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Association of Maternal Demographics with Breastfeeding of Low Birth Weight Infants in Ohio in 2012

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To God, for making a way when there was none.

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Abstract

Background: Breastfeeding (BF) is an important feeding practice for newborns, especially the low birth weight (LBW) infant population and during emergencies. Association of maternal demographics with BF in LBW infants in Ohio, especially during emergencies is not fully characterized. This study aims to fill that data gap.

Methods: The data for this study were the 2012 Ohio Vital Statistics Birth Data compiled by the Ohio Department of Health and obtained from Public Health – Dayton & Montgomery County. It included all 11,805 LBW, 8.5% of the total births in Ohio in 2012. IBM SPSS version 22 was used for the analyses of the data. Descriptive statistics, chi-square analyses, odds ratios using univariate and multivariate logistic regression (LR) analyses were computed.

Results: Out of the 11,805 LBW infants, 6,394 (54%) were breastfed while 5,411 (46 %) were not breastfed. In univaraite LR, mother's race as non-African American (OR =3.22, $p<0.001$), smoking during third trimester (OR = 2.52, $p<0.001$) and marital Status (OR = 2.43, $p<0.001$) were the factors that were associated with a higher prevalence of BF. After multivariate LR, not smoking, being married and mother's race as non-African American were related to higher prevalence of BF.

Conclusion: LBW infants are breastfed less than their non-LBW counterparts. Demographics affect BF in mothers with LBW infants in the same way they affect mothers with non-LBW infants. Targeted efforts during antenatal care to promote BF would help LBW infants during emergencies.

Keywords: breastfed, lactation, low birth weight, infant mortality

Association of Maternal Demographics with the Breastfeeding of Low Birth Weight Infants in Ohio in 2012

Maternal and child health are pivots of public health and its practice. In order to adequately safeguard this segment of the population, public health studies social determinants and risk factors while designing and approving interventions when necessary. This topic is important to public health because it highlights the effect of demographic factors of mothers on their efficacy in breastfeeding their infants born with low birth weight (LBW) (<2500g), a population that is at risk of morbidity and death. It also stresses the importance of breastfeeding (BF) to the overall health of the child either during periods of normalcy or emergencies.

Ohio is the seventh largest state in the U.S. and home to about 3.8% of the U.S. total population (Ohio Development Services Agency, 2014). In 2012, within this population, 82% were white, 12.2% were black, 3.1% of Hispanic origin 1.7% Asian, 0.2% American Indian and Alaska Native, 1.1% other race, and 2.1% being of two or more races (U.S. Census Bureau, 2012). Also, 15.8% of the total population was of low income status and 15.4% had limited English proficiency (U.S. Census Bureau, 2012). The total female population at this time stood at 5.9 million and the resident population aged 15-44 was 2.1 million (U.S. Census Bureau, 2012).

In 2012, Ohio had a slightly higher birth rate of 29.8 births per 1,000 for ages 15 to 19 as compared to 29.4 births nationwide (Ohio Development Services Agency, 2014; Martin, Hamilton, Osterman, Curtin, & Mathews, 2013). In this year, a total of 11,857 LBW infants were born in Ohio constituting about 8.6% of the 138,284 infants born in Ohio that year as compared to a slightly lower national LBW rate of 8.0% (Public Health – Dayton & Montgomery County, 2014; Martin et al., 2013; Annie E. Casey Foundation [AECF], 2013). It is also of note that the

LBW rate for Ohio had remained constant from 2008-2012 and that for LBW, the state ranked 36th out of the 50 states in the U.S. in that year (AECF, 2013).

In Ohio, about three infants die each day, i.e. one baby dies every eight hours (Summit County Public Health [SCPH], 2013). Ohio's infant mortality rate in 2012 was 7.56 per 1,000 live births; it ranked 46th in overall infant mortality nationwide (AECF, 2013). The national mortality rate in 2012 stood at 6.05 per 1,000 live births, one of the highest among industrialized countries (MacDorman, Hoyert & Mathews, 2013; Ohio Infant Mortality Data, 2012; SCPH, 2013). LBW and prematurity are leading causes of infant mortality (SCPH, 2013).

BF helps reduce infant mortality especially with its relevance to catch up growth of LBW infants. The World Health Organization has been a strong advocate in promoting BF as a way of combating infant mortality. Out of the 11,805 LBW infants born, 6394 (54%) were breastfed.

Between 2000 and 2008, Ohio experienced stagnation in population growth, a slow increase in racial and ethnic diversity, income polarization with a significant growth in residents living in poverty and uneven levels of educational attainment across ages and races when compared to the nation (Greater Ohio Policy Center Report, 2010). These developments were still visible in 2012.

This study seeks to evaluate the association between socio-demographic factors affecting women giving birth to LBW infants at full term and whether or not they breastfeed. Also it aims to investigate if LBW infants are breastfed more or less when compared to their non-LBW counterparts.

Literature Review

Low Birth Weight (LBW)

LBW according to the World Health Organization is the weight at birth less than 2500g (UNICEF & World Health Organization [WHO], 2004). It is usually measured in the first hour of life irrespective of gestational age (WHO, 2013). Subdivisions of low birth weight are Very Low Birth Weight (VLBW) which is weight at birth less than 1500g and Extremely Low Birth Weight (ELBW), weight less than 1000g (Griessel, Joubert, Setlaba, Seboco, & Chokoe, 2012). The LBW rate worldwide is 15.5% with 96.5% of that being from developing countries (UNICEF & WHO, 2004). Neonatal death for LBW infants of weight 2000-2499g at birth is four times higher that for infants of weight 2500-2999g and ten times that found in infants of weight 3000-3499g at birth (Ashworth, 1998). The risk for infants weighing 1500-1999g is eight times higher than infants with birth weight of ≥2500g (Black et al., 2008).

Prematurity and intrauterine growth retardation are two sources of low birth weight (Kelley & Podja, 2000; Nohr et al., 2008). According to Khan, Arbab, Murad, Khan, and Abdullah (2014), preterm birth is the primary cause of LBW. Prematurity is delivery before a gestation age of 37 weeks. It is a result of preterm birth in most cases and growth retardation in others if not from both concurrently. Many factors influence prematurity of the baby, preterm birth and stunted growth at birth. These are the risk factors of LBW. The ideal outcome of LBW achievable would be intact survival which is defined as survival without neonatal morbidity and/or future disabilities (Farooqi & Serenius, 2005). Given the high risk nature of this population and various considerations, this ideal isn't always met. Thus, outcomes of LBW infants differ depending on the quality of care before pregnancy and immediately after delivery (Afjen, Sabzehei, Fallahi, & Esmaili, 2013).

Risk factors of low birth weight.

Risk factors are identifiers that increase the likelihood of an individual developing an injury or disease. The risk factors of LBW are those attributes, characteristics or exposures that increase chances of an expectant mother having a baby with birth weight <2500g whether due to preterm delivery or stunted growth at birth. These risk factors include unmarried or status of early marriage, mother's low education, mother's younger or older age, race, poverty, number of cigarettes smoked before and during pregnancy and less than full term pregnancies. Also included are poor maternal nutrition, low gestational weight gain, genetic composition of mother, her lower height, experince of violence during pregnancy, high maternal BMI, infections and disease during pregnancy, hereditary vertical history of LBW, inter-pregnancy interval of less than one year, gestational diabetes and previous birth of LBW infants (Khan, Arbab, Murad, Khan, & Abdullah, 2014).

Khan et al. (2014) reported that LBW frequency decreases with increase in maternal education. This could be due to uneducated mothers being less informed about healthy options during pregnancy like prenatal care or diet. Also, it cites malnutrition as a factor that increases frequency of LBW. The fetus is deprived of basic nutrients it needs to develop and thus experince stunted growth. Overweight and obese mothers are at a greater risk of LBW infants than normal and underweight mothers due to their risk of developing gestational diabetes, high blood pressure and chronic medical conditions during pregnancy resulting in preterm birth and LBW (Nohr et al., 2008).

