthier Children, Families, and Communities looked at the benefits of Cigna's corporate lactation program. It found higher breastfeeding initiation and duration compared to the general population and control group, along with reduced absenteeism and medical costs (Cigna 2000). Another article estimates "the burden of suboptimal breastfeeding in the U.S.," and calculates that the U.S. would save $13 billion and prevent over 900 deaths every year if 90 percent of infants were breastfed exclusively for their first six months, as recommended (Bartick and Reinhold 2010). While these estimates may overstate the health and financial benefits from increased breastfeeding due to selection bias and other confounders, even critics are not likely to disagree that there would be some savings as a result of increased breastfeeding rates. From the perspective of working mothers, the laws certainly reduce the burden of continued breastfeeding and this alone may justify the cost to employers.

Lowering the cost for mothers not on the margin is a worthwhile goal in and of itself, but the other goal of encouraging mothers on the margin to breastfeed longer is the focus of this paper. Understanding the impact of these laws on breastfeeding initiation and duration gives us a better sense of how the laws are meeting this objective. In light of the national healthcare reform's inclusion of workplace lactation support, it is even more critical to determine its impact. If the goal of policymakers in including this language in the recent healthcare reform measures was to achieve the breastfeeding targets set by the government, the assessment of the impact of such legislation on these rates can help them determine whether workplace lactation support is an area on which to focus attention and money.

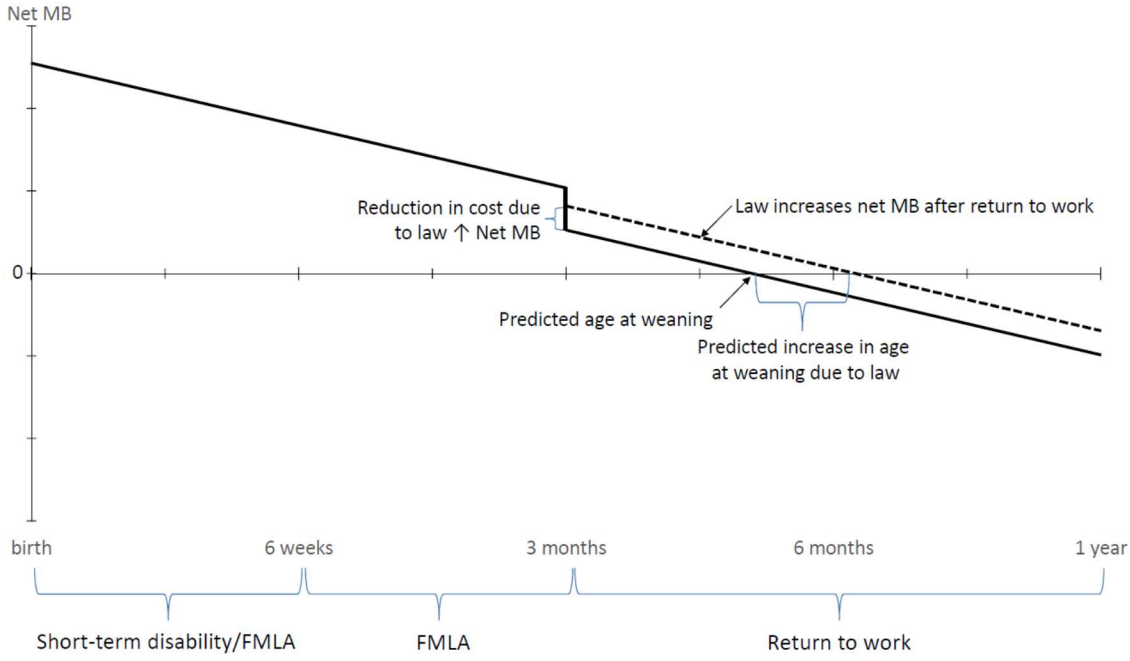
It seems lactation support at work does help in terms of encouraging mothers to continue breastfeeding in the short-run, i.e., during maternity leave and shortly after returning to work, but, in terms of longer duration, the results are mixed. More research is needed to delve deeper into the underlying reasons for differential impacts associated with mothers of different ages and races to determine how future policies might be structured to better address the needs of these groups.

Figure 3.1 Percent of Births in the Sample that were Covered by a Workplace Lactation Support Law, by Year of Birth



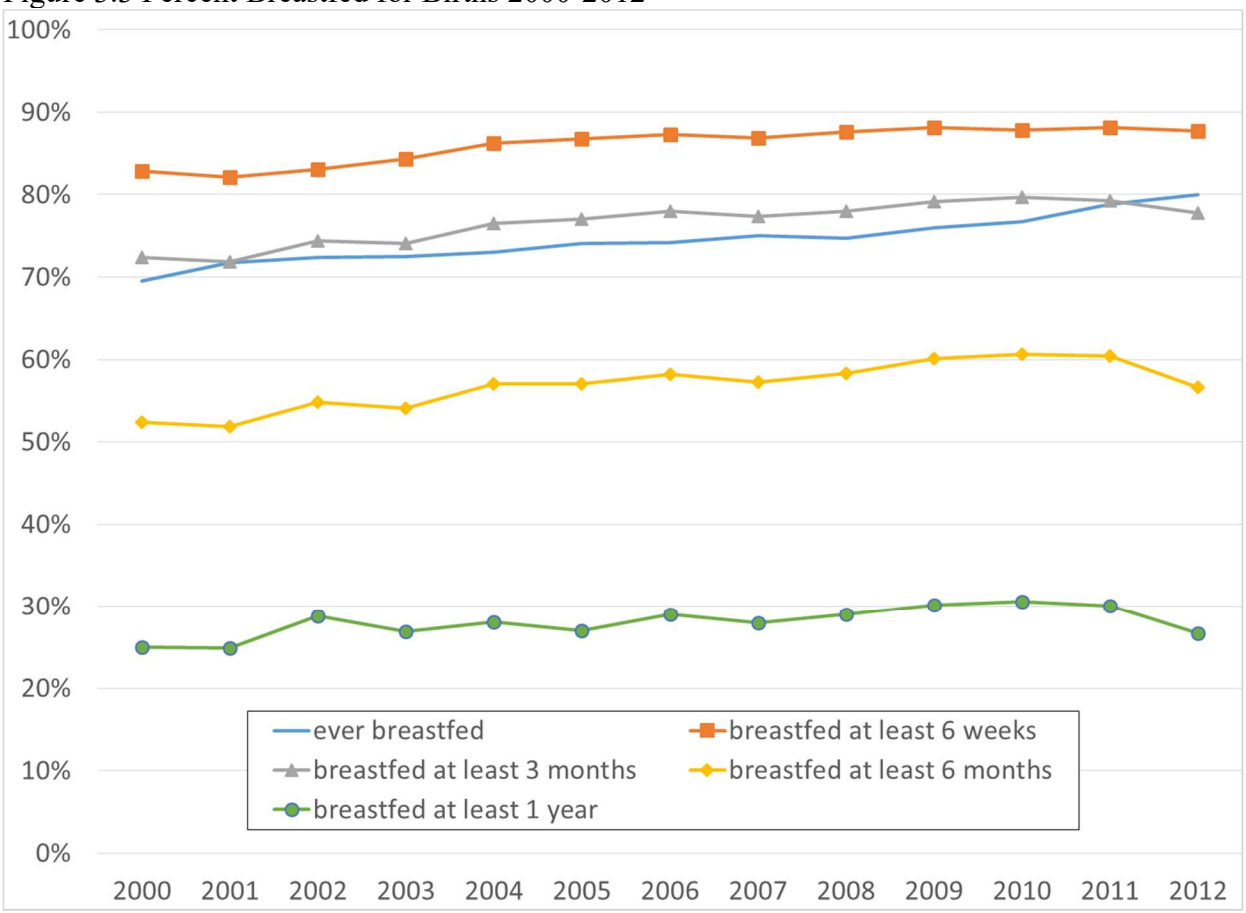
Notes: Data are weighted using survey weights.

Figure 3.2 Model of Breastfeeding Decision



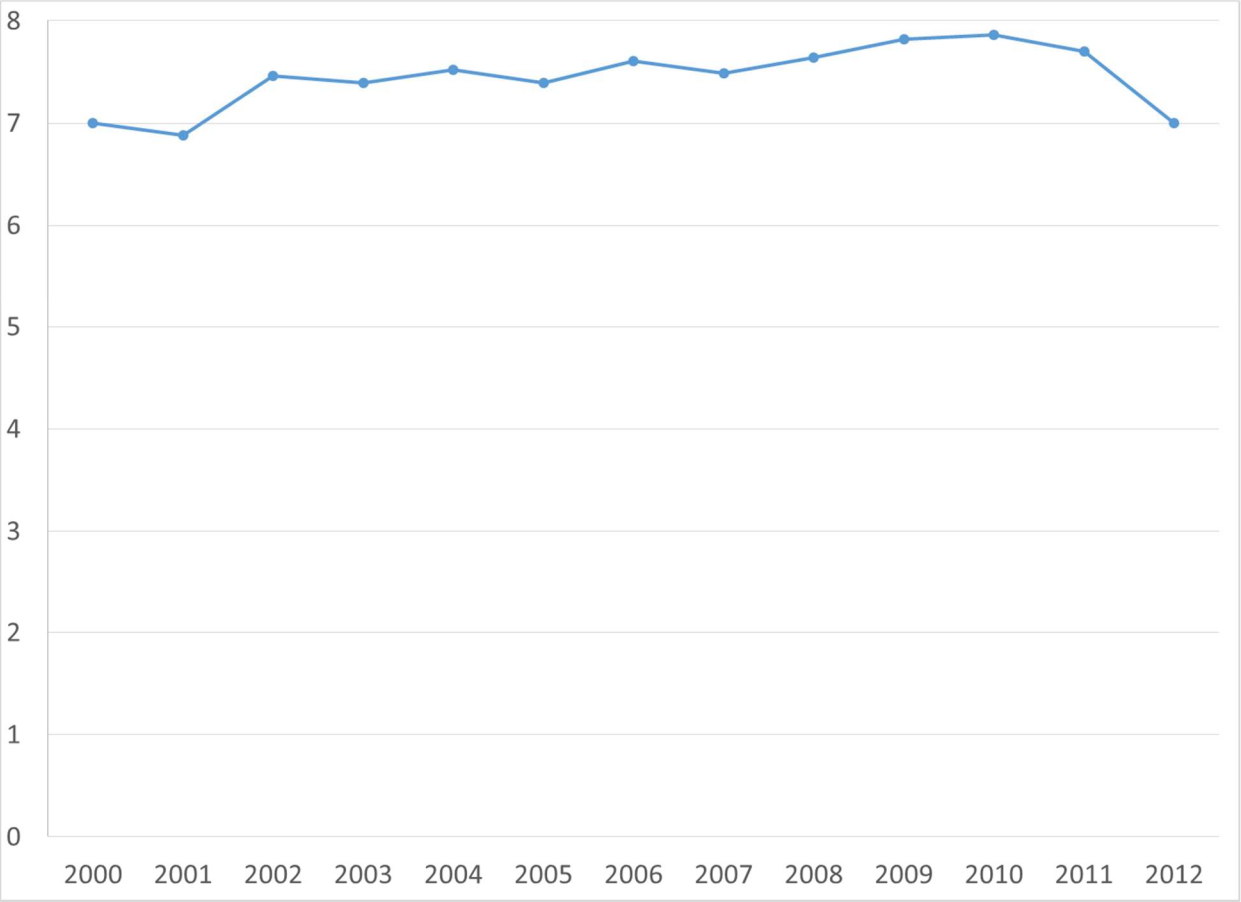
Notes: Laws impact the marginal cost curve only after the return to work.

