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Understanding Infant Feeding Choice from the Great Depression to the Baby Boom in the U.S.

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Understanding Infant Feeding Choice from the Great Depression to the Baby Boom in the U.S.

by

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Thesis

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Dedication

Dedicated to my parents who helped me, but also taught me to help myself, and therein help others.

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Abstract

Understanding Infant Feeding Choice from the Great Depression to the Baby Boom in the U.S.

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Objectives: The objectives of this study were to describe the rates of and factors associated with exclusive breastfeeding (XBR), exclusive breast feeding + breast and bottle-feeding (Ever BR), and of exclusive bottle-feeding (XBOT) from 1925-1964 among mothers of the nurse daughters in the Nurses' Health Cohort Studies. **Methods:** The Nurses' Maternal Cohort Study (N= 39,743) is a retrospective cohort of the mothers of the nurse daughters who completed a questionnaire on reproductive characteristics and infant feeding. Multiple logistic regression analysis was used to estimate the adjusted odds ratios for Ever BR and XBR compared to XBOT by birth year and other covariates.

Results: Ever BR rates steadily declined from 80% in the Great Depression to 37% in 1964; similarly XBR rates declined from 41% to 10%, respectively. Factors positively associated with Ever BR included: any maternal college education compared to <12 years of education and delivering a low or high compared to normal birth weight nurse daughter. Factors negatively associated with Ever BR were: smoking during pregnancy, C-section delivery, prematurity, birth orders 2+, and nurse daughters born 1940-1964. Factors differed by birth cohort, e.g. maternal education was positively associated with XBR only from 1950-64. Among the XBOT, the majority used canned evaporated milk until 1959 and then switched to commercial infant formula. **Conclusions**: This study documents declining rates of XBR and factors influencing infant feeding choice from 1925-1964, with results varying by birth cohort that differ from current determinants.

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Chapter 1: Introduction

The American Academy of Pediatrics (AAP) currently recommends exclusive breastfeeding for the first 6 months plus continued breastfeeding past 12 months.[1] The AAP has proposed standards for infant feeding since 1943,[2] but trends in infant feeding have been based on sparse data. Historically, infant feeding data were abstracted from maternity ward records in 1946[3] and 1956[4] followed by The Ross Laboratories Mother's Survey (RLMS), a market research survey completed by mothers, from 1955 to 2001.[5,6] RLMS did not document rates of in-hospital *exclusive* breastfeeding until 1965 and of exclusive breastfeeding up to 6 months until 1971.[5]

Breastfeeding is one means by which a mother transmits her immune defense to her infant. Exclusive breastfeeding decreases the risk for infectious illnesses such as otitis media, upper respiratory infection, and gastrointestinal disorders[7] especially in impoverished populations across the world and disadvantaged populations in the United States[8]. Breastfeeding may protect against diseases developed later in life such as obesity[9] but the consistency of these associations is unclear due to incomparable definitions for and changing trends in the exclusivity and duration of breastfeeding.[10]

Of paramount importance is the recognition that early life exposures are related to chronic disease in adulthood. Understanding infant feeding practices in earlier cohorts provides essential data to link to risk for adult disease. Secular trends in infant feeding could alter the relationship between early life exposures and disease risk over the life course, yet there have been few published cohorts with adequate infant feeding data and sample size to capture trends over time. The unique data of The Nurses' Mother's Cohort

Study (NMCS) provides the opportunity to document trends in infant feeding for The Nurses' Health Studies I and II (NHS I & II), and unlike previous survey data, fill in a gap in time when limited information was available on ever breastfeeding, the exclusivity of breastfeeding, and factors influencing choice of infant feeding. This information will allow subsequent examination of early life exposures among adults at risk for chronic diseases. The objectives of this paper are to describe the rates of exclusive breast feeding (XBR), exclusive breast-feeding + breast and bottle feeding (Ever BR), and exclusive bottle-feeding (XBOT) from 1925-1964 and document maternal and nurse daughter factors influencing choice of Ever BR and XBR.

Chapter 2: Methods

Study Population and Design

NHS I and II are large, prospective cohort studies designed to collect data on women's health. NMCS is a retrospective cohort study nested within the prospective NHS I & II cohorts. Nurses from the NHS I and NHS II who were free of cancer other than non-melanoma skin cancer in 2001 and who reported their mothers were alive in 1993 or 1996 cohort-specific biannual questionnaires, respectively, were recruited for the NCMS. Among the 238,379 nurses who were members of either NHS I or II, 143,033 were excluded because the mother was deceased and/or the nurse had a diagnosis of cancer by 2001. Therefore 95,346 eligible nurses (40%) and their mothers were invited to participate. Approximately 70% of the nurses (N = 52,543) were willing to participate, while 30% (N = 22,387) responded their mothers had died since 1993/1996 or were too fragile to participate. Of the 52,543 nurse participants, 67% asked to send the questionnaires to their mothers' and 33% had it sent to them. Response rates ranged from 79% (N = 27,956) of the forms returned by mothers and 21% (N = 11,948) returned by the nurse daughter after her mother completed it. Of the 39,904 maternal questionnaires returned to Brigham Women's Hospital, 10% (N = 4,074) of the mothers had nurse daughters in NHS I and 90% (N = 35,830) had nurse daughters in NHS II. The analysis excluded nurse daughters who were adopted (N=113) or had missing data for all infant feeding questions (N=31) resulting in a final sample size of 39,743.

