Cost Benefits of Breastfeeding and the Use of Human Milk
Breastfeeding and human milk are the normative standards for infant feeding and nutrition. Given the documented short- and long-term medical and neurodevelopmental advantages of breastfeeding, infant nutrition should be considered a public health issue and not only a lifestyle choice.

American Academy of Pediatrics

The Affordable Care Act – the health insurance reform legislation passed by Congress and signed into law by President Obama on March 23, 2010 – helps make prevention affordable and accessible for all Americans by requiring health plans to cover preventive services and by eliminating cost sharing. Preventive services that have strong scientific evidence of their health benefits must be covered and plans can no longer charge a patient a copayment, coinsurance or deductible for these services when they are delivered by a network provider…[HHS Guidelines for Health Insurance Coverage include]…Comprehensive lactation support and counseling, by a trained provider during pregnancy and/or in the postpartum period, and costs for renting breastfeeding equipment.

Women’s Preventive Services: Required Health Plan Coverage Guidelines

Introduction

The economics of breastfeeding is an exceptionally complex matrix of issues and perspectives. Human milk feedings -- associated with reduced healthcare costs -- have been known for many years to be financially beneficial to families, businesses, the environment and our national economy. These benefits are juxtaposed with health, financial and environmental concerns related to the use of infant formulas.

Above are two introductory statements; the first comes from the 2012 American Academy of Pediatrics (AAP) revised policy statement, “Breastfeeding and the Use of Human Milk.” This quote by the AAP calls attention to national public health benefits of human milk feedings. Compared to the previous 2005 AAP Policy Statement, the 2012 document summarizes infant and maternal benefits of breastfeeding, endorses the WHO/UNICEF Ten Steps to Successful Breastfeeding and discusses the economic benefits for employers and families of mother/baby friendly workplaces.

The second statement is from the US Department of Health and Human Service’s Health Resources and Services Administration website which explains new preventive care services under the Affordable Care Act and highlights the importance of strong scientific evidence when referring to preventative interventions. As of August 1, 2012, these services are being phased into health insurance guidelines along with other women’s care benefits. These changes have the potential to improve health outcomes in women and their infants.

At this point in time, we see increased interest in the economics of breastfeeding and lactation along with a rising rate of relevant publications. We should remember that economic perspectives originate in a variety of sectors, which then define the variables involved in calculations of savings and costs. On one hand, economic analyses from the perspective of health care insurers focus on direct medical costs of health care -- physician fees, hospital fees and costs to insurers. On the other hand, analyses from a societal perspective include these as well as savings and costs to families, employers, and governments.
Health benefits of breastfeeding, which are associated with economic benefits, include, but are not limited to a reduction in an infant’s risk of:

- Otitis media
- Gastrointestinal tract infections
- Respiratory tract infections
- Atopic dermatitis
- Childhood asthma
- Childhood leukemia
- Diabetes type I
- Obesity
- Necrotizing enterocolitis (NEC)
- Sudden Infant Death Syndrome (SIDS)\(^ {1,7,8}\)

Maternal health benefits of breastfeeding and lactation, which are associated with economic benefits, include, but are not limited to a reduction in a woman’s risk of:

- Breast and ovarian cancers
- Osteoporosis
- Diabetes type II
- Cardiovascular disease
- Rheumatoid arthritis\(^ {1,4,8}\)

Research suggests that for pump-dependent mothers of NICU infants, financial support for hospital-grade breast pump equipment is cost effective when compared to the cost of preterm ready-to-feed formula.

Cost analyses at the national and state levels demonstrate significant cost savings when breastfeeding initiation and duration rates are improved.

Optimal health care of infants, particularly preterm or hospitalized infants, includes human milk feedings. Consistently, improved clinical outcomes translate into economic benefits for hospitals, parents and society.
Each point of view brings different costs and benefits to the discussion of breastfeeding economics. With this broader perspective in mind, we will look at several issues surrounding the financial value of human milk. Our discussion is organized around three cost analyses examining different economic aspects of the use of human milk.

- The first article we will examine, published by Bartick and Reinhold in 2010, is the primary cost analysis cited in the “Economic Benefits” section of the revised AAP breastfeeding policy statement. The question of human milk value is framed in this manner: given the benefits of breastfeeding, what is the financial burden of not breastfeeding? Commentary after a summary of the article will focus on many of the direct and indirect costs associated with ten health conditions affected by infant feeding choices.