The inflammatory response to maternal infections during pregnancy like urinary tract infection, bacterial vaginitis, kidney infection etc releases cytokines that can attack the placenta resulting in preterm birth or it can stunt growth of the fetus by limiting the functioning of the

placenta in providing adequate nutrition (Khan et al., 2014). Infants born with LBW have to catch up to normal and high birth weight infants. In the event that they do not do so quickly, they might advance into adolescence malnourished, physically disadvantaged or both (Khan et al., 2014). This predisposes them to a higher risk of having LBW infants especially if they marry early or even remain unmarried. They need good nutrition themselves and are not able to provide a fetus with all the nutrients it needs (Black et al., 2008).

Structural violence, a sum total of constraints on behavior imposed by existing inequalities in power on those who are underprivileged accounts for the acute effect of these risk factors (Lind, Perrine, Li, Scanlon, & Grummer-Strawn, 2014). Even if genes for LBW and family history are spread evenly across the board, access to healthcare, good nutrition and education are not. African American women are at a higher risk of having LBW infants due to a lifetime exposure to interpersonal racism which is a chronic, psychopsychologial stressor that has been implicated as a cause of maternal hypertension and the acceleration in corticotropin-releasing hormone secretion, a precursor to preterm delivery (Rich-Edwards et al., 2001; Lind et al., 2014).

From the foregoing, it can be observed that a mother at greatest risk of having a LBW baby would in terms of demographics be of a minority race, unmarried, and have a low education level. In terms of social attributes, she would be in her teenage years, in her early twenties or between 40 and 50, she would have a low socioeconomic status and would most likely be a smoker. In terms of her health, she would be malnourished and would have a history of preterm births if she has had prior offspring.

Outcomes of low birth weight infants.

LBW infants have higher risks of health complications that can last their entire lives (Khan et al., 2014). VLBW infants and ELBW infants have slimmer chances of survival (Ballot, Potterton, Chirwa, Hilburn, & Cooper, 2012). The complications associated with LBW infants include cerebral palsy, cognitive impairment, language delays and learning difficulties, behavioral disorders, blindness and hearing loss (Ballot et al., 2012). Also included are renal deficiency, congenital malformation, hypothermia, hypoglycaemia, perinatal asphyxia, coronary heart dieseases, immunological problems, anemia and infection (Khan et al., 2014; Zhiling et al., 2013).

Outcomes are measured by survival, neonatal morbidity and neural development (Iacovidou, Varsami, & Syggellou, 2010). Modern intensive care has increased survival of LBW infants but this does not necessarily translate to improved long term survival. The result is observable poor growth of LBW infants especially ELBW infants as more survive to show signs (Iacovidou et al., 2010; Gregson & Blacker, 2011). Neurodevelopmental outcomes of LBW are usually assessed later on in life usually after 18-24 months and not immediately after birth (Ballot et al., 2012; Iacovidou et al., 2010). Medical intervention is sought when LBW infants are born and this is to ensure intact survival, the ideal outcome (Farooqi & Serenius, 2005). In some cases medical intervention can result in poorer outcomes if suboptimally performed. A common example is infection following admission of LBW infants into the neonatal intensive care unit (NICU) (Zhiling et al., 2013). Sources of infection in the NICU include parenteral hyperalimentation therapy, endotracheal intubation and a peripherally inserted central catheter (Zhiling et al., 2013). In other cases however, interventions like the introduction of assisted ventilation at birth, surfactant replacement therapy and prenatal steroid administration for lung

maturation have improved survival rate (Iacovidou et al., 2010). The goal here is to carry out whatever intervention that is required as optimally as is allowed to ensure good outcomes.

Kangaroo care.

As an alternative to highly specialized medical intervention, Kangaroo care (skin-to-skin contact between mother and infant) has been promoted especially in low income countries. Kangaroo care here meaning a mixture of skin-to-skin contact, exclusive breastfeeding of infant if possible, timely discharge and close observation has been shown to improve mortality rates by 40% in premature births (Gregson & Blacker, 2011). Other benefits of Kangaroo care include reduced hospitalization, better bonding of infant with mother, increase in breastfeeding rates and no increase in NICU admission (Gregson & Blacker, 2011).

Breastfeeding

This is the feeding of a baby with milk from the breast of a woman. It is the recommended way of feeding an infant with the nutrition they need for healthy growth and development (WHO, 2015; CDC, 2013). Breast milk is composed primarily of proteins, fats, carbohydrates and vitamins (American Pregnancy Association, 2014). The proteins found in breast milk include lactoferrin, secretory immunoglobulin A, lysozyme, casein and whey. They protect the infant from the growth of harmful bacteria, E.coli and Salmonella. Breast milk also contains methyl-N-acetyl D-glucosamine, a bifidogenic factor. It promotes the growth of bifidobacteria in the intestines useful in preventing diarrhea in infants. The fats present in breast milk serve as a source of calories and are required for neural development. The vitamins present in breast milk whether fat soluble or water soluble depends on the mother's dietary intake. Lactose is the main carbohydrate in breast milk and provides a good percentage (40%) of calories. It protects against bacteria, improves the absorption of minerals and helps fight disease.

In addition to these, breast milk contains leukocytes, enzymes and hormones that set it apart from formula food in its use and value to the infant's nutrition. Colostrum is the early milk produced after birth. It is the rich in proteins that convey immunity to infections in the intestinal tract of the infant and it is important that newborn infants receive colostrum as they can absorb its proteins easily immediately after birth and boost their immunity ("Lactation," 2013).

Lactation.

This is the letdown of milk by females after birth. It is a process necessary to facilitate breastfeeding of infants and it occurs based on an inter play of various hormones which include estrogen, progesterone, prolactin and oxytocin. Other pituitary hormones like adrenocorticotropin and growth hormone have also to some degree being implicated in facilitating lactation. The mammary glands produce milk and are situated within the breasts. Even though their development and growth occurs during pregnancy, milk secretion occurs only after delivery. It is believed that the association of estrogen and progesterone during pregnancy facilitated by the placenta blocks the secretion of prolactin and inhibits lactation. After delivery and the removal of the placenta, prolactin is secreted and lactation commences. Oxytocin also influences lactation and acts most noticeably in causing muscle contraction in the alveoli in the breast and in milk expulsion. Suckling, fright and sexual intercourse are triggers for its release. It has also been known to initiate lactation in non-pregnant women who are often of childbearing age or older.

Benefits of breastfeeding to the mother.

Mothers have a higher risk of cancer and cardiovascular disease by not breastfeeding, although this is subject to confounders (Stuebe & Schwarz, 2010). Ovulation is suppressed during lactation. This is known as lactational infertility ("Lactation," 2013). Women who do not

breastfeed resume menstruation in 6 to 8 weeks after childbirth. It varies however for those who breastfeed and leads to lactational amenorrhea ("Lactation," 2013). This is beneficial as it prevents bleeding and conserves iron deposits in the mother. Breastfeeding via lactational infertility helps family planning and spacing of infants and has been used as a contraception method (Stuebe & Rich-Edwards, 2009). The secretion of oxytocin during suckling and lactation immediately after birth causes the uterus to contract reducing bleeding. Lactation causes terminal differentiation of breast tissue which may reduce malignancy and offer protection against breast cancer (Stuebe & Schwarz, 2010). Ovarian cancer rates have been shown to be highest in women who never breast-fed and lowest in women who both breast-fed and developed mastitis while breastfeeding with women who breastfed but did not develop mastitis having intermediate rates (Cramer et al., 2005). This might be due to antibodies that develop during mastitis and protect against ovarian cancer (Cramer et al., 2005).

Breastfeeding has also been implicated in preventing cardiovascular disease (Stuebe & Rich-Edwards, 2009). It is a metabolically intensive process requiring the breakdown of nutrients from the mother to the child, thus weight gained during pregnancy is mobilized and this favors reduction in blood pressure. These in addition to good lipid metabolism and stable glucose levels are benefits found to persist after weaning thus improving overall health of the mother (Stuebe & Rich-Edwards, 2009). These benefits protect the mother from diabetes and hypertension.