The maternal questionnaire asked about the pregnancy, delivery and birth, infancy and early childhood of the nurse daughter. Mothers reported a reproductive history and information relevant to the time of the nurse's birth such as maternal and paternal education, occupation, home ownership, and intake of prenatal vitamins. The mother also reported infant feeding at birth, duration of exclusive and ever breastfeeding, age at introduction and age stopped infant formula feeding (by type: commercial or prepared by the mother); and age at introduction of the first solid food. Among the respondents, 52% answered all questions by recall (memory), and 48% relied on at least one source, i.e. the baby book and/or birth certificate or had help from their nurse daughter.

Infant feeding practices were defined as follows: Exclusive breast feeding (XBR) mothers reported only feeding the nurse daughter breast milk and never formula (commercial or soy) or evaporated milk mixed with water. No questions were asked about wet nurses or expressed breast milk. Mothers who reported ever breastfeeding (Ever BR) her nurse daughter included both exclusive breast feeders (XBR) and breast + bottle feeders, all of whom could have fed water to the infant. Exclusive bottle feeders (XBOT) reported never breast-feeding the nurse daughter, but feeding her either canned evaporated milk mixed with water, commercial infant formula, or soy-based infant formula.

Covariates were defined and treated as follows: maternal education in years was categorized into <12 years, 12 years, 1-3 years of college, and 4+ years of college. Maternal age was calculated as the difference between the maternal birth date and the birth date of the nurse daughter and treated as continuous when calculating the average

age of the mothers at the nurse's birth ($\bar{x}$=25 years); for all other analysis the variable was treated categorically <20, 20-24, 25-29, 30-34, 35+. Smoking during pregnancy was defined as mothers who ever or never smoked during the pregnancy. Home ownership was based on mothers who reported not owning or owning a home at the time of the nurse birth. Mode of delivery at the birth of the nurse daughter was categorized as a vaginal delivery or Caesarian section. Gestational weight gain was reported in the following categories: <10, 10-14, 15-19, 20-29, 30-40, and 40+lbs. Pregnancy complications were reported as a diagnosis by a physician or health care provider of anemia, diabetes, high blood pressure, pre-eclampsia or eclampsia, proteinuria, and/or infection (kidneys, respiratory, etc.) during the index pregnancy. All but anemia and infection were included as complications. Pre-pregnancy body mass index (BMI) was calculated using reported weight before the nurse daughter's pregnancy divided by reported height^2 at age 20-30, and treated as a categorical variable using cut offs of lean (<18.5), normal (18.5-24.9), overweight (25-29.9), and obese (≥30).

Nurse Daughter Variables: Birth weight was categorized as low birth weight (LBW) 1000-2499g, normal birth weight (NBW) 2500-4000g, and high birth weight (HBW) 4001-5000g. Gestational age was categorized as early (2 or more weeks before the due date), on-time (less than 2 weeks before or after the due date), and late (2 or more weeks after the due date). The nurse daughter's birth order was categorized as first or later. Birth years were grouped in 5-year intervals except for 1925-39, which was grouped as a 15-year interval due to few births. Results referred to birth years by historical events of the time: 1925-39 The Great Depression; 1940-44 World War II

(WWII); 1945-49 Post-WWII; and 1950-54 Baby Boomers I, 1955-59 Baby Boomers II, 1960-64 Baby Boomers III.

Statistical Analysis

Histograms were created to illustrate the frequency of Ever BR/XBR/Type of Formula over time. χ^2 tests were computed to evaluate differences between categories of covariates (see previous paragraph). Reference groups for logistic regression were selected according to previous literature[8, 9] with the exception of the variable maternal age in which the referent group was 25-29 because the average age of the mothers at the nurse delivery was 25. Univariate logistic regression was performed on all covariates listed above and only included in the multivariate model if significance ($P<0.05$) was attained to prevent over-fitting. Multivariate logistic regression was performed to estimate the adjusted odds ratio (OR) and 95% confidence interval (95% CI) of infant feeding choice (Ever BR/Xbot, XBR/Xbot) by various covariates. SAS 9.2 was used to run these tests. All tests were considered significant at a P-value of <0.05.

Statement of Ethics.

The Institutional Review Boards of the Brigham and Women's Hospital, the National Cancer Institute, and the University of Texas at Austin approved this study.

Chapter 3: Results

DEMOGRAPHICS

Table 1. Characteristics of NCMS stratified by NHS I and NHS II were significantly different. Eighty percent of NHS I mothers and 63% of NHS II mothers had ≤12 years of education. The average maternal age (in years) at the nurses' birth was 23.9 for NHS I and 26.1 for NHS II. More NHS II (22%) than NHS I (14%) mothers smoked in pregnancy. Likewise, more NHS II (48%) than NHS I (22%) mothers owned a home. The majority of mothers in NHS I and NHS II had vaginal deliveries, on-time births, and no pregnancy complications. Fifty percent of nurse daughters in NHSI and 36% of nurse daughters in NHSII were first-borns. Birth years spanned from 1925-54 for NHS I and 1950-64 for NHS II.

INFANT FEEDING TRENDS

Figure 1. The percentage of mothers who Ever BR by each birth cohort were 80.3% during the Great Depression, 71.3% during WWII, 60% during Post-WWII, and 50.3%, 41.2%, 36.5% among the Baby Boomer I, II, and III cohorts, respectively (Figure 1). XBR followed the same declining trend with 40.9% in the Great Depression cohort, 27.5% in the WWII cohort, 16.9% in the Post-WWII cohort, and 13.7%, 11.4%, and 9.7% in the Baby Boomer I, II, and III cohorts, respectively.