Figure 3.3 Percent Breastfed for Births 2000-2012



Notes: Data are from the restricted NIS and are weighted using survey weights. Each data point represents the percent of babies born in each year that were ever breastfed, breastfed at least 6 weeks, 3 months, 6 months, and one year conditional on having ever been breastfed.

Figure 3.4 Average Months Breastfed Conditional on Ever Breastfed for Births 2000-2012



Notes: Data are from the restricted NIS and are weighted using survey weights. Each data point represents the average months a baby born in each year was breastfed conditional on the baby ever being breastfed.

Figure 3.5 Duration of Breastfeeding in Months Conditional on Ever Breastfed

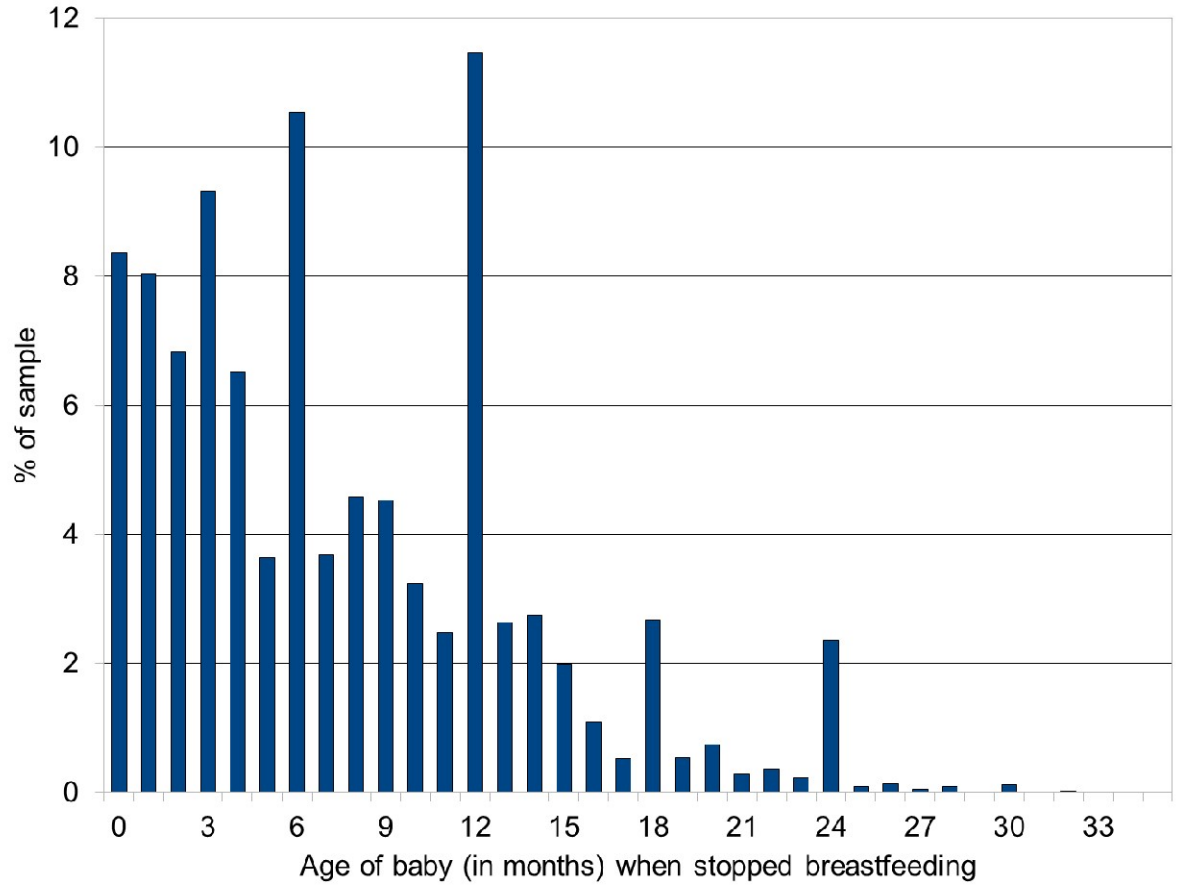
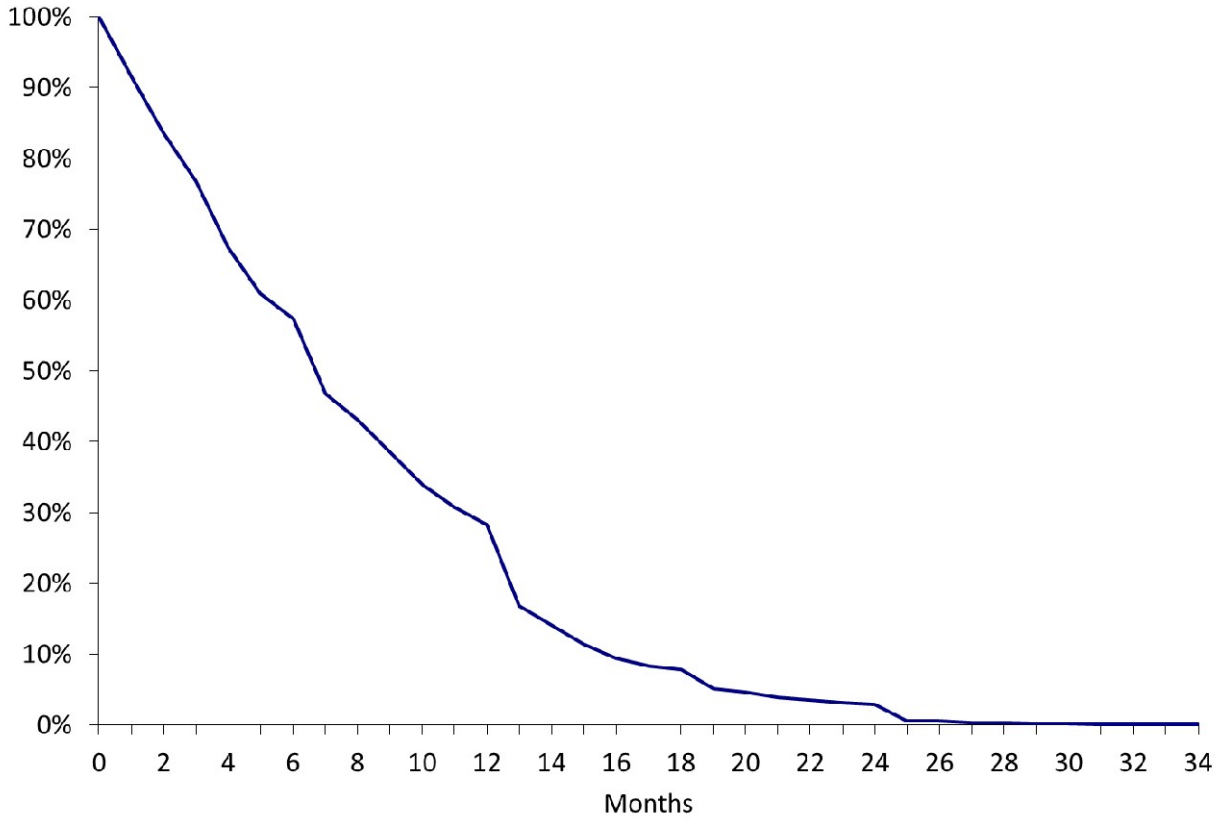


Figure 3.6 Percent Still Breastfeeding Each Month, Conditional on Initiation by Year of Birth 2000-2012



Notes: Data are from the restricted NIS, weighted using survey weights. The lines represent each year of birth in the pooled NIS. Each point on the line represents the percent of babies born in that year who were still being breastfed at month *m* conditional on being breastfed at month *m-1*.