Benefits of breastfeeding to the infant.

The benefits of colostrum and breast milk to the infant are based on the immune factors produced by the mother and present in the milk to protect the infant from antigens present in their immediate surroundings (Hamosh, 2001). Such immunity cannot be conferred by formula feeding which is the feeding of alternatives to breast milk. Breast milk is thus nutritionally

superior, contains the right proteins, fats and calories for optimum growth. The content of breast milk interrupts the progress of common pathogens like E.coli, rotavirus, Streptococcus pneumonia etc. and thus reduces infections morbidity (Stuebe & Schwarz, 2010). Formula feeding on the other hand has been shown to increase risk of gastroenteritis, diarrhea etc. For infants, an increased risk of the following are associated with not breastfeeding; ear infections, lower respiratory infections, sepsis, Sudden Infant Death Syndrome (SIDS), necrotizing enterocolitis, leukemia, lymphoma, obesity, diabetes, etc. (Lessen, 2012).

Contraindications of breastfeeding.

These arise when special infant and maternal conditions are considered (WHO, 2009). Infants who should not receive breast milk include those with metabolic disorders like galactosemia, phenylketonuria and maple syrup disease. Also, infants born with very low birth weight, very preterm (less than 32 weeks of gestation) or those with impaired metabolic adaptation will need other food in addition to breast milk (WHO, 2009; Lessen, 2012). Mothers, who are HIV positive, have severe illness that prevent care-giving, have herpes simplex virus and lesions on breast or are currently being medicated should not breast feed. However, those with breast abscess on one breast, hepatitis B and C, mastitis, tuberculosis and substance abuse can still breastfeed if the appropriate guidelines, e.g., immunization, are followed and close supervision by hospital personnel is employed. Substance abuse should however be discontinued (WHO, 2009; Lessen, 2012).

Socio-demographics and breastfeeding.

In public health, breast feeding is considered in terms of its relevance to the health outcomes for mother and infant. To obtain the best possible outcome, exclusive breast feeding has been recommended by the World Health Organization for at least the first six months of life

followed by gradual introduction of complementary foods and later by complete weaning of the infant from breast milk in about a year after birth (WHO, 2009).

The mother's age, race, education and marital status, household composition, living arrangements, parental histories and socioeconomic status (this determines the type of healthcare facilities that can be accessed) all affect breastfeeding intention, initiation, duration and exclusivity (Spencer & Grassley, 2013). A mother least likely to breastfeed would be black, unmarried, of low educational background, younger and of a low socioeconomic status (Forste, Weiss, & Lippincott, 2001). Such a mother would have limited access to quality health care and have less time off work or school after delivery if employed or schooling.

A conversation about breastfeeding and breastfeeding interventions especially in regions with glaring health disparities usually involves dividing breastfeeding into intention, initiation, duration and exclusivity (Spencer & Grassley, 2013). Tailoring health interventions to target intention to breastfeed, initiation, duration and exclusivity of breastfeeding has provided ways to ensure efficiency and specificity. Breast feeding is a means to avoid infant morbidity and assist special categories of newborn infants, i.e. low birth weight (Stuebe & Schwarz, 2010; Agrasada, Ewald, Kylberg, & Gustafsson, 2011). Some indices for breastfeeding are given in Tables 1 and 2.

Table 1

Breastfeeding Initiation and Duration Rates

Breastfeeding nationwide	2000 (in %)	2008 (in %)	2011 (in %)	2012 (in %)	Target, 2020 (in %)
Initiation	70.3	74.2	74.6	76.9	82
Duration (6 months)	34.5	43.1	44.3	47.2	61
12 months	16	21.4	23.8	25.5	34

Sources: CDC, 2008; CDC, 2012; CDC, 2013; Lessen, 2012

Table 2

Breastfeeding Exclusivity Rates

Breastfeeding nationwide (Exclusivity)	2014 (in %)	Target, 2020 (in %)
3 months	41	19
6 months	46	26

Sources: Jarlenski, Bennett, Bleich, Barry & Stuart, 2014; Lessen, 2012

In 2000, breastfeeding initiation was 47.4% among blacks, 71.8% among whites, and 77.6% among Hispanics. By 2008, the percentages increased 58.9%, 75.2% and 80.0% respectively (CDC, 2013). While the increase in rates among black mothers is commendable, it is lower overall when compared to other races (Forste et al., 2001). A reason for this is the lack of support faced by African American women both culturally and socioeconomically when it relates to breast feeding (Lewallen & Street, 2010). Nationwide however, there is an association of maternal demographics with access to the following; good nutrition, optimal maternity care facilities, WIC sites and workplaces and baby friendly hospitals.

Good nutrition.

In populations predominated by African Americans, nutrition is threatened by low socioeconomic status, large size of household, poor education and unemployed status, unmarried status and at times heavy physical labor (LINKAGES Project, 2004; CDC, 2013). This predisposes this group to a greater risk of infections, parasites, and micronutrient deficiencies, repeated and closely spaced pregnancies as well as reduced energy intake (LINKAGES Project, 2004). These stressors ultimately affect the quality of breast milk that can be provided to a newborn infant and the intention of the mother to breastfeed (Agrasada et al., 2011; CDC, 2013; Lind et al., 2014).

Contrary to common misconceptions, malnutrition prior to pregnancy and childbirth does not reduce the quantity of milk produced by a nursing mother. This is determined by the frequency and vigor of the suckling action of the baby. Therefore a proper intervention to improve quality of nutrition provided the infant would be to provide food for the mother even during breastfeeding and especially in times of emergencies (LINKAGES Project, 2004). Also, consumption of a variety of foods is best for a breastfeeding mother even during pregnancy (Woo et al., 2012). Special attention is only necessary if specific micronutrients like vitamin B-6, vitamin B-12, iodine, thymine etc. are deficient in the environment of the mother. These can be administered as supplements in pre-natal care to ensure that the infant receives these nutrients in breast milk (Lind et al., 2014). For undernourished populations due to poverty or food deserts, it is important to recall that it is better to target intervention at the mother than the infant, i.e. provide the mother with more nutrition instead of changing the baby to formula feeding (LINKAGES Project, 2004; Forste et al., 2001).

Optimal maternity care facilities, WIC sites and workplace.

Race, education and income levels determine the type of jobs as well as maternity care facilities and WIC sites women can access (Lind et al., 2014; Lewallen & Street, 2010). The hospital stay is a pivotal period in establishing breastfeeding. Maternity care practices range from prenatal care to care during labor and after labor (Shealy, Li, Benton-Davis, & Grummer-Strawn, 2005). The quality of care received by a pregnant woman and subsequently mother reflects to a large extent the quality of routine practices at the maternal care facility. New mothers usually do not request a different form of care from what is offered by health personnel (Shealy et al., 2005).

The optimal level of maternity care that can be provided by a hospital or clinic has been recommended by the WHO and United Nations' joint initiative; the Ten Steps to Successful breastfeeding (CDC, 2007; CDC, 2011). These steps range from a having a routinely communicated written breastfeeding policy to helping mothers with early breastfeeding initiation and ensuring that infants receive only breast milk unless contraindications occur (Shealy et al., 2005; Agrasada et al., 2011). Hospitals and clinics in areas predominated by African American populations usually fall short of all ten steps and have problems with rooming-in of mothers and infants for breastfeeding due to space constraints, informing pregnant women of the benefits of breastfeeding and its management either due to negligence or improper training. They also have difficulties fostering support groups for discharged mothers who wish to continue breastfeeding (Lind et al., 2014; Lessen, 2012; CDC, 2010).