Figure 2. Of the mothers who XBOT, formula type for each birth cohort was reported as canned evaporated milk, commercial infant formula, and soy-based formula, respectively as follows: 81%, 18%, and 2% during the Great Depression, 71.2%, 27.3%, and 1.5% during WWII, 60.9%, 36.3%, and 2.8% during Post-WWII, 58.4%, 38.5%, and

3.1% during Baby Boomers I, 50.0%, 45.6%, and 4.4% during Baby Boomers II, 36.1%, 58.6%, and 5.3% during Baby Boomers III.

Factors Influencing Infant Feeding Choice

Maternal education, age, and smoking during pregnancy; mode of delivery; nurse daughter birth weight and birth cohort were associated with the adjusted OR of Ever BR (Table 2). Compared to mothers with < 12 years of education, mothers with 1-3 years and 4+ years had ORs of Ever BR of 1.38 (95% CI: 1.15-1.65) and 2.28 (95% CI: 1.84-2.82), respectively. Mothers who smoked during pregnancy had an OR of Ever BR of 0.49 (95% CI 0.45-0.58) compared to non-smokers. Compared to mothers who had vaginal deliveries, mothers who delivered by C-section had an OR of Ever BR of 0.50 (95% CI: 0.36, 0.69). Compared to mothers who delivered a nurse daughter of NBW, mothers who delivered LBW and HBW nurse daughters had higher odds of Ever BR by 46% (95% CI:1.20, 1.77) and by 93% (95% CI: 1.46, 2.55) respectively. Compared to mothers who delivered on-time, mothers who delivered early had 23% (95% CI: 0.66, 0.90) lower odds of Ever BR. Births 2+ had 21% (95% CI: 0.70, 0.89) lower odds of Ever BR. When compared to the Great Depression birth cohort, subsequent nurse daughter birth cohorts had a monotonic decreasing odds of mothers who Ever BR from 0.48 (95% CI: 0.37, 0.62) in WWII to 0.07 (95% CI: 0.06, 0.09) in Baby Boomer III. Similar findings appeared for the above associations and the adjusted odds of XBR (Table 2) except that mothers with pregnancy complications were associated with a 29% (95% CI: 0.59, 0.84) lower odds of XBR compared to mothers who did not have complications.

BIRTH COHORT SPECIFIC MODELS

The factors influencing the ORs of Ever BR and XBR within each birth cohort had nearly identical odds; therefore the ORs and confidence intervals are given for XBR only. During the Great Depression, younger mothers (<20 and 20-24 years) had ORs of 9.64 (95% CI: 2.49, 37.34) and of 4.26 (95% CI: 1.52, 11.99) for XBR compared to mothers aged 25-29, respectively. During WWII a mother with a HBW daughter had 9.36 (95% CI: 2.16, 40.58) higher odds of XBR compared to mothers of NBW daughters. During Post WWII, smokers and C-section deliveries had inverse associations with XBR with ORs of 0.36 (95% CI: 0.25, 0.54) and 0.22 (95%: 0.07, 0.65), respectively. During the Baby Boom I, maternal education and daughter's birth weight were directly associated with XBR while smoking during pregnancy, birth order 2+, and pregnancy complications were inversely associated. Compared to those with an education of <12 years, mothers with 1-3 and 4+ years of college had OR 1.69 (95% CI: 1.19, 2.39) and 2.73 (1.82, 4.09), respectively. Compared to mothers with NBW daughters, mothers with LBW and HBW nurse daughters had OR for XBR of 1.53 (95% CI: 1.07, 2.19) and 2.07 (95% CI: 1.23, 3.47), respectively. Smokers had an OR for XBR of 0.54 (95% CI: 0.42, 0.68); having one or more pregnancy complications an OR of 0.66 (95% CI: 0.47, 0.92); and birth order 2+ an OR of 0.78 (95% CI: 0.63, 0.97). The Baby Boom II cohort had the same trends and strength of associations as the Baby Boom III cohort, therefore only Baby Boom III odds are reported. Maternal education of 1-3 and 4+ years of college had higher odds of XBR by 60% (95% CI: 1.10, 2.34) and 2.85 fold (95% CI: 1.88, 4.34), respectively. Smokers, women who delivered by C-section, and birth order 2+ had lower odds of XBR by 54% (95% CI: 0.36, 0.60), 47% (95% CI: 0.30, 0.94), and 35% (95% CI: 0.52, 0.82), respectively.

Chapter 4: Discussion

The percentage of mothers who ever BR in the NMCS peaked at 81% in 1925-39 and steadily declined over time to 36.5% in 1960-64. A declining trend also appeared in XBR from 41% in 1925-39 to 10% in 1960-64. Canned evaporated milk was popular until 1959 when mothers switched to commercial infant formula. Soy-based formula use increased over time but was the least popular choice. Mothers who had a higher odds of Ever BR and XBR were non-smokers, aged < 25 years, and college educated; delivered vaginally, and delivered LBW or HBW daughters, and delivered during 1925-39 compared to later birth years.