Figure 3.7 Event Study Coefficients on Time in Years Before and After Implementation of Workplace Lactation Support Laws

Figure 3.7a: Breastfeeding Initiation

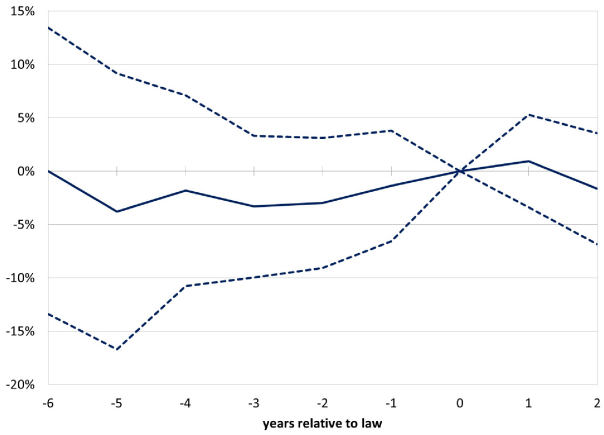


Figure 3.7b: Breastfeeding at 6 Weeks

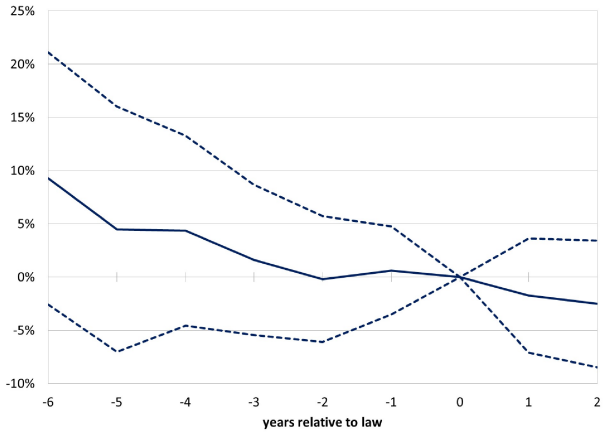


Figure 3.7c: Breastfeeding at 6 Weeks Conditional on Ever Breastfed

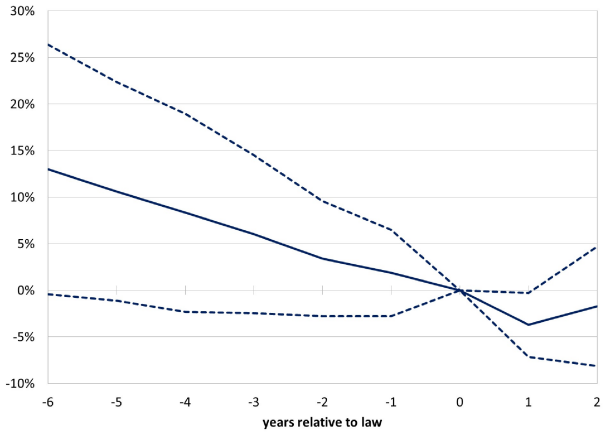


Figure 3.7d: Breastfeeding at 3 Months

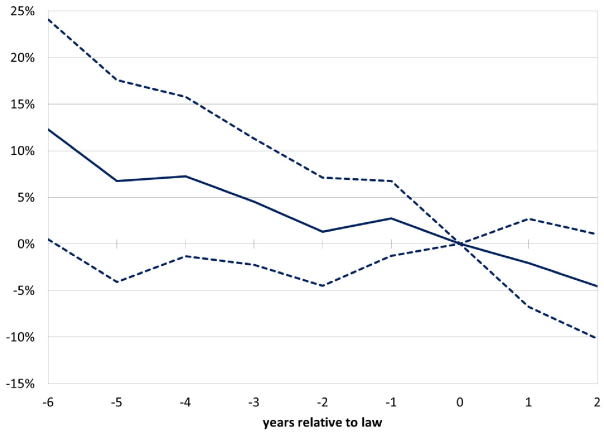


Figure 3.7e: Breastfeeding at 3 Months Conditional on Ever Breastfed

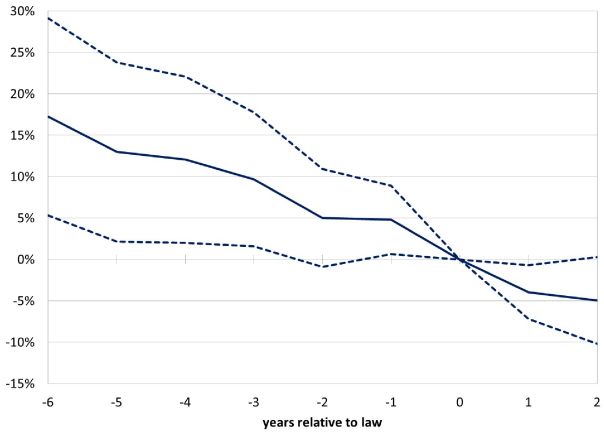


Figure 3.7f: Breastfeeding at 6 Months

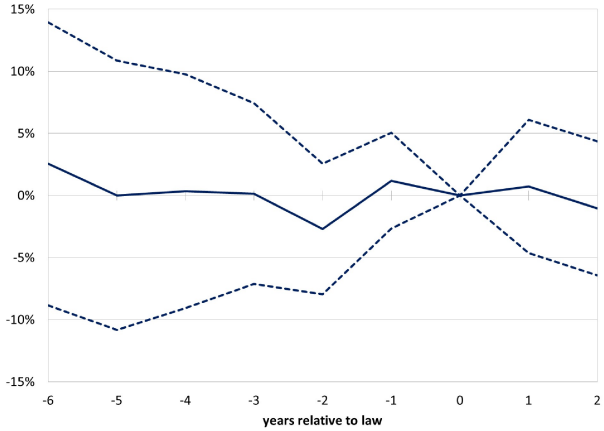


Figure 3.7g: Breastfeeding at 6 Months Conditional on Ever Breastfed

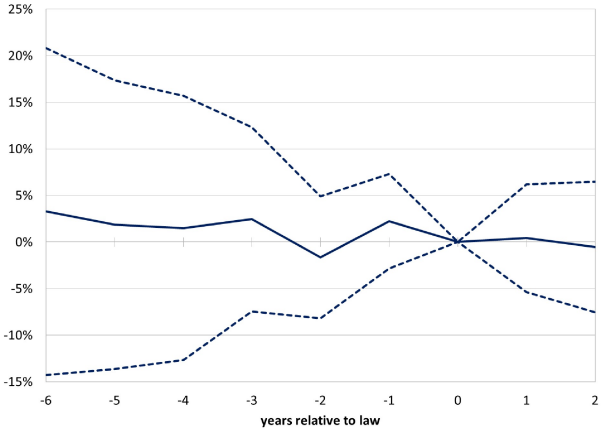


Figure 3.7h: Breastfeeding at 1 Year

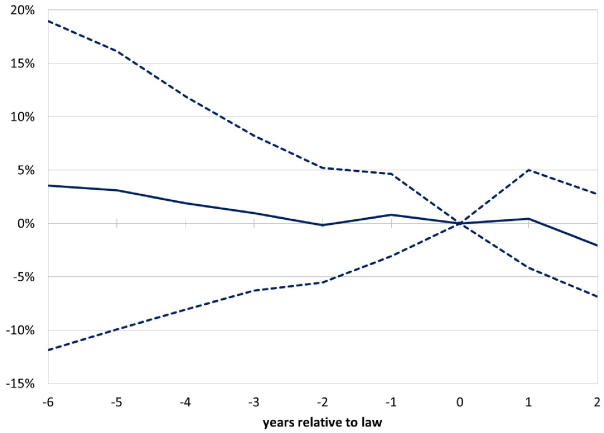


Figure 3.7i: Breastfeeding at 1 Year Conditional on Ever Breastfed

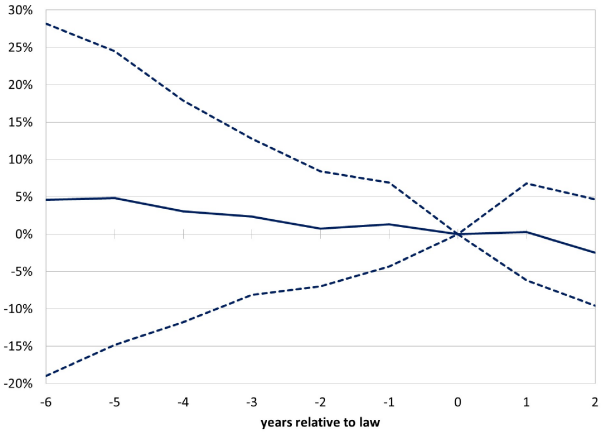


Figure 3.7j: Breastfeeding in Months

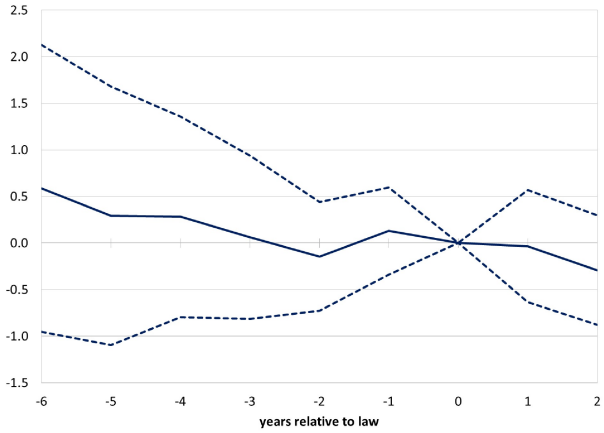
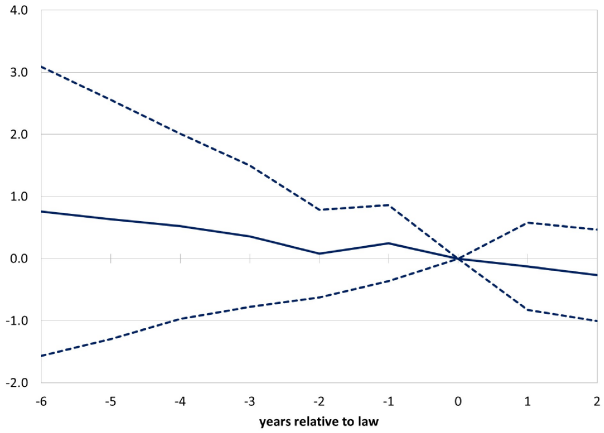


Figure 3.7k: Breastfeeding in Months Conditional on Ever Breastfed



Notes: Y-axis is the coefficient on the change in breastfeeding percentages or months breastfed for *d* years before/after laws were implemented. The omitted year is *d=0*. The time period reflects a balanced sample that includes 42 states and DC. The dashed lines represent the 95% confidence intervals based on state of birth clustered standard errors. See the discussion in Section 3.4.1 for more information.