The Special Supplemental Nutrition for Women, Infants and Children (WIC) has helped women infants and children nutritionally at risk since its inception in 1972 by providing supplemental food, education and referrals. It is even more poignant as it caters to those with low income. However, because of this restriction, its unintended consequences are focused solely on this demographic. Among African American mothers with a low intention to breastfeed, WIC sites offering supplemental foods further do more harm than good (Woo et al., 2012). In these populations, the WIC sites reduce breastfeeding initiation rates (Spencer & Grassley, 2013). With regards to encouraging breastfeeding initiation, WIC sites work best when they encourage education of benefits of exclusive breastfeeding to both the mother and infant, making sure that this form of intervention is both culturally sensitive and specific (Lind et al., 2014).

While there are existing policies in the workplace to support nursing mothers as well as designated private spaces for breastfeeding or expressing milk, access to these benefits are

limited (Shealy et al., 2005). Mothers with a low educational level or of a certain race e.g. African American can work jobs without these perks. These mothers usually return to work sooner and are not provided with nursing mother rooms. Thus they have to either express milk before work and store it or cut breastfeeding short and wean the child early to cope with work and stop leaking from lactation (Phillips, Brett, & Mendola, 2011). In better work environments, nursing mother rooms and maternity breaks of 3 to 6 months are set up for nursing mothers (Shealy et al., 2005)

Baby-friendly hospitals.

Maternal care facilities that practice all ten steps to successful breastfeeding are designated as baby-friendly because the ten steps are practiced as part of the baby-friendly health initiative (Stealy et al., 2005; Lind et al., 2014). Such facilities usually experience an increase in breastfeeding rates (Philipp et al., 2001). Studies have shown that the more steps a health facility can implement, the greater the duration of breastfeeding observed in nursing mothers there (DiGirolamo, Grummer-Strawn, & Fein, 2001).

In hospitals and clinics found in disadvantaged communities, it might be difficult to implement all ten steps especially with regards to rooming-in, training and setting others up with support groups upon discharge. This delimits the success of breastfeeding that they expect to have. However, consistent education focused on breastfeeding exclusivity management and the dissuasion of pacifier use with newborns helps nonetheless.

Cultural myths associated with breastfeeding.

Different populations have different beliefs about breastfeeding. These populations are divided based on race or ethnicity as well as occupational and/or income level. These cultural issues determine the level of support nursing mothers receive from partners, spouses, family and

the community (CDC, 2013). In a study by Lewallen and Street (2010), popular cultural myths within the African American population are; breastfeeding is what white people do, it hurts, breast milk is harmful for the baby and rots the baby's teeth as it is too sweet, breastfeeding male infants makes them become too dependent on their mothers and soft, breastfeeding isn't guaranteed to work all the time. These might account for why breastfeeding rates are lowest within this demographic. Community support is not sufficient and thus African American mothers who are older, married, and have high education levels are more likely to breastfeed (Pak-Gorstein, Haq, & Graham, 2009; Phillips et al., 2011). Hispanic mothers on the other hand display a strong resistance to acculturation partially due to the influx of immigrants into the U.S. and the nature of the family unit. This has helped them maintain the highest breastfeeding rates till date (CDC, 2013).

Feminism and breastfeeding.

Breastfeeding before the turn of the century was not regarded as a feminist issue. It is one because it requires a deeper look into society's division of labor based on gender as well as the balance between women's reproductive and occupational lives (Van Esterik, 1994). As a feminist issue, an analysis of breastfeeding exposes current issues regarding the romanticizing of breastfeeding, the sexualizing of breasts, the place of motherhood and personal choice in society. Utilizing feminist theory in analysis breastfeeding trends promotes conversations that extend beyond mothering and breastfeeding delving into deep set notions in society regarding the woman and her access to support (Van Esterik, 1994).

Breastfeeding and low birth weight.

LBW infants can either be full term (between 39 and 40 weeks) or preterm (before 37 weeks) (Hill, Ledbetter, & Kavanaugh, 1997). It is important to note that whatever barriers exist

for mothers of healthy full term infants irrespective of demographics, mothers of LBW infants face more because of inadequate information and assistance on breastfeeding for LBW infants. These problems are further aggravated by the failure of health professionals to use latching on of LBW infants during suckling as a benchmark for discharging the mothers (Hill et al., 1997; Spencer & Grassley, 2013). Hence, these women continue to experience breastfeeding problems even after discharge. Interventions tailored to the specific needs of these mothers and not those created from generalizations off full term, health infants. For LBW/preterm infants, breastfeeding is best defined as a combination of feeding at the breast and the use of expressed mother's milk either via bottle or the supplemental nursing system (Hill et al., 1997).

Breastfeeding in emergencies

An emergency response plan is divided into the pre-event plan, the event plan and the post-event plan with specific interventions developed for each of these three phases. The aim of an emergency response is to reduce morbidity and mortality in the target population at that point in time.

Considering LBW infants, an emergency response is necessary especially concerning preterm LBW infants to reduce morbidity and mortality. In this target population, the pre-event, event and post-event plans can be modified into the pre-conception, gestation and post-delivery plans with specific interventions developed for each of these three phases. Breastfeeding is one of the interventions for the post-delivery phase and is part of the overall emergency response to reduce morbidity and mortality in the LBW population given its clear benefits to both the child and the mother.

In times of emergency, there is disruption of normalcy and at times chaos. A nursing mother usually faces challenges that threaten to keep her from sustaining breastfeeding. It is

important that she maintains exclusive now more than ever as more stresses are placed on the health of the infant. Bottle or formula feeding should be discouraged as these increase risk of infection. These forms of feeding require clean water and power, amenities that might be in scarce supply during emergencies. Also poor hygiene and crowding serve as factors to increase risk as well.

It is important to realize that in emergencies, nursing mothers need actual help and not just advice. Most believe they cannot produce enough milk to maintain exclusive breastfeeding, a notion that has been found to be false (Wellstart International, 2005). Nursing mothers need specific help with their nutrition, infant positioning when feeding, counsel on optimal breastfeeding as well as trauma counseling and the details on the process of lactation; how it happens, what promotes and hinders it and what they have to do to continue or resume it (Wellstart International, 2005).

Methods

Approval from Wright State University's IRB committee was obtained through exempt review (see Appendix A). Retrospective Ohio Birth data for 2012 was obtained from the Ohio Department of Health through Public Health - Dayton & Montgomery County. Of the 138,284 infants born in Ohio in 2012, 11,805 (8.5%) were low birth weight (LBW) infants. All LBW births that had complete data for breastfeeding and other demographic variables were included in this analysis. Breastfeeding (Did Not Breastfeed/Breastfed) was selected as the outcome variable. The variables used as covariates include: mother's age, mother's race, mother's education, marital status, insurance type, smoking status at third trimester, number of prenatal visits, access to WIC, previous live births now living, previous live births now dead, gestational

diabetes, previous preterm births, assisted ventilation >6 hours and admission to NICU. The definition of these variables is shown in Table 3.

Table 3

Descriptions of Variables used as Covariates

Variable	Description
Age	Mother's age in years
Marital Status	Is the mother married?
Education	Extent of mother's education
Race	Mother's race
Prenatal Visits	Did the mother access prenatal care?
WIC	Did the mother access Supplementary Women, Infants and Children nutrition?
Smoking Status at Third Trimester	Number of cigarettes smoked by mother at third trimester
Insurance Type	How did mother pay for the delivery?
Previous Live Births now Living	How many infants born to the mother prior are living?
Previous Live Births now Dead	How many infants born to the mother prior are dead?
Gestational Diabetes	Does the mother have gestational diabetes?
Previous Preterm Births	How many prior preterm births does the mother have?
Assisted Ventilation >6 hours	Was the infant on assisted ventilation for more than 6 hours?
Admission to NICU	Was the infant admitted to the NICU?

Mother's race was divided into three categories; Caucasian, African American (referent) and other. Mother's education was subdivided into two categories; less than high school graduate and high school graduate or higher (referent). Marital status and smoking status at third trimester were also divided into two categories; not married/not married (referent) and non-smoker/smoker (referent) respectively. Mother's insurance type was divided into two categories as well; non Medicaid/Medicaid (referent). Gestational diabetes (referent: has diabetes), Previous preterm births (yes: referent), assisted ventilation >6 hours (referent: no), admission into NICU (referent: yes), and mother's access to WIC (referent: yes), were subdivided into yes and no. Mother's age,

number of prenatal visits, previous live births now living, and previous live births now dead were continuous variables.