Birth cohort specific models of the factors associated with Ever and XBR differed from the aggregate model described above. A college education was directly associated with XBR among the Baby Boomer cohorts. Smoking during pregnancy was a strong negative factor associated with XBR except during the Great Depression when cigarette advertisements began targeting women and portraying smoking as glamorous and promoting weight loss .[12,13] The reduced odds of XBR for women with C-section deliveries were significant during Post-WWII, Baby Boom II, and Baby Boom III. The rates of elective versus emergency C-section has not been documented in the United States during this time, however social and medical factors such as infant isolation from the mother who had a cesarean delivery, medical complications in either the infant or the mother, and surgery recovery may delay the initiation of breastfeeding.[14,15] First-born daughters had higher odds of being breastfed than nurse daughters who were second or later birth order during Baby Boom I II, and III cohorts of which NCMS breastfeeding rates dropped below 50%. This downward trend may correlate with the decreasing rates of mothers who successfully breastfed their first-borns are then more likely to breastfeed subsequent babies.[16] Mothers aged <25 had higher odds of breastfeeding only during the Great Depression, which is likely due to the large numbers, i.e. 73% of NCMS women having children before age 25 during this time. Compared to the aggregate model, pre-pregnancy BMI, gestational weight gain, gestational age, and home ownership (SES) never achieved significance. These factors, however, have been documented as current determinants of breastfeeding.[17-22]

Five surveys with data on infant feeding practices in the United States overlapped the NCMS 1925-64 birth cohorts and included: the National Fertility Survey (NFS)[23] from 1926-64, the National Survey of Family Growth (NSFG) from 1955-64,[24,25] Ross Laboratories Mothers Survey (RLMS) from 1955-64,[25] and the abstracted maternity hospital ward records by Bain[2] in 1946 and Meyer[4] in 1956. Compared to Ever BR trends in the NCMS, the NFS rates were nearly identical peaking in 1926-30 at 81% and steadily declining to 32% in 1961-65.[23] Data abstracted from maternity hospital records had similar Ever BR rates to the NCMS with 65% in 1946 and 37% in 1956[2,4]. Compared to NCMS that had rates of 41% Ever BR in 1955-59 and 37% in 1960-64, the NSFG reported lower rates with 36% Ever BR from 1956-60 and 32% in 1961-65.[24] Ross Laboratories also reported lower percentages of Ever BR than NCMS with 29% in 1955-59 and 27% from 1960-64.[25] Bain and Meyer reported double the rates of XBR to NCMS with 38% in 1946 and 21% in 1956.[2,4] Yet all the data are in accord with the NCMS confirm the downward trend in Ever BR and XBR from 1925-1964.

For factors influencing Ever BR, the NFS reported 47% of mothers who breastfed had 10-11 years of education, 44% had 12 years of education, and 54% with 13-15 years of education.[23] The NSFG reported a similar negative curvilinear relationship between maternal education and Ever BR with 34% of mothers with <12 years of education, 26% with 12 years of education, and 39% with >12 years of education.[24] This pattern was seen in the NCMS 1950-59 period-specific cohorts and in the overall model.

Differences in survey objective, sampling approach, sample size, and data collection contribute to the discrepancies between absolute rates of breast-feeding in the NCMS with results from other studies. For example, both the NFS and NFSG report rates of Ever BR to all births from the same mother during this time period in contrast to the unit of a unique mother-daughter dyad in the NCMS.[23,24] Therefore, caution is required in comparing the exact Ever BR and XBR percentages amongst the five surveys, but they collectively confirmed a downward trend in breastfeeding from 1925-1964 and that mothers with 12 years of education had the lowest percentages and odds of Ever BR.[24]

The strengths of this study are the large sample size, detailed infant-feeding data, and breadth of pregnancy and early life covariates that gives context to data spanning thirty-nine years. The limitations of this study are the sample consists of predominantly non-working, Non-Hispanic White females, therefore the findings are generalizable to similar population. LBW nurse daughters had increased odds of Ever BR and XBR contrary to feeding patterns among NBW and recommendations exhibited in other studies; however, the mean LBW was 2270.5 grams, very close to the upper limit to the NBW cut off suggesting these babies were term babies and therefore low-risk.[26]

In conclusion, NCMS is the first study to report birth cohort-specific models of the factors associated with the odds of Ever BR and XBR from 1925-64. Factors associated with choice changed over time and differed from current determinants such as pre-pregnancy BMI and gestational weight gain. This information can contribute to surveillance and monitoring of breastfeeding behavior in the United States. Furthermore, although it is widely known that contents of the bottle have changed over time, our study provide the documentation of the rates and time trends of bottle contents from 1925-64. Significant determinants give context to the infant feeding behaviors and documented early life exposures in the NCMS and can be linked to the adult nurses who continually answer biannual questionnaires spanning their reproductive years thereby offering data on early life-course exposures and health outcomes.

Table 1. Demographic and Reproductive Characteristics of the Maternal Cohort Study of the NHS I (N=4047) and NHS II (N=35,696)