Table 3.1 Descriptive Statistics for NIS Sample

	Full Sample	Sample under Supportive Law	Sample not under Supportive Law	
Maternal Characteristics				
Married	55.7	54.8	56.2	**
Greater than HS educated[25]	38.7	43.4	36.0	***
Age 30+ at time of child's birth	31.4	33.3	30.4	***
race/ethnicity				
White	55.2	48.3	58.8	***
Black	16.7	14.1	18.1	***
Hispanic	22.8	30.9	18.5	***
Other	5.3	6.7	4.6	***
Child/Family characteristics				
born under a supportive law	34.7	100.0	0.0	
Male	51.5	51.9	51.3	
Firstborn	48.6	46.2	49.9	***
ever enrolled in WIC	67.1	67.9	66.6	**
poverty status				
above poverty, >$75K	22.3	19.2	22.0	***
above poverty, <=$75K	40.3	34.6	40.0	***
below poverty	37.4	40.3	32.7	***
N	86,829	30,107	56,722	

Notes: all numbers are percentages except *N*. All data are weighted using survey weights. Means of the samples with and without supportive laws are statistically significantly different at the following levels: ***p<0.01; **p<0.05; *p<0.1.

[25] Less than high school or high school graduate includes those coded as 0-16 years, never attended/kindergarten, elementary, 8th grade or less, 9th-12th grade no diploma, and high school graduate, including those with GEDs. Greater than high school includes those coded as having 17 or more years of education, some college, or vocational/trade school, as well as those with associate's degrees; college graduate includes those with bachelor's degrees or higher.

Table 3.1 (continued): Descriptive Statistics for NIS Sample

	Full Sample	Sample under Supportive Law	Sample not under Supportive Law	
Outcomes				
ever breastfed	71.1	75.8	68.6	***
breastfed at least 6 weeks	59.2	65.0	56.2	***
breastfed at least 3 months	51.8	57.9	48.6	***
breastfed at least 6 months	37.1	42.4	34.3	***
breastfed at least 1 year	17.5	21.0	15.6	***
average months breastfed	4.9	5.6	4.5	***
breastfed at least 6 weeks | ever breastfed	83.9	86.6	82.4	***
breastfed at least 3 months | ever breastfed	73.4	77.0	71.2	***
breastfed at least 6 months | ever breastfed	52.5	56.4	50.3	***
breastfed at least 1 year | ever breastfed	24.8	27.9	22.9	***
average months breastfed | ever breastfed	6.9	7.5	6.6	***
N	86,829	30,107	56,722	

Notes: all numbers are percentages except *months breastfed* and *N*. All data are weighted using survey weights. Means of the samples with and without supportive laws are statistically significantly different at the following levels: ***p<0.01; **p<0.05; *p<0.1.

Table 3.2 WLS Regression Results

Table 3.2a: Unconditional Measures of Breastfeeding

	Initiation	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	-0.0074	0.0006	0.0109	0.0015	0.0029	0.0256
	[0.0101]	[0.0103]	[0.00858]	[0.00768]	[0.00836]	[0.104]
Mean of dependent variable	71.1%	59.2%	51.8%	37.1%	17.5%	4.9 mo.
N	86,829	85,189	85,189	85,189	85,189	85,126
R-squared	0.08	0.08	0.08	0.08	0.05	0.09

Notes: controls for child's sex, firstborn status, mother's race/ethnicity, and age at birth and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.2b: Conditional Measures of Breastfeeding

	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	0.00852	0.0223*	0.00787	0.00649	0.101
	[0.00851]	[0.0122]	[0.0109]	[0.0114]	[0.150]
Mean of dependent variable	83.9%	73.4%	52.5%	24.8%	6.9 mo.
N	58,717	58,717	58,717	58,717	58,655
R-squared	0.05	0.07	0.09	0.06	0.09

Notes: controls for child's sex, firstborn status, mother's race/ethnicity, and age at birth and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.3 Differential Impacts: WLS Regression Results by Maternal Age at Birth

Table 3.3a: Teen Mothers: Unconditional Measures of Breastfeeding

	Initiation	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	-0.0495	-0.0243	0.0161	-0.016	0.0263	0.0873
	[0.0301]	[0.0346]	[0.0503]	[0.0358]	[0.0211]	[0.332]
Constant	0.502	0.388	0.323	0.185	0.0701	2.314
N	8,495	8,418	8,418	8,418	8,418	8,417
R-squared	0.103	0.076	0.066	0.052	0.036	0.067

Notes: controls for child's sex, firstborn status, mother's race/ethnicity, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.3b: Teen Mothers: Conditional Measures of Breastfeeding

	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	0.0256	0.0688	-0.00165	0.0515*	0.508
	[0.0429]	[0.0659]	[0.0501]	[0.0295]	[0.427]
Constant	0.741	0.598	0.334	0.125	4.278
N	5,011	5,011	5,011	5,011	5,010
R-squared	0.041	0.051	0.047	0.040	0.046

Notes: controls for child's sex, firstborn status, mother's race/ethnicity, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.3c: Mothers 20-29: Unconditional Measures of Breastfeeding

	Initiation	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	0.0022	0.00812	0.0201	0.0201	0.00579	0.143
	[0.0119]	[0.0128]	[0.0122]	[0.0133]	[0.0147]	[0.189]
Constant	0.638	0.510	0.427	0.301	0.115	3.950
N	46,930	46,254	46,254	46,254	46,254	46,223
R-squared	0.072	0.066	0.065	0.055	0.040	0.069

Notes: controls for child's sex, firstborn status, mother's race/ethnicity, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.3d: Mothers 20-29: Conditional Measures of Breastfeeding

	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	0.00747	0.0240*	0.0263	0.00666	0.168
	[0.0109]	[0.0125]	[0.0170]	[0.0185]	[0.217]
Constant	0.803	0.676	0.476	0.186	6.255
N	34,053	34,053	34,053	34,053	34,022
R-squared	0.021	0.029	0.028	0.030	0.041

Notes: controls for child's sex, firstborn status, mother's race/ethnicity, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.3e: Mothers 30-39: Unconditional Measures of Breastfeeding

	Initiation	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	-0.0147	-0.00659	-0.0163	-0.0397	-0.0315**	-0.365
	[0.0176]	[0.0239]	[0.0254]	[0.0281]	[0.0151]	[0.239]
Constant	0.750	0.709	0.644	0.498	0.235	6.700***
N	25,684	24,979	24,979	24,979	24,979	24,955
R-squared	0.055	0.049	0.047	0.041	0.035	0.050

Notes: controls for child's sex, firstborn status, mother's race/ethnicity, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.3f: Mothers 30-39: Conditional Measures of Breastfeeding

	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	0.00995	-0.00205	-0.0328	-0.0311**	-0.263
	[0.0154]	[0.0185]	[0.0234]	[0.0146]	[0.178]
Constant	0.937	0.853	0.659	0.312	8.879
N	20,077	20,077	20,077	20,077	20,053
R-squared	0.018	0.022	0.029	0.031	0.037

Notes: controls for child's sex, firstborn status, mother's race/ethnicity, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.3g: Mothers 40+: Unconditional Measures of Breastfeeding

	Initiation	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	-0.0105	0.00611	0.0232	0.0346	0.0655**	0.341
	[0.0335]	[0.0421]	[0.0356]	[0.0323]	[0.0324]	[0.395]
Constant	0.585	0.550	0.510	0.383	0.203	5.141
N	5,720	5,538	5,538	5,538	5,538	5,531
R-squared	0.110	0.105	0.097	0.072	0.059	0.084

Notes: controls for child's sex, firstborn status, mother's race/ethnicity, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.3h: Mothers 40+: Conditional Measures of Breastfeeding

	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	0.0202	0.0408	0.0474	0.0858**	0.483
	[0.0320]	[0.0437]	[0.0445]	[0.0427]	[0.527]
Constant	0.924	0.851	0.629	0.328	8.492
N	4,085	4,085	4,085	4,085	4,078
R-squared	0.057	0.049	0.053	0.061	0.074

Notes: controls for child's sex, firstborn status, mother's race/ethnicity, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.4 Differential Impacts: WLS Regression Results by Race of Mother

Table 3.4a: White Mothers: Unconditional Measures of Breastfeeding

	Initiation	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	0.0024	0.0083	0.0091	0.0146	0.0058	-0.0026
	[0.0113]	[0.0116]	[0.0116]	[0.0141]	[0.0113]	[0.185]
Constant	0.528	0.380	0.264	0.141	0.0420	2.089
N	54,471	53,461	53,461	53,461	53,461	53,415
R-squared	0.068	0.078	0.087	0.085	0.049	0.091

Notes: controls for child's sex, firstborn status, mother's age at birth, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.4b: White Mothers: Conditional Measures of Breastfeeding

	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	0.0073	0.0094	0.0185	0.0069	-0.0277
	[0.00823]	[0.00925]	[0.0161]	[0.0145]	[0.201]
Constant	0.711	0.499	0.270	0.0882	3.988
N	40,826	40,826	40,826	40,826	40,780
R-squared	0.039	0.061	0.068	0.042	0.075

Notes: controls for child's sex, firstborn status, mother's age at birth, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.4c: Black Mothers: Unconditional Measures of Breastfeeding