Statistical analysis was performed to determine the association between the covariates and the outcome variable. IBM SPSS version 22 (IBM, 2013) was used for the analyses of the data. Descriptive analysis comprised of comparing all covariates across the two categories of breastfeeding (yes/no). The significance level for all hypothesis tests was $\alpha = 0.05$ (two-tailed). Descriptive statistics, including checks for normality, were computed for all continuous variables. Measures of centrality (mean, median) and dispersion (standard deviation, inter-quartile range) were computed and tested using Student's-test for continuous normally variables, and Mann-Whitney-U test for non-normal variables. Frequency distributions were examined for categorical variables such as mother's smoking status, mother's race, mother's education, marital status, insurance type, access to WIC, gestational diabetes, previous preterm births, assisted ventilation >6 hours and admission to NICU and were tested using Pearson Chi-square analysis.

Univariate logistic analysis was completed to assess association of each predictor variable with breastfeeding (yes/no; no=referent). The result as odds ratios and 95% confidence interval and p-values were computed. To assess independent association of individual predictor variables with breast feeding, multivariate logistic regression analysis was completed. Model building for the analysis was begun by analyzing mother's age and mother's race and their relationship with breastfeeding. The second model included the variables analyzed in the first model and the addition of mother's education and marital status. The third model included the addition of access to WIC and mother's insurance type. Smoking status at third trimester, number of prenatal visits, and previous live births living and dead were included in the fourth

model while gestational diabetes, previous preterm births, assisted ventilation >6 hours and admission to NICU were added to create the fifth and final model.

Results

Table 4 provides the descriptive characteristics of LBW infants in Ohio by breastfeeding status and Table 5 provides the univariate LR showing association of breastfeeding status with covariates in LBW infants in Ohio.

The total number of infants in this sample of LBW infants was 11,805. Out of this, 6,394 (54%) were breastfed while 5,411(46 %) were not breastfed (see Table 4).

Table 4

Descriptive Characteristics of LBW Infants in Ohio (2012) by Breastfeeding Status

Characteristic (*n*=11,805)	Did not breastfeed (*n*=5,411) (46%)	Breastfed (*n*=6,394) (54%)	p-value
Mother's age, mean (SD), year	27 (6)	28 (6)	<0.001
Mother's race, *n* (%)			
Caucasian (White)	3507 (66)	4353 (70)	<0.001
African American (Black)	1676 (32)	1585 (26)	
Other	85 (2)	259 (4)	
Mother's education, *n* (%)			
Less than high school graduate	1391 (26)	949 (15)	<0.001
High school graduate or higher	3918 (74)	5389 (85)	
Mother's marital status, *n* (%)			
Not married	3554 (67)	2882 (46)	<0.001
Married	1755 (33)	3456 (54)	
Mother's insurance type, *n* (%)			
Not Medicaid	2098 (40)	3771 (59)	<0.001
Medicaid	3169 (60)	2571 (41)	
Smoking status at third trimester, *n* (%)			
Non smoker	3564 (70)	5403 (85)	<0.001
Smoker	1567 (30)	943 (15)	

Characteristic (*n*=11,805)	Did not breastfeed (*n*=5,411) (46%)	Breastfed (*n*=6,394) (54%)	p-value
No. of prenatal visits, mean (SD), visits	9 (5)	10 (5)	<0.001
Access to WIC, *n* (%)			
No	2130 (46)	3259 (58)	<0.001
Yes	2532 (54)	2329 (42)	
Previous live births now living, mean (SD)	3 (13)	2 (8)	<0.001
Previous live births now dead, mean (SD)	2 (14)	1 (9)	<0.001
Inter-current illnesses, mother			
Gestational diabetes, *n* (%)			
No	5050 (93)	5869 (92)	0.002
Yes	361 (7)	525 (8)	
Previous preterm births, *n* (%)			
No	4702 (87)	5748 (90)	<0.001
Yes	709 (13)	646 (10)	
Inter-current illnesses, infant			
Assisted ventilation > 6 hours, *n* (%)			
No	4795 (89)	5798 (91)	<0.001
Yes	616 (11)	596 (9)	
Admission to NICU, *n* (%)			
No	2901 (54)	3243 (51)	0.002
Yes	2510 (46)	3151 (49)	

Table 5

Univariate Logistic Regression Showing Association of Breastfeeding Status with Covariates in LBW Infants in Ohio (2012)

Characteristic	Odds ratios (95% CI)	p-value
Mother's Age	1.03 (1.03-1.04)	<0.001
Mother's Race		
African American (Black)	Reference	<0.001
Caucasian (White)	1.31 (1.21-1.42)	<0.001
Other	3.22 (2.50-4.17)	<0.001

Characteristic	Odds ratios (95% CI)	p-value
Mother's Education		
High school graduate or higher	Reference	
Less than high school graduate	0.50 (0.45-0.54)	<0.001
Mother's marital status		
Not married	Reference	
Married	2.43 (2.25-2.62)	<0.001
Mother's Insurance Type		
Medicaid	Reference	
Not Medicaid	2.22 (2.05-2.39)	<0.001
Smoking status at third trimester		
Smoker	Reference	
Non smoker	2.52 (2.30-2.76)	<0.001
No. of prenatal visits	1.05 (1.04-1.06)	<0.001
Access to WIC		
Yes	Reference	
No	1.67 (1.54-1.80)	<0.001
Previous live births now living	0.86 (0.84-0.88)	<0.001
Previous live births now dead	0.89 (0.78-1.00)	0.049
Inter-current Illnesses, Mother		
Gestational Diabetes		
Yes	Reference	
No	0.72 (0.60-0.87)	<0.001
Previous preterm births		
Yes	Reference	
No	1.15 (1.02-1.31)	0.023
Inter-current Illnesses, Infant		
Assisted Ventilation > 6 hours		
No	Reference	
Yes	0.80 (0.70-0.90)	<0.001
Admission to NICU		
Yes	Reference	
No	0.81 (0.74-0.90)	<0.001

Mother's Age

As shown in Table 4, among LBW infants born in Ohio in 2012, the mean age of the mothers who breastfed was higher than mothers who did not breastfeed their infants, i.e., 28 years (SD:6) versus 27 years (SD:6) respectively ($p<0.001$). Increasing age of mothers was associated with 3% higher prevalence of breastfeeding (OR = 1.03; 95% CI = 1.03-1.04) ($p<0.001$) (Table 5).

Mother's Race

From Table 4, among LBW infants born in Ohio in 2012, more Caucasian, and other race mothers breastfed than did African American mothers, i.e. 4,353 (70%) versus 1,585 (26%) respectively ($p<0.001$). According to Table 5, being Caucasian was associated with a 31% higher prevalence of breastfeeding (OR = 1.31; 95% CI = 1.21-1.42) ($p<0.001$).

Mother's Education

Among LBW infants born in Ohio in 2012, the majority of mothers who breastfed were high school graduates or higher, i.e. 5,389 (85%) ($p<0.001$) (Table 4). Not being a high school graduate was associated with a 50% lower prevalence of breastfeeding (OR = 0.50; 95% CI = 0.45-0.54) ($p<0.001$) (Table 5).

Marital Status

As shown in Table 4, among LBW infants born in Ohio in 2012, more of the mothers who breastfed were married than unmarried, i.e. 3,456 (54%) versus 2,882 (46%) respectively ($p<0.001$). As presented in Table 5, being married was associated with a 143% higher prevalence of breastfeeding (OR = 2.43, 95% CI = 2.25-2.62) ($p<0.001$).

Mother's Insurance Type

As described in Table 4, among LBW infants born in Ohio in 2012, more of the mothers who breastfed were not on Medicaid, i.e. 3,771 (59%) ($p<0.001$). As described in Table 5, not being on Medicaid was associated with a 122% higher prevalence of breastfeeding (OR = 2.22; 95% CI = 2.05-2.39) ($p<0.001$).