* P-value <0.01	NHS I	NHS II
Characteristics	**μ± SD (range)**	**μ± SD (range)**
Nurse's age in years in 2001	59 ± 4 (54-76)	45 ± 4.6 (35-57)*
Nurse's birth year[1]	1941 ± 4 (1923-47)	1955± 4.6 (1944-65)*
Mother's age (y) at the nurses' birth[1]	23.9 ± 3.5 (15-38)	26.1 ± 4.9 (14-53)*
Nurse's birthweight (g)[2]	3275 ± 545 (1360-4990)	3267± 532 (1360-4990)*
Maternal education at the nurse's birth[3]	**% (n)**	**% (n)**
<12 years*	34 (1368)	13 (4786)
12 years*	46 (1868)	50 (17783)
1-3 years of college*	16 (652)	26 (9204)
4+ years of college*	3 (135)	11 (3797)
Maternal age at the time of nurses' birth[4]	**% (n)**	**% (n)**
<20*	9 (278)	5 (1504)
20-24*	50 (1513)	37 (10532)
25-29*	35 (1049)	35 (10034)
30-34*	6 (189)	16 (4654)
35+*	0.02 (7)	6 (1822)
Smoking During Pregnancy[5]	**% (n)**	**% (n)**
No*	86 (3458)	74(26279)
Yes*	14 (563)	26(9300)
Home Ownership[6]	**% (n)**	**% (n)**
Yes*	22 (894)	48 (16779)
No*	78 (3080)	52 (18515)
Mode of Delivery[7]	**% (n)**	**% (n)**
Vaginal Delivery*	99 (3979)	97 (34452)
C-Section*	1 (57)	3 (1178)
Pregnancy Complication[8]	**% (n)**	**% (n)**
No*	88 (3491)	89 (31407)
Yes*	12 (488)	11 (3976)
Gestational Age[9]	**% (n)**	**% (n)**
Early*	16 (315)	18 (3734)
On-Time*	75 (1494)	71(14644)
Late*	9 (189)	11(2286)
Birth Order[10]	**% (n)**	**% (n)**
First*	50 (1961)	36 (12436)
Other*	50 (1966)	64 (22261)
Birth Cohort[1]	**% (n)**	**% (n)**
1925-39*	6 (200)	0
1940-44*	24 (729)	0
1945-49*	50 (1525)	0 (1)
1950-54*	20 (627)	18 (4054)
1955-59*	0	39 (8935)
1960-64*	0	43 (9802)

Table 1 Continued

Missing data for NHS I & II in this order;
[1] Nurse daughter birth year: N=966 and N=6896
[2] Nurse daughter birth weight: N=306 and N=1500
[3] Maternal education: N=24 and N=126
[4] Maternal age: N=1011 and N=7150
[5] Smoking during pregnancy: N=26 and N=117
[6] Home ownership: N=73 and N=402
[7] Mode of delivery: N=11 and N=66
[8] Pregnancy complication: N=68 and N=313
[9] Gestational age: N=2049 and N=15032
[10] Birth order: N=120 and N=999

Figure 1. Ever BR/XBR Time Trend

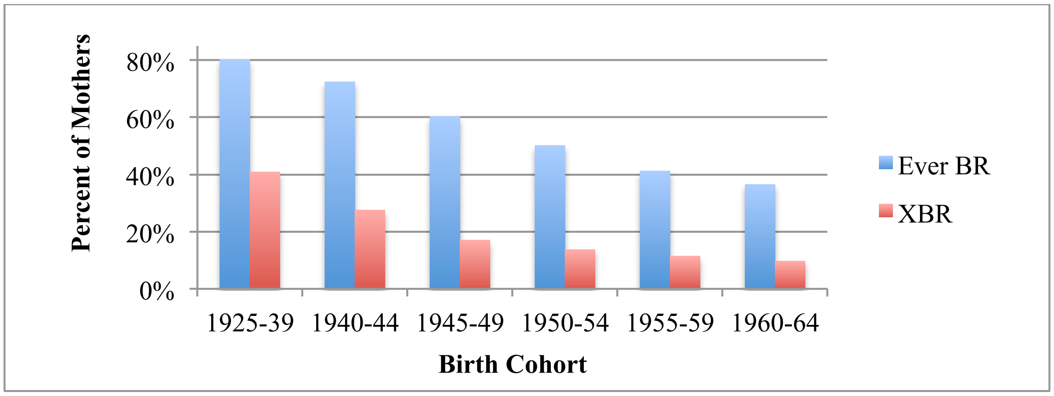


Figure 2. What's In The Bottle?

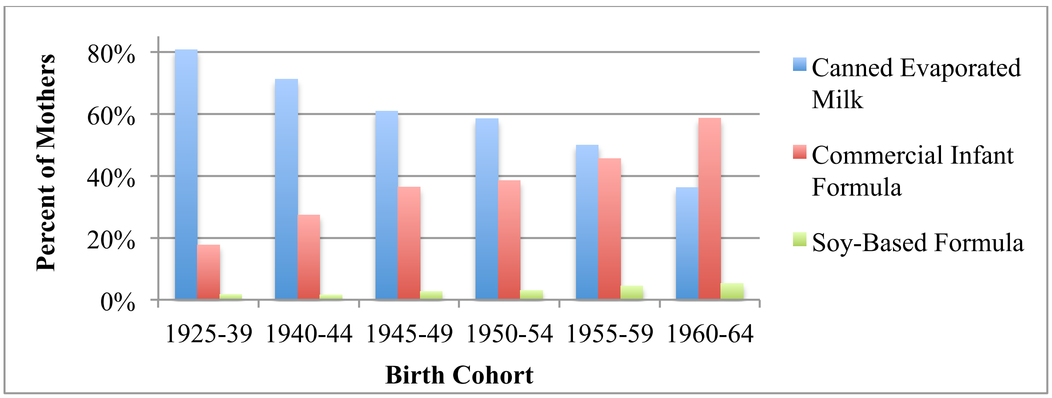


Table 2. Crude and adjusted odds ratios (95% CI) of Ever BR and XBR by maternal and child characteristics