	Initiation	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	-0.0551*	-0.0496	-0.0524	-0.0379	-0.0451*	-1.012***
	[0.0286]	[0.0300]	[0.0373]	[0.0301]	[0.0226]	[0.328]
Constant	0.402	0.291	0.227	0.115	0.027	1.525
N	12,592	12,451	12,451	12,451	12,451	12,445
R-squared	0.066	0.062	0.066	0.062	0.054	0.077

Notes: controls for child's sex, firstborn status, mother's age at birth, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.4d: Black Mothers: Conditional Measures of Breastfeeding

	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	0.0026	-0.0088	-0.0059	-0.0490*	-0.947**
	[0.0288]	[0.0369]	[0.0312]	[0.0291]	[0.392]
Constant	0.726	0.572	0.305	0.0776	4.000
N	6,998	6,998	6,998	6,998	6,992
R-squared	0.040	0.058	0.062	0.063	0.081

Notes: controls for child's sex, firstborn status, mother's age at birth, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.4e: Hispanic Mothers: Unconditional Measures of Breastfeeding

	Initiation	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	-0.0102	0.0098	0.0436*	-0.0174	0.0265	0.6120
	[0.0223]	[0.0209]	[0.0257]	[0.0286]	[0.0235]	[0.365]
Constant	0.659	0.477	0.401	0.193	0.0887	3.404
N	14,176	13,854	13,854	13,854	13,854	13,850
R-squared	0.025	0.038	0.043	0.047	0.037	0.051

Notes: controls for child's sex, firstborn status, mother's age at birth, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.4f: Hispanic Mothers: Conditional Measures of Breastfeeding

	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	0.0229	0.0616*	-0.0153	0.0349	0.799*
	[0.0175]	[0.0342]	[0.0354]	[0.0283]	[0.444]
Constant	0.741	0.624	0.320	0.145	5.343
N	11,013	11,013	11,013	11,013	11,009
R-squared	0.033	0.042	0.046	0.039	0.052

Notes: controls for child's sex, firstborn status, mother's age at birth, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.4g: Mothers of Other Races/Ethnicities: Unconditional Measures of Breastfeeding

	Initiation	At 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	0.0100	-0.0276	-0.0144	0.0019	-0.0239	-0.2880
	[0.0342]	[0.0519]	[0.0501]	[0.0447]	[0.0298]	[0.618]
Constant	0.614	0.486	0.448	0.375	0.0937	3.604
N	5,590	5,423	5,423	5,423	5,423	5,416
R-squared	0.106	0.101	0.116	0.108	0.069	0.103

Notes: controls for child's sex, firstborn status, mother's age at birth, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Table 3.4h: Mothers of Other Races/Ethnicities Mothers: Conditional Measures of Breastfeeding

	at 6 weeks	at 3 months	at 6 months	at 1 year	Months
Supportive law in effect	-0.0429	-0.0247	-0.0044	-0.0312	-0.3770
	[0.0360]	[0.0350]	[0.0467]	[0.0293]	[0.536]
Constant	0.787	0.708	0.562	0.155	5.630
N	4,389	4,389	4,389	4,389	4,382
R-squared	0.064	0.084	0.088	0.064	0.082

Notes: controls for child's sex, firstborn status, mother's age at birth, and fixed effects for survey year, state of birth, year of birth, and month of birth are included; all data are weighted using the NIS weights; standard errors are clustered by state of birth. ***p<0.01; **p<0.05; *p<0.1

Appendix Table A3.1 Timeline of Workplace Lactation Support Law Adoption

Year law went into effect	State(s)
1998	Minnesota
1999	Hawaii and Tennessee
2001	Connecticut and Illinois
2002	California
2006	Mississippi
2007	New Mexico, New York, and the District of Columbia
2008	Colorado, Indiana, Oregon, and Vermont
2009	Arkansas and Maine
2010	National

Source: National Conference of State Legislatures (2011).

Appendix Table A3.2 Summary of State Laws Pertaining to Workplace Lactation Support

State	Year Effective	Language of laws includes: Encourages	Requires	No discrimination	Break time	Private location	Other information
Arkansas	2009		X		X	X	
California	1998	X				X	
	2002		X		X		Penalty for noncompliance
Colorado	2008		X		X	X	
Connecticut	2001		X		X	X	
District of Columbia	2007		X	X	X	X	
Georgia	1999	X			X	X	Exemption if "unduly" disruption
Hawaii	1999		X	X	X		Penalty for noncompliance
Illinois	2001		X		X	X	
Indiana	2008		X			X	>25 employees
Maine	2009		X	X	X	X	
Minnesota	1998		X		X	X	
Mississippi	2006		X	X			
Montana	2007		X	X	X	X	Public employees
New Mexico	2007		X		X	X	
New York	2007		X		X	X	
North Dakota	2009	X			X	X	Employers can be designated "infant friendly"
Oklahoma	2006	X			X		
State	Year Effective	Language of laws includes: Encourages	Requires	No discrimination	Break time	Private location	Other information
Oregon	2008		X		X		Exemptions for some employers; penalty for noncompliance
Rhode Island	2003	X			X		

Tennessee	1999		X		X	X	
Texas	1995	X					Employers can be designated "mother friendly"
Vermont	2008		X	X	X	X	
Virginia	2002	X			X	X	
Washington	2001	X					Employers can be designated "infant friendly"
Wyoming	2003	X					Commends employers
National	2010		X		X	X	Nonexempt employees; >50 employees

Source: National Conference of State Legislatures (2011).

Appendix Table A3.3 Timeline of Other Potentially Confounding Changes in State Laws

Year law went into effect (year passed)	State	Type of law	Lactation support law (year effective)?
2004 (2002)	California	Paid family leave	Yes, law requiring (2001); law encouraging (1998)
2009 (2008)	New Jersey	Paid family leave	No
2014 (2013)	Rhode Island	Paid family leave	Yes, but not strict requirement (2003)
To date, has not gone into effect (2007)	Washington	Paid family leave	Yes, but only encourages employers (2001)

Source: National Conference of State Legislatures (2011).

Appendix Table A3.4 WLS Regression Full Results
Appendix Table A3.4a: Outcome Breastfeeding Initiation

		(1)	(2)	(3)	(4)	(5)	(6)
	Supportive law in effect	0.000303	-0.00738	-0.00794	-0.00883	-0.0108	-0.00965
		[0.00847]	[0.0101]	[0.00850]	[0.00836]	[0.00920]	[0.00893]
	Child male		0.00297	0.00318	0.00176	0.000994	0.00155
			[0.00505]	[0.00514]	[0.00563]	[0.00561]	[0.00577]
	Child firstborn		0.0478***	0.0242***	0.0279***	0.0283***	0.0284***
			[0.00592]	[0.00540]	[0.00569]	[0.00536]	[0.00525]
Mother's age	20-29 years old		0.108***	0.0566***	0.0357***	0.0333***	0.0289***
			[0.00979]	[0.00865]	[0.00854]	[0.00877]	[0.00883]
	30-39 years old		0.169***	0.0636***	0.0316***	0.0247**	0.0148
			[0.0136]	[0.00876]	[0.00919]	[0.00958]	[0.00999]
	40+ years old		0.107***	0.0300**	0.00605	-0.000674	-0.00806
			[0.0140]	[0.0142]	[0.0143]	[0.0169]	[0.0179]
Mother's race/ethnicity	black		-0.107***	-0.0867***	-0.0532***	-0.0490***	-0.0419***
			[0.0125]	[0.0137]	[0.0143]	[0.0144]	[0.0144]
	Hispanic		0.0490***	0.0449***	0.0461***	0.0436***	0.0434***
			[0.0162]	[0.0138]	[0.0129]	[0.0138]	[0.0137]
	other		0.0735***	0.129***	0.138***	0.142***	0.150***
			[0.0124]	[0.0147]	[0.0152]	[0.0162]	[0.0164]
Mother's education	high school graduate			0.0319***	0.0260**	0.0252**	0.0246**
				[0.0113]	[0.00997]	[0.0101]	[0.00992]
	some college/associate's degree			0.163***	0.145***	0.140***	0.133***
				[0.0162]	[0.0149]	[0.0145]	[0.0141]
	college graduate or greater			0.257***	0.217***	0.207***	0.188***
				[0.0235]	[0.0203]	[0.0193]	[0.0179]
	Mother is married				0.111***	0.106***	0.0969***
					[0.00733]	[0.00722]	[0.00647]
Income	above poverty, <$75K					-0.0246***	-0.00376
						[0.00670]	[0.00670]
	below poverty					-0.0415***	-0.012
						[0.00941]	[0.00903]
	Child ever received WIC benefits						-0.0660***
							[0.00949]
	N	88,441	86,829	80,398	80,198	76,623	76,289
	R-squared	0.05	0.08	0.12	0.13	0.13	0.14
Characteristics	sex, firstborn, age, race/ethnicity		x	x	x	x	x
	education			x	x	x	x
	marital status				x	x	x
	income					x	x
	WIC participation (ever)						x

Notes: All specifications include state and year of birth fixed effects, and specifications 2-6 also include survey and month of birth fixed effects.