Smoking Status at Third Trimester

From Table 4, among LBW infants born in Ohio in 2012, more of the mothers who breastfed were non-smokers, i.e. 5,403 (85%) ($p<0.001$). As compared to smokers, (Table 5) being a non-smoker was associated with a 152% higher prevalence of breastfeeding (OR = 2.52; 95% CI = 2.30-2.76) ($p<0.001$).

Number of Prenatal Visits

Among LBW infants born in Ohio in 2012, the mean number of prenatal visits of the mothers who breastfed was higher than for mothers who did not breastfeed, i.e. 10 visits (SD: 5) versus 9 visits (SD: 5) respectively ($p<0.001$) (Table 4). Having a higher number of prenatal visits was associated with a 5% higher prevalence of breastfeeding (OR = 1.05; 95% CI = 1.04-1.06) ($p <0.001$) (Table 5).

Access to WIC

According to Table 4 among LBW infants born in Ohio in 2012, more mothers who breastfed did not use WIC, i.e. 3,259 (58%) ($p<0.001$). Not using WIC was associated with a 67% higher prevalence of breastfeeding (OR = 1.67; 95% CI = 1.54-1.80) ($p<0.001$) (Table 5).

Previous Live Births now Living

In Table 4, among LBW infants born in Ohio in 2012, the mean number of previous live births now living was higher in mothers who did not breastfeed than in mothers who breastfed,

i.e. three infants (SD:13) versus two infants (SD:8) respectively (p<0.001). As described in Table 5, having more live births now living was associated with a 14% lower prevalence of breastfeeding (OR = 0.86; 95% CI = 0.84-0.88) (p<0.001).

Previous Live Births now Dead

Table 4 again shows that, among LBW infants born in Ohio in 2012, the mean number of previous live births now dead was higher in mothers who did not breastfeed than in mothers who breastfed, i.e. two infants (SD:14) versus one baby (SD:9) respectively (p<0.001). From Table 5 we see that having more live births now dead was associated with an 11% lower prevalence of breastfeeding (OR = 0.89; 95% CI = 0.78-1.00) (p = 0.049).

Gestational Diabetes

Among LBW infants born in Ohio in 2012, more of the mothers who breastfed did not have gestational diabetes, i.e. 5,869 (92%) (p=0.002) (Table 4). As shown in Table 5, however, not having gestational diabetes was associated with a 28% lower prevalence of breastfeeding (OR = 0.72; 95% CI = 0.60-0.87) (p<0.001).

Previous Preterm Births

More of the mothers who breastfed did not have previous preterm infants, i.e. 5,748 (90%) (p<0.001) (Table 4). Not having previous preterm births was associated with a 15% higher prevalence of breastfeeding (OR = 1.15; 95% CI = 1.02-1.31) (p=0.023) (Table 5).

Assisted Ventilation >6 hours

From Table 4, among LBW infants born in Ohio in 2012, 5,798 (91%) of those breastfed were not on assisted ventilation for over six hours (p<0.001). As shown in Table 5, being on assisted ventilation for more than six hours was associated with a 20% lower prevalence of breastfeeding (OR = 0.80; 95% CI = 0.70-0.90) (p<0.001).

Admission to NICU

As shown in Table 4, among LBW infants born in Ohio in 2012, 3,243 (51%) of those who were breastfed were not admitted to the NICU (p=0.002). From Table 5 however, not being admitted to the NICU was associated with a 19% lower prevalence of breastfeeding (OR = 0.81; 95% CI = 0.74-0.90) (p<0.001).

Table 6 shows that after multivariate logistic regression; all variables remained significant except for 'Caucasian (White)', 'Access to WIC', 'Previous live births now dead', and 'Gestational Diabetes'. Belonging to another race other than African American was found to support breastfeeding. 'Mother's education', 'Previous live births now living', 'Assisted ventilation >6 hours' and 'Admission to NICU' were not protective factors for breastfeeding.

Table 6

Multiple Logistic Regression Analysis of Breastfeeding Status with Covariates among LBW Infants in Ohio (2012)

Model	Odds ratios (95% CI)	p values
Model 1		
Mother's Age	1.03 (1.02-1.04)	<0.001
Mother's Race		
African American (Black)	Reference	<0.001
Caucasian (White)	1.23 (1.13-1.33)	<0.001
Other	2.08 (1.73-2.49)	<0.001
Model 2		
Mother's Age	1.00 (0.99-1.00)	0.181
Mother's Race		
African American (Black)	Reference	<0.001
Caucasian (White)	0.93 (0.85-1.01)	0.091
Other	1.64 (1.36-1.97)	<0.001
Mother's Education	0.60 (0.54-0.66)	<0.001
Mother's marital status	2.28 (2.08-2.49)	<0.001
Model 3		
Mother's Age	0.99 (0.98-1.00)	0.009
Mother's Race		

African American (Black)	Reference	<0.001
Caucasian (White)	0.88 (0.80-0.96)	0.004
Other	1.54 (1.27-1.86)	<0.001
Mother's Education	0.64 (0.58-0.70)	<0.001
Mother's marital status	1.96 (1.79-2.16)	<0.001
Access to WIC	1.04 (0.95-1.13)	0.433
Mother's Insurance Type	1.50 (1.37-1.64)	<0.001
Model 4		
Mother's Age	1.00 (1.00-1.02)	0.066
Mother's Race		
African American (Black)	Reference	<0.001
Caucasian (White)	0.99 (0.90-1.08)	0.759
Other	1.44 (1.20-1.73)	<0.001
Mother's Education	0.77 (0.69-0.85)	<0.001
Mother's marital status	1.72 (1.56-1.90)	<0.001
Access to WIC	0.98 (0.90-1.07)	0.797
Mother's Insurance Type	1.24 (1.13-1.36)	<0.001
Smoking status at third trimester	2.07 (1.88-2.28)	<0.001
No. of prenatal visits	1.03 (1.02-1.04)	<0.001
Previous live births now living	0.90 (0.88-0.93)	<0.001
Previous live births now dead	0.97 (0.86-1.09)	0.568
Model 5		
Mother's Age	1.00 (1.00-1.02)	0.092
Mother's Race		
African American (Black)	Reference	<0.001
Caucasian (White)	0.98 (0.89-1.08)	0.711
Other	1.43 (1.19-1.72)	<0.001
Mother's Education	0.77 (0.69-0.85)	<0.001
Mother's marital status	1.72 (1.56-1.90)	<0.001
Access to WIC	0.99 (0.91-1.08)	0.838
Mother's Insurance Type	1.23 (1.12-1.35)	<0.001
Smoking status at third trimester	2.06 (1.87-2.27)	<0.001
No. of prenatal visits	1.02 (1.02-1.04)	<0.001
Previous live births now living	0.91 (0.88-0.94)	<0.001
Previous live births now dead	0.97 (0.86-1.10)	0.643
Gestational Diabetes	1.03 (0.88-1.19)	0.744
Previous preterm births	1.11 (0.98-1.26)	0.110
Assisted Ventilation > 6 hours	0.75 (0.66-0.86)	<0.001
Admission to NICU	0.86 (0.79-0.93)	<0.001

Statistically significant odd ratios are shown below and in Figure 1.