	Ever BR		XBR	
Maternal Variables	**Crude OR (95%)**	**Adjusted OR (95%)**	**Crude OR (95%)**	**Adjusted OR (95%)**
Education				
<12 years	**1**	**1**	**1**	**1**
12 years	**0.71 (0.67, 0.75)**	**0.86 (0.73, 1.01)**	**0.52 (0.48, 0.56)**	**0.85 (0.72, 1.01)**
1-3 years of college	**1.02 (0.95, 1.08)**	**1.38 (1.15, 1.65)**	**0.68 (0.62, 0.74)**	**1.35 (1.13, 1.62)**
4+ years of college	**1.29 (1.19, 1.40)**	**2.28 (1.84, 2.82)**	**0.97 (.86, 1.08)**	**2.25 (1.81, 2.79)**
P-for trend	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Age				
<20	**1.47 (1.33, 1.63)**	**1.27 (0.99, 1.62)**	**1.29 (1.10, 1.51)**	**1.26 (0.98, 1.62)**
20-24	**1.30 (1.23, 1.37)**	**1.13 (0.99, 1.62)**	**1.12 (1.03, 1.22)**	**1.13 (0.99, 1.29)**
25-29	**1**	**1**	**1**	**1**
30-34	**0.85 (0.80, 0.91)**	**0.96 (0.82, 1.53)**	**0.90 (0.81, 1.00)**	**0.96 (0.81, 1.13)**
35+	**0.80 (0.73, 0.89)**	**1.13 (0.89, 1.44)**	**0.92 (0.78, 1.08)**	**1.13 (0.88, 1.44)**
P-for trend	**<0.001**	**0.13**	**<0.001**	**0.14**
Smoking During Pregnancy				
No	**1**	**1**	**1**	**1**
Yes	**0.65 (0.62, 0.68)**	**0.51 (0.45, 0.58)**	**0.43 (0.39, 0.47)**	**0.49 (0.43, 0.57)**
P-for trend	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Home Ownership				
No	**1**	**1**	**1**	**1**
Yes	**0.73 (0.70, 0.76)**	**1.08 (0.96, 1.21)**	**0.83 (0.78, 0.89)**	**1.10 (0.98, 1.23)**
P-for trend	**<0.001**	**0.200**	**<0.001**	**0.12**
Mode of Delivery				
Vaginal Delivery	**1**	**1**	**1**	**1**
C-section	**0.49 (0.44, 0.56)**	**0.50 (0.36, 0.69)**	**0.44 (0.36, 0.55)**	**0.50 (0.36, 0.70)**
P-for trend	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Gestational Weight Gain				
< 10 lbs	**0.99 (0.88, 1.10)**	**1.04 (0.77, 1.40)**	**1.03 (0.87, 1.22)**	
10-14 lbs	**0.98 (0.92, 1.05)**	**0.92 (0.77, 1.09)**	**1.05 (0.95, 1.16)**	
15-19 lbs	**0.98 (0.93, 1.04)**	**0.98 (0.85, 1.12)**	**0.98 (0.90, 1.07)**	
20-29 lbs	**1**	**1**	**1**	**Removed**
30-40 lbs	**1.11 (1.04, 1.18)**	**1.00 (0.87, 1.16)**	**1.05 (0.96, 1.15)**	
40+ lbs	**1.02 (0.93, 1.12)**	**0.84 (0.67, 1.07)**	**0.95 (0.83, 1.10)**	
P-for trend	**0.005**	**0.68**	**0.59**	
Pregnancy Complication				
No	**1**		**1**	**1**
Yes	**1.01 (0.96, 1.06)**	**Removed**	**0.75 (0.68, 0.84)**	**0.71 (0.59, 0.84)**
P-for trend	**0.47**		**<0.001**	**<0.001**
Pre-Pregnancy BMI				
Lean	**0.99 (0.93, 1.06)**	**1.15 (0.96, 1.36)**	**1.12 (1.01, 1.25)**	**1.15 (0.96, 1.38)**
Normal	**1**	**1**	**1**	**1**
Overweight	**0.92 (0.83, 1.01)**	**1.23 (0.95, 1.61)**	**1.20 (1.03, 1.41)**	**1.28 (0.98, 1.67)**

Table 2 Continued

Obese	**0.76 (0.60, 0.96)**	**1.21 (0.70, 2.10)**	**1.20 (0.85, 1.68)**	**1.34 (0.77, 2.32)**
P-for trend	**0.03**	**0.38**	**0.08**	**0.27**
Nurse Daughter Variables				
Birth Weight				
LBW	**0.66 (0.62, 0.71)**	**1.46 (1.20, 1.77)**	**1.76 (1.56, 1.99)**	**1.45 (1.19, 1.76)**
NBW	**1**	**1**	**1**	**1**
HBW	**1.07 (0.98, 1.17)**	**1.93 (1.46, 2.55)**	**2.44 (2.06, 2.89)**	**1.94 (1.47, 2.57)**
P-for trend	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Gestation Age				
Early	**0.661 (0.59, 0.74)**	**0.77 (0.66, 0.90)**	**0.66 (0.58, 0.74)**	**0.78 (0.66, 0.92)**
On Time	**1**	**1**	**1**	**1**
Late	**0.98 (0.86, 1.12)**	**1.01 (0.85, 1.18)**	**1.00 (0.88, 1.15)**	**1.03 (0.88, 1.21)**
P-for trend	**<0.001**	**0.004**	**<0.001**	**0.009**
Birth Order				
First	**1**	**1**	**1**	**1**
Other	**0.75 (0.71, 0.80)**	**0.79 (0.70, 0.89)**	**0.76 (0.71, 0.81)**	**0.80 (0.71, 0.90)**
P-for trend	**<0.001**	**<0.001**	**<0.001**	**<0.001**
Birth Cohort				
1925-39	**1**	**1**	**1**	**1**
1940-44	**0.48 (0.37, 0.62)**	**0.48 (0.33, 0.71)**	**0.49 (0.38, 0.63)**	**0.49 (0.33, 0.72)**
1945-49	**0.21 (0.17, 0.26)**	**0.26 (0.19, 0.37)**	**0.21 (0.16, 0.26)**	**0.27 (0.19, 0.38)**
1950-54	**0.13 (0.10, 0.16)**	**0.17 (0.12, 0.23)**	**0.16 (0.10, 0.16)**	**0.17 (0.12, 0.24)**
1955-59	**0.09 (0.07, 0.11)**	**0.11 (0.08, 0.16)**	**0.09 (0.07, 0.11)**	**0.12 (0.08, 0.16)**
1960-64	**0.07 (0.06, 0.09)**	**0.08 (0.06, 0.12)**	**0.07 (0.06, 0.09)**	**0.08 (0.06, 0.12)**
P-for trend	**<0.001**	**<0.001**	**<0.001**	**<0.001**