Appendix Table A3.4b: WLS Regression Full Results: Outcome Breastfed at Least 6 Weeks

		(1)	(2)	(3)	(4)	(5)	(6)
	Supportive law in effect	0.00851	0.00057	-0.00208	-0.00288	-0.00626	-0.00538
		[0.00807]	[0.0103]	[0.00912]	[0.00879]	[0.00810]	[0.00779]
	Child male		0.00649	0.00765	0.00617	0.00574	0.00624
			[0.00514]	[0.00530]	[0.00559]	[0.00571]	[0.00579]
	Child firstborn		0.0200***	-0.00784	-0.00358	-0.00361	-0.00367
			[0.00569]	[0.00563]	[0.00607]	[0.00583]	[0.00571]
Mother's age	20-29 years old		0.146***	0.0878***	0.0626***	0.0597***	0.0541***
			[0.0105]	[0.0128]	[0.0131]	[0.0128]	[0.0134]
	30-39 years old		0.235***	0.113***	0.0757***	0.0670***	0.0529***
			[0.00986]	[0.0114]	[0.0122]	[0.0122]	[0.0137]
	40+ years old		0.176***	0.0815***	0.0526**	0.0422*	0.0315
			[0.0196]	[0.0221]	[0.0223]	[0.0241]	[0.0255]
Mother's race/ethnicity	black		-0.0801***	-0.0564***	-0.0159	-0.0132	-0.0026
			[0.0131]	[0.0144]	[0.0155]	[0.0163]	[0.0164]
	Hispanic		0.0553***	0.0479***	0.0497***	0.0499***	0.0495***
			[0.0179]	[0.0146]	[0.0136]	[0.0135]	[0.0133]
	other		0.0783***	0.142***	0.152***	0.156***	0.167***
			[0.0105]	[0.0117]	[0.0122]	[0.0136]	[0.0136]
Mother's education	high school graduate			0.0232**	0.0159	0.0147	0.0132
				[0.0112]	[0.00999]	[0.00941]	[0.00923]
	some college/associate's degree			0.160***	0.138***	0.133***	0.122***
				[0.0146]	[0.0137]	[0.0131]	[0.0130]
	college graduate or greater			0.301***	0.253***	0.240***	0.212***
				[0.0219]	[0.0191]	[0.0167]	[0.0157]
	Mother is married				0.132***	0.124***	0.111***
					[0.00709]	[0.00655]	[0.00581]
Income	above poverty, <$75K					-0.0344***	-0.00351
						[0.00761]	[0.00702]
	below poverty					-0.0489***	-0.00504
						[0.0124]	[0.0121]
	Child ever received WIC benefits						-0.0971***
							[0.0102]
	N	86,788	85,189	78,879	78,686	75,202	74,882
	R-squared	0.05	0.08	0.13	0.14	0.14	0.15
Characteristics	sex, firstborn, age, race/ethnicity		x	x	x	x	x
	education			x	x	x	x
	marital status				x	x	x
	income					x	x
	WIC participation (ever)						x

Notes: All specifications include state and year of birth fixed effects, and specifications 2-6 also include survey and month of birth fixed effects.

Appendix Table A3.4c: WLS Regression Full Results: Outcome Breastfed at Least 6 Weeks | Ever Breastfed

		(1)	(2)	(3)	(4)	(5)	(6)
	Supportive law in effect	0.0109	0.00852	0.00535	0.0054	0.00289	0.00228
		[0.0106]	[0.00851]	[0.00889]	[0.00890]	[0.00944]	[0.00936]
	Child male		0.00544	0.00702	0.00652	0.00658	0.00679
			[0.00548]	[0.00524]	[0.00524]	[0.00544]	[0.00545]
	Child firstborn		-0.0280***	-0.0401***	-0.0382***	-0.0390***	-0.0395***
			[0.00531]	[0.00556]	[0.00561]	[0.00606]	[0.00611]
Mother's age	20-29 years old		0.100***	0.0755***	0.0626***	0.0604***	0.0572***
			[0.0134]	[0.0153]	[0.0157]	[0.0144]	[0.0149]
	30-39 years old		0.154***	0.103***	0.0840***	0.0792***	0.0705***
			[0.0103]	[0.0134]	[0.0140]	[0.0136]	[0.0143]
	40+ years old		0.144***	0.0970***	0.0807***	0.0727***	0.0653***
			[0.0136]	[0.0168]	[0.0172]	[0.0164]	[0.0173]
Mother's race/ethnicity	black		0.0144*	0.0235***	0.0414***	0.0402***	0.0481***
			[0.00826]	[0.00842]	[0.00994]	[0.0112]	[0.0115]
	Hispanic		0.0193*	0.0154	0.0164	0.0191*	0.0195*
			[0.0114]	[0.0108]	[0.0109]	[0.0103]	[0.0105]
	other		0.0252***	0.0545***	0.0601***	0.0611***	0.0694***
			[0.00539]	[0.00658]	[0.00629]	[0.00688]	[0.00679]
Mother's education	high school graduate			-0.00065	-0.00362	-0.00405	-0.00503
				[0.00657]	[0.00645]	[0.00699]	[0.00714]
	some college/associate's degree			0.0435***	0.0354***	0.0338***	0.0275***
				[0.00780]	[0.00796]	[0.00860]	[0.00894]
	college graduate or greater			0.114***	0.0947***	0.0902***	0.0743***
				[0.00943]	[0.00883]	[0.00807]	[0.00923]
	Mother is married				0.0594***	0.0550***	0.0473***
					[0.00697]	[0.00708]	[0.00666]
Income	above poverty, <$75K					-0.0138*	0.00534
						[0.00777]	[0.00844]
	below poverty					-0.0169	0.0112
						[0.0128]	[0.0137]
	Child ever received WIC benefits						-0.0591***
							[0.00728]
	N	64,494	63,226	58,824	58,717	56,153	55,910
	R-squared	0.01	0.03	0.05	0.05	0.05	0.05
Characteristics	sex, firstborn, age, race/ethnicity		x	x	x	x	x
	education			x	x	x	x
	marital status				x	x	x
	income					x	x
	WIC participation (ever)						x

Notes: All specifications include state and year of birth fixed effects, and specifications 2-6 also include survey and month of birth fixed effects.

Appendix Table A3.4d: WLS Regression Full Results: Outcome Breastfed at Least 3 Months

		(1)	(2)	(3)	(4)	(5)	(6)
	Supportive law in effect	0.0152*	0.0109	0.00772	0.00706	-0.0016	-0.000873
		[0.00791]	[0.00858]	[0.00843]	[0.00879]	[0.00765]	[0.00735]
	Child male		-0.00395	-0.0033	-0.00491	-0.00438	-0.00369
			[0.00515]	[0.00525]	[0.00573]	[0.00526]	[0.00530]
	Child firstborn		0.0115**	-0.0157***	-0.0113**	-0.00963	-0.00987*
			[0.00517]	[0.00514]	[0.00562]	[0.00597]	[0.00587]
Mother's age	20-29 years old		0.174***	0.113***	0.0872***	0.0827***	0.0765***
			[0.0123]	[0.0164]	[0.0167]	[0.0142]	[0.0151]
	30-39 years old		0.276***	0.153***	0.114***	0.103***	0.0883***
			[0.00971]	[0.0162]	[0.0170]	[0.0152]	[0.0169]
	40+ years old		0.226***	0.128***	0.0983***	0.0865***	0.0745***
			[0.0208]	[0.0232]	[0.0236]	[0.0235]	[0.0253]
Mother's race/ethnicity	black		-0.0629***	-0.0400***	0.00277	0.00585	0.0175
			[0.0109]	[0.0119]	[0.0133]	[0.0133]	[0.0135]
	Hispanic		0.0674***	0.0605***	0.0628***	0.0622***	0.0635***
			[0.0187]	[0.0158]	[0.0148]	[0.0151]	[0.0152]
	other		0.0779***	0.142***	0.153***	0.156***	0.169***
			[0.0107]	[0.0115]	[0.0121]	[0.0131]	[0.0133]
Mother's education	high school graduate			0.0200**	0.012	0.0118	0.0101
				[0.00935]	[0.00830]	[0.00808]	[0.00814]
	some college/associate's degree			0.150***	0.127***	0.126***	0.114***
				[0.0115]	[0.0108]	[0.0107]	[0.0109]
	college graduate or greater			0.302***	0.251***	0.242***	0.212***
				[0.0198]	[0.0167]	[0.0157]	[0.0154]
	Mother is married				0.139***	0.134***	0.120***
					[0.00767]	[0.00624]	[0.00568]
Income	above poverty, <$75K					-0.0394***	-0.00577
						[0.00691]	[0.00654]
	below poverty					-0.0408***	0.00674
						[0.0113]	[0.0109]
	Child ever received WIC benefits						-0.105***
							[0.0111]
	N	86,788	85,189	78,879	78,686	75,202	74,882
	R-squared	0.05	0.08	0.13	0.14	0.15	0.15
Characteristics	sex, firstborn, age, race/ethnicity		x	x	x	x	x
	education			x	x	x	x
	marital status				x	x	x
	income					x	X
	WIC participation (ever)						X

Notes: All specifications include state and year of birth fixed effects, and specifications 2-6 also include survey and month of birth fixed effects.