- Mother's age (1.00)
- Mother's race (Other) (1.43)
- Mother's education (0.77)
- Mother's marital status (1.72)
- Mother's insurance type (1.23)
- Smoking status at third trimester (2.06)
- No. of prenatal visits (1.02)
- Previous live births now living (0.91)
- Previous preterm births (1.11)
- Assisted ventilation >6 hours (0.75)
- Admission to NICU (0.86)

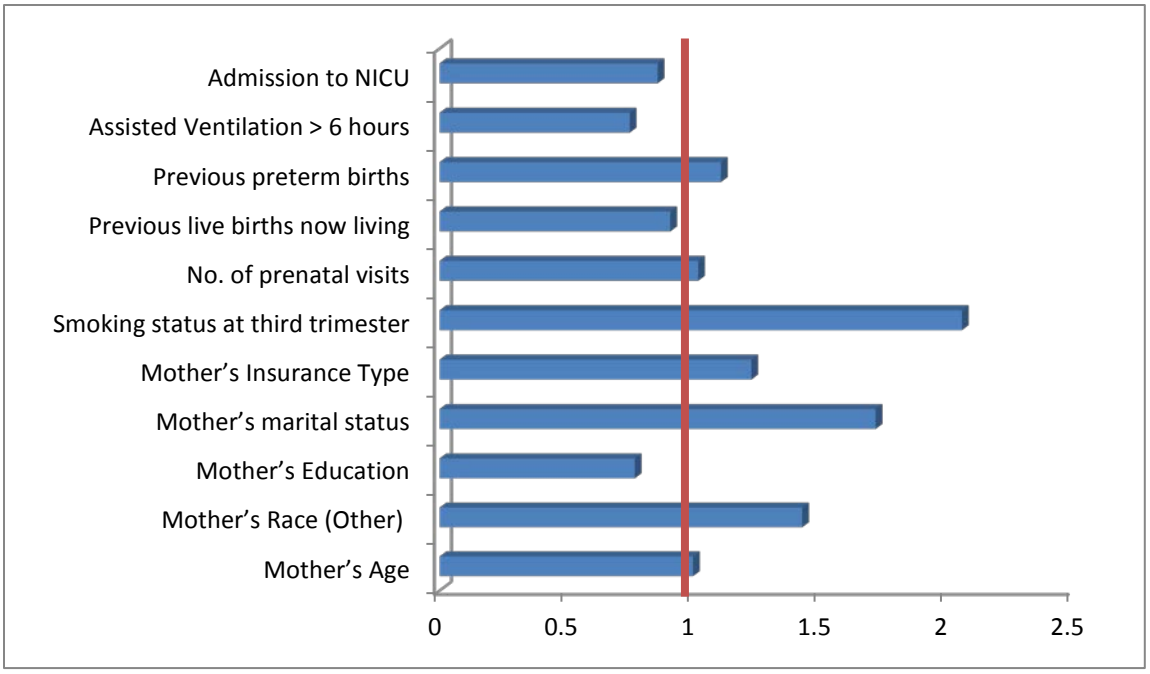

Figure 1. Statistically significant odds ratios for association of breastfeeding with maternal demographics and other characteristics.

Discussion

This study has shown that being an older mother, belonging to non-African American race, being married and a non-smoker, not being on Medicaid, completing more prenatal visits and having a previous preterm infant are protective factors for breastfeeding in LBW infant. These findings affirm those in Spencer and Grassley (2013) as well as in Forste, Weiss, and Lippincott (2001) where it is stressed that demographics are factors that influence the probability of breastfeeding. This study adds significant information to the existing literature on BF breastfeeding in the LBW infant population, showing that the BF characteristics in LBW infants are same as for the normal birth weight population with some exceptions.

This analysis was restricted to LBW infants, Hill et al. (1997) showed that LBW mothers have a harder time breastfeeding than mothers of non-LBW infants due to problems with latching on and associated morbidities in the infants. The current analysis supports this by showing that only 54% of LBW infants were breastfed in Ohio in 2012. The breastfeeding rate for non-LBW infants in Ohio in the previous year was 70.1% (CDC, 2015). This proves that LBW infants are breastfed less than non-LBW infants, an alarming finding given the fact that the LBW population is at greater risk of morbidities and mortality. This is made even worse when emergency situations are considered. In such circumstances, infants are the most vulnerable population and LBW infants are even more so. A good emergency preparedness measure would be to begin now to advocate for higher breastfeeding rates with this population by improving health personnel competence, community support and individual self-efficacy on the part of the mother.

It was noted in this study that as mothers' age increases, the prevalence of BF increases which is the existing observed breast feeding trend seen in BF non-LBW infants. According to

literature, reasons associated with increasing breastfeeding with mother's age vary from increased education or marriage. If a mother is married, there's a higher chance of her breastfeeding due to the presence of spousal support. Also, if the mother is educated she can access better the quality of life, and is more likely to BF, either due to having a job that provides maternity breaks or having access to methods of storing breast milk. Age can also determine the quality of healthcare a woman is able to access (Spencer & Grassley, 2013).

From our study, 70% of mothers who breastfed were Caucasian while 26% were African American and 4% were from other races. This might have been due to a majority of the sample population being Caucasian (69 %) as opposed to other races (31 %). Thus a higher percentage of (4,353/7,860; 55%) Caucasian mothers breastfed as compared to (1,585/ 3,261; 49%) African American mothers. Pak-Gorstein, Haq, and Graham (2009) and Phillips, Brett, and Mendola (2011) suggest that the low prevalence of BF in African American population is due to cultural reluctance to breastfeed as well as being unmarried while nursing. White mothers have better support in the workplace and from the community for breastfeeding (Shealy et al., 2005) and thus should have higher breastfeeding prevalence. The findings of this study are consistent with that hypothesis even among LBW infants.

According to Forste et al. (2001), there are restrictions to the types of jobs and health services mothers can access as well as the neighborhoods they live in due to their educational status. This can affect their breastfeeding patterns. Findings in this study support this as more mothers with high school degrees or higher education breastfed than mothers with lower than a high school degree. Mothers with lower than a high school diploma usually work jobs that do not give maternity leaves thus they cannot practice exclusive breastfeeding over the recommended duration. They employ the use of formula feeding as this is a more convenient alternative.

As observed in this study, married women had a higher prevalence of breastfeeding compared to women who were unmarried. The presence of support in the household (Phillips et al., 2011) might be a reason for this. Spousal support plays a key role in encouraging intention to breastfeed and the initiation of breastfeeding. Studies have shown that the type of family unit determines exclusivity and duration of breastfeeding if initiated (CDC, 2013). In situations where support is financial, the partner works while the nursing mother can take a break to breastfeed. LINKAGES Project (2004) reports that the absence of stress promotes breastfeeding. Unmarried women continue to work in order to support themselves and their infants, this strains duration and exclusivity of breastfeeding.

According to this study, among the mothers that breastfed, less proportion was on Medicaid. Woo et al. (2012) suggests that the prevalence of breastfeeding is lower in a population that is of a lesser socioeconomic status, have less favorable employment opportunities, lack support and are beneficiaries of supplementary feeding. The findings of current analysis support this premise and shows that it is equally valid in LBW infants.

Mothers who were nonsmokers had a higher prevalence of breastfeeding than smokers, according to our study. Asides from socio-economics status and all the confounders that influence it, a major reason for this difference in prevalence according to Spencer and Grassley (2013) lies in the intention to breastfeed. Mothers intend to breastfeed when they feel they can adequately provide for their infants. In contrast, a mother who smokes and struggles with quitting feels like she cannot breastfeed for fear of harming the baby. Such mothers tend to use supplemental feeding in place of breast milk (Spencer & Grassley, 2013).

Mothers with a higher number of prenatal visits had a higher prevalence of breastfeeding. This finding is consistent with literature which posits that access to prenatal care improves

breastfeeding intention, initiation, duration and exclusivity (Agrasada et al., 2011). Mothers are taught the benefits of breastfeeding to both themselves and their infants and are primed early on in the pregnancy to bond with their infants. This translates to higher breastfeeding intentions.

Though an association of breastfeeding with access to WIC was statistically significant in univariate LR, it was not significant when all variables were modeled together in multivariate analysis. An explanation for this can be found within the functions of the WIC program itself. It encourages breastfeeding initiation and promotes breastfeeding intention. However, duration and exclusivity become concerns when other variables are considered, e.g., a mother might learn about breastfeeding from the program and be willing to exclusively breastfeed. She however uses formula because she smokes and thinks her milk will be detrimental to her baby. She might be unmarried, be unemployed, or working at a job without maternity breaks. Hence, her decision to formula feed becomes ideal as even the formula itself is provided by the WIC program.