Figures 3a-d. Birth cohort specific odds of Ever BR and XBR

1925-39 | 1940-44 | 1945-49 | 1950-54 | 1955-59 | 1960-64

Figure 3a: Odds of Ever BR and XBR by maternal education compared to <12 years of education

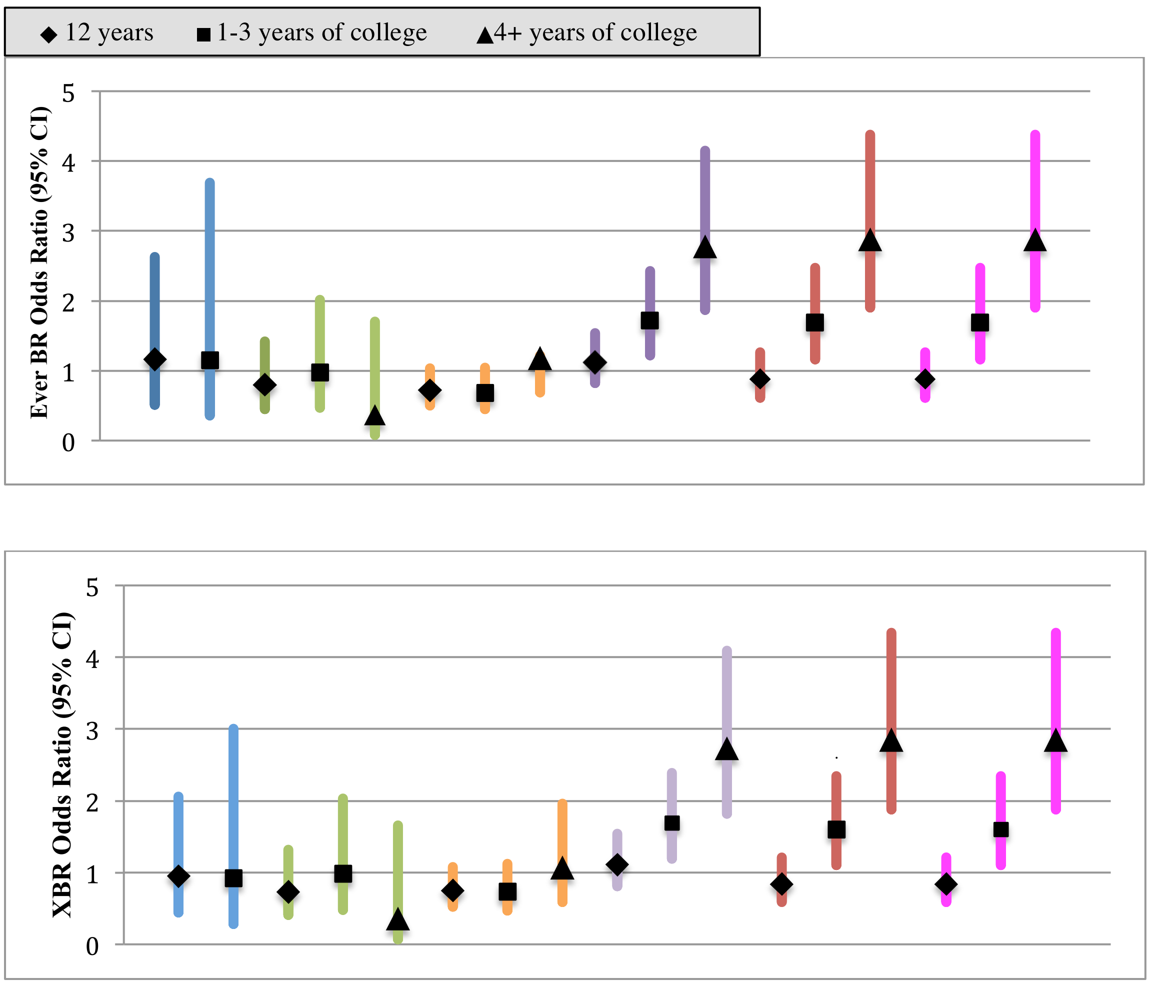


Figure 3b. Odds of Ever BR and XBR among smokers compared to non-smokers