Appendix Table A3.4e: WLS Regression Full Results: Outcome Breastfed at Least 3 Months | Ever Breastfed

		(1)	(2)	(3)	(4)	(5)	(6)
	Supportive law in effect	0.0209*	0.0223*	0.0179	0.018	0.0082	0.00737
		[0.0121]	[0.0122]	[0.0129]	[0.0133]	[0.0127]	[0.0129]
	Child male		-0.00886**	-0.00780*	-0.00869*	-0.00726	-0.00667
			[0.00422]	[0.00455]	[0.00481]	[0.00472]	[0.00473]
	Child firstborn		-0.0316***	-0.0469***	-0.0440***	-0.0424***	-0.0432***
			[0.00475]	[0.00509]	[0.00526]	[0.00596]	[0.00593]
Mother's age	20-29 years old		0.168***	0.130***	0.112***	0.107***	0.102***
			[0.0162]	[0.0202]	[0.0211]	[0.0168]	[0.0179]
	30-39 years old		0.248***	0.177***	0.151***	0.141***	0.130***
			[0.0123]	[0.0193]	[0.0208]	[0.0179]	[0.0192]
	40+ years old		0.242***	0.176***	0.154***	0.142***	0.131***
			[0.0129]	[0.0170]	[0.0184]	[0.0153]	[0.0170]
Mother's race/ethnicity	black		0.0228***	0.0332***	0.0602***	0.0608***	0.0716***
			[0.00796]	[0.00757]	[0.00981]	[0.0104]	[0.0110]
	Hispanic		0.0410***	0.0373**	0.0391***	0.0403***	0.0431***
			[0.0146]	[0.0144]	[0.0145]	[0.0146]	[0.0151]
	other		0.0375***	0.0779***	0.0858***	0.0862***	0.0978***
			[0.00631]	[0.00824]	[0.00843]	[0.00886]	[0.00919]
Mother's education	high school graduate			0.00132	-0.00333	-0.00212	-0.00323
				[0.00764]	[0.00791]	[0.00896]	[0.00945]
	some college/associate's degree			0.0579***	0.0455***	0.0503***	0.0418***
				[0.0109]	[0.0114]	[0.0118]	[0.0123]
	college graduate or greater			0.152***	0.124***	0.124***	0.102***
				[0.0131]	[0.0123]	[0.0132]	[0.0146]
	Mother is married				0.0877***	0.0876***	0.0773***
					[0.00998]	[0.00833]	[0.00766]
Income	above poverty, <$75K					-0.0222***	0.00401
						[0.00699]	[0.00719]
	below poverty					-0.00981	0.0284*
						[0.0137]	[0.0144]
	Child ever received WIC benefits						-0.0803***
							[0.00905]
	N	64,494	63,226	58,824	58,717	56,153	55,910
	R-squared	0.02	0.05	0.07	0.07	0.07	0.08
Characteristics	sex, firstborn, age, race/ethnicity		x	x	x	x	x
	education			x	x	x	x
	marital status				x	x	x
	income					x	x
	WIC participation (ever)						x

Notes: All specifications include state and year of birth fixed effects, and specifications 2-6 also include survey and month of birth fixed effects.

Appendix Table A3.4f: WLS Regression Full Results: Outcome Breastfed at Least 6 Months

		(1)	(2)	(3)	(4)	(5)	(6)
	Supportive law in effect	0.00877	0.00148	-0.000829	-0.00118	-0.00754	-0.0076
		[0.00698]	[0.00768]	[0.00752]	[0.00835]	[0.00832]	[0.00808]
	Child male		0.000831	0.00207	0.00028	0.000494	0.00112
			[0.00423]	[0.00528]	[0.00482]	[0.00520]	[0.00509]
	Child firstborn		-0.000729	-0.0252***	-0.0207***	-0.0202***	-0.0209***
			[0.00508]	[0.00469]	[0.00484]	[0.00523]	[0.00498]
Mother's age	20-29 years old		0.168***	0.112***	0.0843***	0.0823***	0.0759***
			[0.0161]	[0.0188]	[0.0181]	[0.0161]	[0.0172]
	30-39 years old		0.274***	0.159***	0.118***	0.109***	0.0932***
			[0.0118]	[0.0150]	[0.0145]	[0.0125]	[0.0146]
	40+ years old		0.232***	0.138***	0.107***	0.0955***	0.0825***
			[0.0140]	[0.0126]	[0.0121]	[0.0128]	[0.0140]
Mother's race/ethnicity	black		-0.0700***	-0.0477***	-0.00308	0.000778	0.014
			[0.0106]	[0.0109]	[0.0108]	[0.0110]	[0.0110]
	Hispanic		0.0534***	0.0509***	0.0533***	0.0545***	0.0554***
			[0.0177]	[0.0155]	[0.0144]	[0.0148]	[0.0147]
	other		0.0390***	0.0974***	0.108***	0.109***	0.123***
			[0.0112]	[0.0108]	[0.0115]	[0.0114]	[0.0113]
Mother's education	high school graduate			0.0132	0.00496	0.00558	0.00313
				[0.00919]	[0.00818]	[0.00826]	[0.00818]
	some college/associate's degree			0.113***	0.0884***	0.0887***	0.0759***
				[0.0111]	[0.0107]	[0.0106]	[0.0106]
	college graduate or greater			0.284***	0.232***	0.222***	0.188***
				[0.0138]	[0.0130]	[0.0134]	[0.0134]
	Mother is married				0.146***	0.126***	0.126***
					[0.00637]	[0.00922]	[0.00922]
Income	above poverty, <$75K					-0.0119	-0.0119
						[0.00766]	[0.00766]
	below poverty					0.00737	0.00737
						[0.0104]	[0.0104]
	Child ever received WIC benefits						-0.115***
							[0.0108]
	N	86,788	85,189	78,879	78,686	75,202	74,882
	R-squared	0.04	0.08	0.12	0.14	0.14	0.15
Characteristics	sex, firstborn, age, race/ethnicity		x	x	x	x	x
	education			x	x	x	x
	marital status				x	x	x
	income					x	x
	WIC participation (ever)						x

Notes: All specifications include state and year of birth fixed effects, and specifications 2-6 also include survey and month of birth fixed effects.

Appendix Table A3.4g: WLS Regression Full Results: Outcome Breastfed at Least 6 Months | Ever Breastfed

		(1)	(2)	(3)	(4)	(5)	(6)
	Supportive law in effect	0.0137	0.00787	0.00433	0.00463	-0.00288	-0.00478
		[0.0102]	[0.0109]	[0.0118]	[0.0129]	[0.0124]	[0.0127]
	Child male		-0.00116	0.000856	-0.000652	0.000233	0.000956
			[0.00722]	[0.00816]	[0.00747]	[0.00798]	[0.00780]
	Child firstborn		-0.0338***	-0.0525***	-0.0480***	-0.0482***	-0.0495***
			[0.00688]	[0.00659]	[0.00631]	[0.00668]	[0.00649]
Mother's age	20-29 years old		0.196***	0.149***	0.121***	0.119***	0.112***
			[0.0209]	[0.0232]	[0.0228]	[0.0196]	[0.0212]
	30-39 years old		0.297***	0.206***	0.166***	0.158***	0.142***
			[0.0146]	[0.0172]	[0.0174]	[0.0145]	[0.0167]
	40+ years old		0.286***	0.202***	0.168***	0.156***	0.142***
			[0.0122]	[0.0110]	[0.0119]	[0.0127]	[0.0126]
Mother's race/ethnicity	black		-0.0275***	-0.0112	0.0291**	0.0318**	0.0472***
			[0.0102]	[0.0104]	[0.0116]	[0.0121]	[0.0123]
	Hispanic		0.0346**	0.0358**	0.0382**	0.0408**	0.0432**
			[0.0168]	[0.0170]	[0.0168]	[0.0172]	[0.0176]
	other		0.00806	0.0580***	0.0697***	0.0692***	0.0852***
			[0.00905]	[0.0108]	[0.0117]	[0.0116]	[0.0116]
Mother's education	high school graduate			0.00202	-0.00427	-0.00182	-0.00386
				[0.00908]	[0.00868]	[0.00951]	[0.00962]
	some college/associate's degree			0.0576***	0.0393***	0.0445***	0.0324**
				[0.0129]	[0.0127]	[0.0130]	[0.0130]
	college graduate or greater			0.198***	0.156***	0.152***	0.122***
				[0.0131]	[0.0124]	[0.0148]	[0.0148]
	Mother is married				0.133***	0.118***	0.118***
					[0.00807]	[0.0107]	[0.0107]
Income	above poverty, <$75K					-0.00262	-0.00262
						[0.00855]	[0.00855]
	below poverty					0.0278**	0.0278**
						[0.0133]	[0.0133]
	Child ever received WIC benefits						-0.111***
							[0.0111]
	N	64,494	63,226	58,824	58,717	56,153	55,910
	R-squared	0.02	0.05	0.08	0.09	0.09	0.10
Characteristics	sex, firstborn, age, race/ethnicity		x	x	x	x	x
	education			x	x	x	x
	marital status				x	x	x
	income					x	x
	WIC participation (ever)						x

Notes: All specifications include state and year of birth fixed effects, and specifications 2-6 also include survey and month of birth fixed effects.

Appendix Table A3.4h: WLS Regression Full Results: Outcome Breastfed at Least 1 Year

		(1)	(2)	(3)	(4)	(5)	(6)
	Supportive law in effect	0.00513	0.0029	0.00147	0.00148	-0.00343	-0.00372
		[0.00752]	[0.00836]	[0.00839]	[0.00882]	[0.00883]	[0.00883]
	Child male		-0.00331	-0.00318	-0.00447	-0.00401	-0.00454
			[0.00326]	[0.00346]	[0.00349]	[0.00351]	[0.00355]
	Child firstborn		-0.0157***	-0.0268***	-0.0238***	-0.0223***	-0.0227***
			[0.00343]	[0.00346]	[0.00345]	[0.00321]	[0.00333]
Mother's age	20-29 years old		0.0862***	0.0594***	0.0430***	0.0433***	0.0397***
			[0.00997]	[0.0122]	[0.0112]	[0.0102]	[0.0108]
	30-39 years old		0.154***	0.0989***	0.0745***	0.0737***	0.0638***
			[0.0106]	[0.0133]	[0.0126]	[0.0110]	[0.0122]
	40+ years old		0.128***	0.0842***	0.0650***	0.0640***	0.0557***
			[0.0108]	[0.0105]	[0.0109]	[0.0106]	[0.0108]
Mother's race/ethnicity	black		-0.0476***	-0.0362***	-0.00952*	-0.0106**	-0.0024
			[0.00564]	[0.00569]	[0.00530]	[0.00465]	[0.00461]
	Hispanic		0.0314***	0.0302***	0.0318***	0.0345***	0.0338***
			[0.00925]	[0.00871]	[0.00876]	[0.00858]	[0.00814]
	other		0.0297***	0.0591***	0.0651***	0.0642***	0.0722***
			[0.00689]	[0.00627]	[0.00658]	[0.00679]	[0.00653]
Mother's education	high school graduate			-6.38E-05	-0.00498	-0.00321	-0.00508
				[0.00745]	[0.00658]	[0.00706]	[0.00695]
	some college/associate's degree			0.0352***	0.0208**	0.0221**	0.0142
				[0.00825]	[0.00795]	[0.00880]	[0.00880]
	college graduate or greater			0.141***	0.110***	0.110***	0.0895***
				[0.00953]	[0.00911]	[0.00979]	[0.00979]
	Mother is married				0.0871***	0.0797***	0.0797***
					[0.00497]	[0.00662]	[0.00662]
Income	above poverty, <$75K					0.0129*	0.0129*
						[0.00756]	[0.00756]
	below poverty					0.0301***	0.0301***
						[0.00968]	[0.00968]
	Child ever received WIC benefits						-0.0699***
							[0.00623]
	N	86,788	85,189	78,879	78,686	75,202	74,882
	R-squared	0.03	0.05	0.07	0.08	0.08	0.08
Characteristics	sex, firstborn, age, race/ethnicity		x	x	x	x	x
	education			x	x	x	x
	marital status				x	x	x
	income					x	x
	WIC participation (ever)						x

Notes: All specifications include state and year of birth fixed effects, and specifications 2-6 also include survey and month of birth fixed effects.