The association of previous pregnancy outcomes with breastfeeding was significant in this analysis. This means that the number of previous live births living or dead affect a mother's intention to breastfeed a LBW infant. However, when considering other variables, among mothers who experienced a previous live birth now dead did not have a significant association with breastfeeding a LBW baby ($p=0.643$).

Findings from our study show that mothers that do not have gestational diabetes had a lower prevalence of breastfeeding to those who had it. According to Stuebe and Rich-Edwards (2009), breastfeeding helps stabilize glucose levels and improves lipid metabolism, therefore mothers with gestational diabetes might be encouraged to breastfeed as a means of treatment. When considering other variables, i.e. in the multivariate regression, gestational diabetes did not show a significant association with breastfeeding ($p=0.744$). This sample population had a lower

prevalence of gestational diabetes (7% and 8% in non-BF, and BF mothers) as compared to a 2014 national average of 9.2% (DeSisto, Kim, & Sharma, 2014). One of the reasons could be that diabetic mothers have large size births, and the current sample analysis was restricted to LBW infants

This study also showed that mothers who did not have preterm births had a higher prevalence of breastfeeding than mothers who did. This was unexpected as literature suggests that mothers tend to repeat feeding practices with their offspring. Thus, when advised to breastfeed a LBW infant, mothers tend to repeat should they have such infants again. However, in multivariate analysis, having previous preterm births is a protective factor for breastfeeding. This is consistent with literature.

Infants on assisted ventilation had a lower prevalence of breastfeeding. This was expected and is consistent with literature. Infants who were not admitted into the NICU however had a lower prevalence of breastfeeding. This means that breastfeeding must have been used as an intervention technique with such infants hence its higher prevalence. Neither 'Assisted ventilation >6 hours' or 'Admission to NICU' were protective factors for breastfeeding when compared with other factors in the multivariate regression.

Limitations

Our study was not devoid of limitations. The sample size was restricted to LBW low birth weight infants and the data for breastfeeding only covers breastfeeding initiation and does not include duration or exclusivity of breastfeeding data. While the study's findings are applicable to LBW infants in Ohio, it isn't guaranteed that they can be generalized to other states. We were also unable to analyze ethnicity of the baby as a variable due to a large number of unknown data for this variable.

Conclusion

Maternal demographic characteristics have a statistically significant association with breastfeeding in LBW infants. This study has shown that LBW mothers breastfeed at a lower rate than non-LBW mothers. Given that breastfeeding is critical for these infants, especially in emergencies, the public health community should help promote breastfeeding within this population. This study also shows that the protective factors for breastfeeding a low birth weight infant are the same as those for infants of other weight categories. Thus, the same conditions that favor breastfeeding of a non-LBW infant apply when low birth weight infants are considered

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Appendix A – IRB Approval

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DATE: May 22, 2015

TO: Raymond Okeke, PI, Student
Community Health
Naila Khalil, Ph.D., Faculty Advisor

FROM: Jodi Blacklidge
Program Facilitator, WSU-IRB

SUBJECT: SC# 5881
'The Effects of Socio-Demographic Low Birth Weight Risk Factors on Breastfeeding Within the Low Birth Weight Population of Montgomery County in 2012'

The above-listed study has been determined to meet Federal exemption criteria 45 CFR 46.101(b)(4). **Please note that any material change in the protocol must be reviewed by the IRB, as the project may no longer be exempt.** As a reminder, all investigators must maintain current CITI training certification.

If your research is being conducted at a facility other than Wright State University, you must have approval from that facility in order to proceed.

This action will be reported to the Full Board at their next scheduled meeting.

If you have any questions or require additional information, please contact me at 775-3974.

Best wishes for a successful study.

Appendix B – Public Health Competencies Used in CE

Tier 1 Core Public Health Competencies

Domain #1: Analytic/Assessment Skills
Describes factors affecting the health of a community (e.g., equity, income, education, environment)
Identifies quantitative and qualitative data and information (e.g., vital statistics, electronic health records, transportation patterns, unemployment rates, community input, health equity impact assessments) that can be used for assessing the health of a community
Applies ethical principles in accessing, collecting, analyzing, using, maintaining, and disseminating data and information
Uses information technology in accessing, collecting, analyzing, using, maintaining, and disseminating data and information
Selects valid and reliable data
Identifies gaps in data
Collects valid and reliable quantitative and qualitative data
Describes public health applications of quantitative and qualitative data
Uses quantitative and qualitative data
Contributes to assessments of community health status and factors influencing health in a community (e.g., quality, availability, accessibility, and use of health services; access to affordable housing)
Explains how community health assessments use information about health status, factors influencing health, and assets and resources
Domain #2: Policy Development/Program Planning Skills
Contributes to state/Tribal/community health improvement planning (e.g., providing data to supplement community health assessments, communicating observations from work in the field)
Contributes to development of program goals and objectives
Describes organizational strategic plan (e.g., includes measurable objectives and targets; relationship to community health improvement plan, workforce development plan, quality improvement plan, and other plans)
Identifies current trends (e.g., health, fiscal, social, political, environmental) affecting the health of a community
Gathers information that can inform options for policies, programs, and services (e.g., secondhand smoking policies, data use policies, HR policies, immunization programs, food safety programs
Domain #3: Communication Skills
Communicates in writing and orally with linguistic and cultural proficiency (e.g., using age-appropriate materials, incorporating images)
Conveys data and information to professionals and the public using a variety of approaches (e.g., reports, presentations, email, letters)
Facilitates communication among individuals, groups, and organizations
Domain #4: Cultural Competency Skills
Describes the concept of diversity as it applies to individuals and populations (e.g., language, culture, values, socioeconomic status, geography, education, race, gender, age, ethnicity, sexual orientation, profession, religious affiliation, mental and physical abilities, historical experiences)
Describes the diversity of individuals and populations in a community
Describes the ways diversity may influence policies, programs, services, and the health of a community
Recognizes the contribution of diverse perspectives in developing, implementing, and evaluating policies, programs, and services that affect the health of a community
Describes the effects of policies, programs, and services on different populations in a community
Domain #5: Community Dimensions of Practice Skills
Describes the programs and services provided by governmental and non-governmental organizations to improve the health of a community
Recognizes relationships that are affecting health in a community (e.g., relationships among health departments, hospitals, community health centers, primary care providers, schools, community-based organizations, and other types of organizations)
Suggests relationships that may be needed to improve health in a community
Supports relationships that improve health in a community
Collaborates with community partners to improve health in a community (e.g., participates in committees, shares data and information, connects people to resources)
Provides input for developing, implementing, evaluating, and improving policies, programs, and services

Domain #6:Public Health Sciences Skills
Describes how public health sciences (e.g., biostatistics, epidemiology, environmental health sciences, health services administration, social and behavioral sciences, and public health informatics) are used in the delivery of the 10 Essential Public Health Services
Retrieves evidence (e.g., research findings, case reports, community surveys) from print and electronic sources (e.g., PubMed, Journal of Public Health Management and Practice, Morbidity and Mortality Weekly Report, The World Health Report) to support decision making
Recognizes limitations of evidence (e.g., validity, reliability, sample size, bias, generalizability)
Describes evidence used in developing, implementing, evaluating, and improving policies, programs, and services

Domain #8: Leadership and Systems Thinking Skills
Describes the ways public health, health care, and other organizations can work together or individually to impact the health of a community
Contributes to development of a vision for a healthy community (e.g., emphasis on prevention, health equity for all, excellence and innovation)
Describes needs for professional development (e.g., training, mentoring, peer advising, coaching)
Describes ways to improve individual and program performance

Concentration Specific Competencies

Emergency Preparedness:
Communicate and manage information related to an emergency
Use research and/or evaluation science methodologies and instruments to collect, analyze and interpret quantitative and qualitative data
Employ ethical principles in the practice of public health emergency preparedness