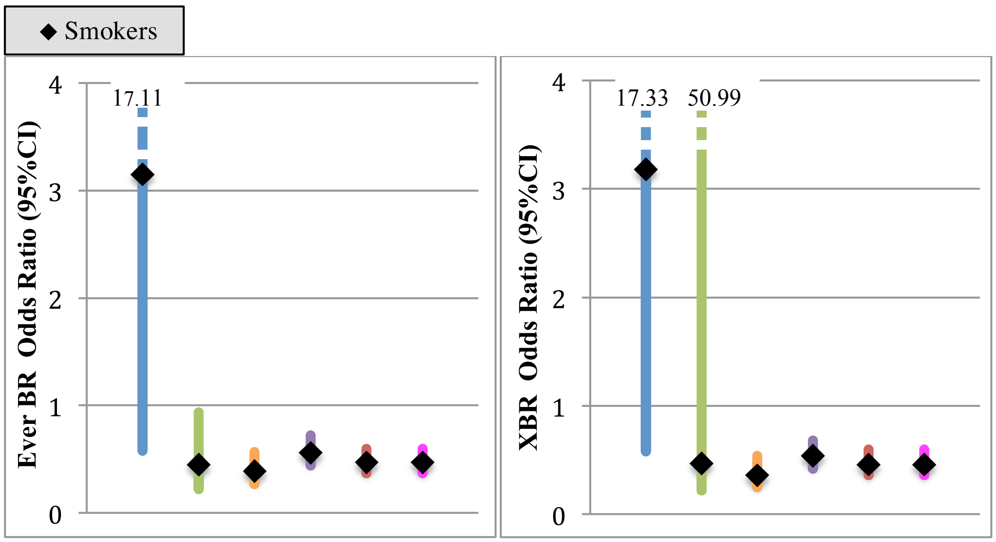


Figure 3c. Odds of Ever BR and XBR among mothers with a C-section compared to vaginal delivery

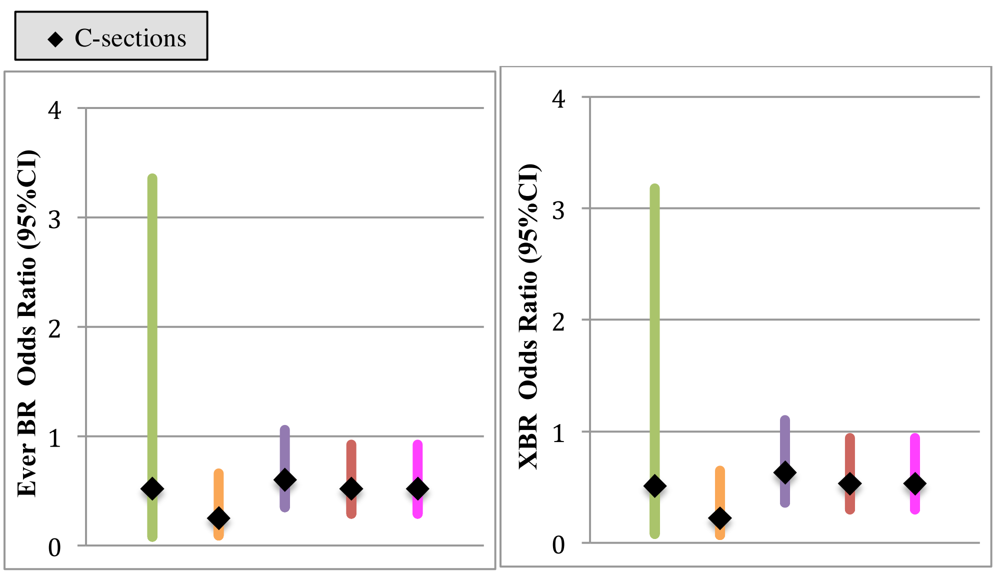
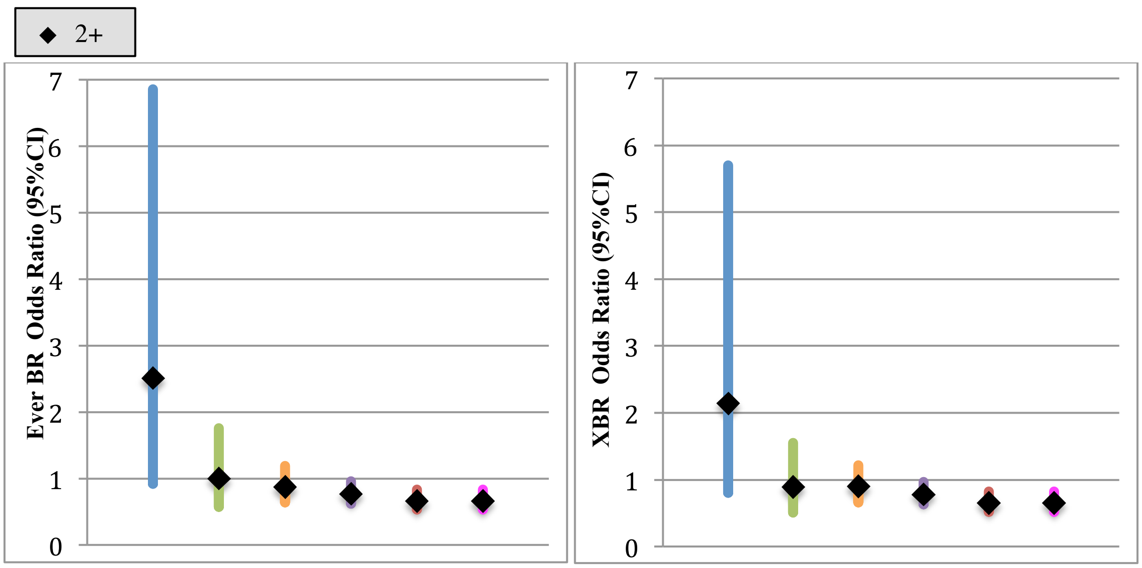


Figure 3d. Odds of Ever BR and XBR among birth order 2+ compared to first-borns.



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