Appendix Table A3.4i: WLS Regression Full Results: Outcome Breastfed at Least 1 Year | Ever Breastfed

		(1)	(2)	(3)	(4)	(5)	(6)
	Supportive law in effect	0.00851	0.00649	0.00418	0.00464	-0.00149	-0.00291
		[0.0106]	[0.0114]	[0.0117]	[0.0125]	[0.0122]	[0.0123]
	Child male		-0.00545	-0.0051	-0.00639	-0.00532	-0.00606
			[0.00471]	[0.00495]	[0.00487]	[0.00474]	[0.00484]
	Child firstborn		-0.0364***	-0.0447***	-0.0411***	-0.0393***	-0.0403***
			[0.00493]	[0.00541]	[0.00525]	[0.00483]	[0.00497]
Mother's age	20-29 years old		0.108***	0.0842***	0.0652***	0.0660***	0.0620***
			[0.0130]	[0.0159]	[0.0151]	[0.0132]	[0.0141]
	30-39 years old		0.179***	0.133***	0.106***	0.108***	0.0965***
			[0.0137]	[0.0171]	[0.0167]	[0.0142]	[0.0156]
	40+ years old		0.165***	0.125***	0.101***	0.101***	0.0912***
			[0.0182]	[0.0152]	[0.0164]	[0.0161]	[0.0157]
Mother's race/ethnicity	black		-0.0401***	-0.0307***	-0.00321	-0.00631	0.00433
			[0.00673]	[0.00664]	[0.00658]	[0.00621]	[0.00627]
	Hispanic		0.0242**	0.0246**	0.0264**	0.0303***	0.0303***
			[0.0102]	[0.0106]	[0.0108]	[0.0104]	[0.00993]
	other		0.0190**	0.0458***	0.0532***	0.0506***	0.0607***
			[0.00776]	[0.00809]	[0.00851]	[0.00884]	[0.00861]
Mother's education	high school graduate			-0.00741	-0.0117	-0.00839	-0.0103
				[0.00891]	[0.00816]	[0.00908]	[0.00889]
	some college/associate's degree			0.00623	-0.00602	-0.00171	-0.0101
				[0.0101]	[0.00974]	[0.0110]	[0.0110]
	college graduate or greater			0.104***	0.0753***	0.0807***	0.0596***
				[0.0108]	[0.00983]	[0.0112]	[0.0112]
	Mother is married				0.0905***	0.0857***	0.0857***
					[0.00559]	[0.00716]	[0.00716]
Income	above poverty, <$75K					0.0245***	0.0245***
						[0.00888]	[0.00888]
	below poverty					0.0508***	0.0508***
						[0.0127]	[0.0127]
	Child ever received WIC benefits						-0.0753***
							[0.00664]
	N	64,494	63,226	58,824	58,717	56,153	55,910
	R-squared	0.02	0.04	0.05	0.06	0.06	0.06
Characteristics	.		x	x	x	x	x
	education			x	x	x	x
	marital status				x	x	x
	income					x	x
	WIC participation (ever)						x

Notes: All specifications include state and year of birth fixed effects, and specifications 2-6 also include survey and month of birth fixed effects.

Appendix Table A3.4j: WLS Regression Full Results: Outcome Months Breastfed

		(1)	(2)	(3)	(4)	(5)	(6)
	Supportive law in effect	0.101	0.0256	-0.00958	-0.0106	-0.0857	-0.0863
		[0.0975]	[0.104]	[0.102]	[0.112]	[0.105]	[0.103]
	Child male		-0.0231	-0.0168	-0.036	-0.0429	-0.042
			[0.0456]	[0.0512]	[0.0490]	[0.0492]	[0.0490]
	Child firstborn		-0.159**	-0.441***	-0.383***	-0.361***	-0.368***
			[0.0655]	[0.0624]	[0.0660]	[0.0667]	[0.0660]
Mother's age	20-29 years old		1.966***	1.330***	0.998***	1.000***	0.924***
			[0.182]	[0.217]	[0.207]	[0.185]	[0.198]
	30-39 years old		3.291***	1.966***	1.468***	1.418***	1.220***
			[0.144]	[0.185]	[0.176]	[0.149]	[0.174]
	40+ years old		2.804***	1.751***	1.351***	1.275***	1.121***
			[0.187]	[0.195]	[0.190]	[0.190]	[0.205]
Mother's race/ethnicity	black		-0.935***	-0.676***	-0.132	-0.138	0.0182
			[0.119]	[0.124]	[0.123]	[0.125]	[0.126]
	Hispanic		0.817***	0.756***	0.786***	0.807***	0.814***
			[0.181]	[0.156]	[0.150]	[0.150]	[0.145]
	other		0.697***	1.384***	1.512***	1.495***	1.656***
			[0.149]	[0.137]	[0.139]	[0.152]	[0.151]
Mother's education	high school graduate			0.097	-0.00851	0.00873	-0.0219
				[0.135]	[0.118]	[0.124]	[0.121]
	some college/associate's degree			1.298***	1.003***	1.010***	0.853***
				[0.123]	[0.119]	[0.110]	[0.110]
	college graduate or greater			3.307***	2.667***	2.620***	2.222***
				[0.171]	[0.161]	[0.149]	[0.149]
	Mother is married				1.768***	1.575***	1.575***
					[0.0738]	[0.115]	[0.115]
Income	above poverty, <$75K					0.063	0.063
						[0.117]	[0.117]
	below poverty					0.369**	0.369**
						[0.153]	[0.153]
	Child ever received WIC benefits						-1.377***
							[0.131]
	N	86,718	85,126	78,817	78,624	75,140	74,820
	R-squared	0.05	0.09	0.13	0.15	0.15	0.15
Characteristics	sex, firstborn, age, race/ethnicity		x	x	x	x	x
	education			x	x	x	x
	marital status				x	x	x
	income					x	x
	WIC participation (ever)						x

Notes: All specifications include state and year of birth fixed effects, and specifications 2-6 also include survey and month of birth fixed effects.

Appendix Table A3.4k: WLS Regression Full Results: Outcome Months Breastfed | Ever Breastfed

		(1)	(2)	(3)	(4)	(5)	(6)
	Supportive law in effect	0.153	0.101	0.0472	0.057	-0.0293	-0.052
		[0.149]	[0.150]	[0.160]	[0.173]	[0.166]	[0.170]
	Child male		-0.0601	-0.0492	-0.0622	-0.0625	-0.0633
			[0.0767]	[0.0807]	[0.0748]	[0.0743]	[0.0745]
	Child firstborn		-0.653***	-0.836***	-0.781***	-0.759***	-0.774***
			[0.0713]	[0.0690]	[0.0692]	[0.0736]	[0.0744]
Mother's age	20-29 years old		2.190***	1.723***	1.405***	1.420***	1.347***
			[0.238]	[0.268]	[0.261]	[0.218]	[0.236]
	30-39 years old		3.412***	2.495***	2.034***	2.026***	1.833***
			[0.181]	[0.213]	[0.210]	[0.160]	[0.187]
	40+ years old		3.358***	2.523***	2.107***	2.044***	1.879***
			[0.195]	[0.183]	[0.197]	[0.179]	[0.181]
Mother's race/ethnicity	black		-0.400***	-0.235**	0.231**	0.182*	0.359***
			[0.100]	[0.0966]	[0.104]	[0.106]	[0.113]
	Hispanic		0.607***	0.581***	0.611***	0.651***	0.676***
			[0.149]	[0.156]	[0.160]	[0.158]	[0.156]
	other		0.324**	0.849***	0.976***	0.916***	1.095***
			[0.132]	[0.136]	[0.140]	[0.151]	[0.153]
Mother's education	high school graduate			-0.0987	-0.181	-0.141	-0.168
				[0.125]	[0.115]	[0.128]	[0.124]
	some college/associate's degree			0.471***	0.259**	0.329***	0.182
				[0.125]	[0.124]	[0.115]	[0.115]
	college graduate or greater			2.044***	1.557***	1.623***	1.269***
				[0.135]	[0.129]	[0.138]	[0.138]
	Mother is married				1.521***	1.401***	1.401***
					[0.0788]	[0.122]	[0.122]
Income	above poverty, <$75K					0.238*	0.238*
						[0.121]	[0.121]
	below poverty					0.727***	0.727***
						[0.190]	[0.190]
	Child ever received WIC benefits						-1.294***
							[0.122]
	N	64,424	63,163	58,762	58,655	56,091	55,848
	R-squared	0.02	0.06	0.08	0.09	0.10	0.10
Characteristics	sex, firstborn, age, race/ethnicity		x	x	x	x	x
	education			x	x	x	x
	marital status				x	x	x
	income					x	x
	WIC participation (ever)						x

Notes: All specifications include state and year of birth fixed effects, and specifications 2-6 also include survey and month of birth fixed effects.

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