- The second article by Jegier and associates (2010) estimates of the cost of initial human milk production and expression compared to the costs of formula and donor milk for preterm infants. Maternal costs, both equipment and time, are primary factors in the equation.

- The last article by Ma, Brewer-Asling and Magnus takes Bartick and Reinhold’s cost analysis to the state level. This particular article calculates cost savings of optimal breastfeeding for the state Louisiana. By taking the discussion to the state level, we are reminded of the levels of commitment required for health care prevention strategies to work.

Economic investigations of the benefits of breastfeeding originally evaluated the financial impact of individual infant disease states. In the last few decades the science of breastfeeding and human milk feeding has rapidly expanded with discovery of benefits for both mother and infant extending years if not decades beyond the period of lactation. Thus, economic analyses and scientific findings have their own symbiotic relationship, growing and developing in association with one another. Both types of research inform our clinical practice decisions to support and promote lactating mothers and infants.

All in all, our goal in this paper is to foster an appreciation for the economic benefit of human milk feedings while illuminating some of the obvious, and not so obvious, factors in this multidimensional equation.

Key Points

Individuals and organizations attentive to health care issues of women and infants -- the US Surgeon General, American Academy of Pediatrics (AAP), the Centers for Disease Control (CDC), the Joint Commission – unanimously agree breastfeeding and human milk feeds are the superior form of infant nutrition and nurture.1-4

Health benefits associated with breastfeeding positively affect short and long-term health care and societal costs.

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Background

A previous cost analysis published in 2001 by Weimer of the USDA's Economic Research Service estimated a cost savings in the US of $3.6 billion if exclusive breastfeeding rates were 75% initiation and 50% duration at 6 months. Unlike previous studies, Weimer's analysis factored in cost savings from preventing disease, specifically: otitis media, gastroenteritis and NEC.

In 2007 Stanley Ip and his associates at the Agency for Healthcare Research and Quality (AHRQ) identified seven additional diseases reduced by breastfeeding. Their complete list of diseases included the following:

- Otitis media
- Gastroenteritis
- Necrotizing enterocolitis
- Lower respiratory tract infections
- Atopic dermatitis
- Childhood asthma
- Childhood leukemia
- Type I diabetes
- Obesity
- SIDS.

This study by Bartick and Reinhold, summarized below, evaluated the cost benefits conferred by breastfeeding in reducing the risk of each of these ten diseases. The costs of premature deaths from NEC, SIDS, lower respiratory tract infections, asthma, leukemia and type I diabetes were also factored into the cost analysis.

The purpose of Bartick and Reinhold's study was to estimate US cost savings in two hypothetical scenarios:

- If 80% of families breastfed their infants exclusively for 6 months.
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Cost savings were estimated based on the incidence of certain disease conditions and the estimated odds ratio of the disease if an infant is breastfed. The authors then calculated costs of direct and indirect care, hospitalizations, premature death and parental leave to care for a sick child.

Bartick and Reinhold discuss each disease separately along with odds ratio, data, sources and formulas used to calculate the cost of not breastfeeding. All costs were in 2007 US dollars.

Results

Cost analyses suggested, if 90% of families in the US breastfeed exclusively for 6 months, the US could save $13 billion/year and 911 deaths could be prevented.

If 80% of families in the US breastfeed exclusively for 6 months, the US could save $10.5 billion/year and 741 deaths could be prevented.

All disease states considered in the analysis were associated with cost savings if infants were breastfed (or received human milk). Excluding the costs of premature deaths, national savings of over $500,000,000 per disease were associated with otitis media, atopic dermatitis and childhood obesity if 90% of infants were exclusively breastfed for 6 months.

The largest cost savings were for premature deaths, in descending order, from SIDS, NEC, lower respiratory tract infections, asthma, leukemia and type I diabetes. The authors used Weimer's value of a statistical life adjusted to 2007 dollars, or $10.56 million per death.

Conclusions

Increasing breastfeeding initiation, exclusivity and duration rates could save the United States billions of dollars in healthcare costs, parental lost wages and economic losses from preventable infant deaths.

The authors concluded, "Actions to improve breastfeeding…including creation of a national infrastructure to support breastfeeding, could be cost effective" (Pe1054).

Commentary

While human milk feedings have been associated with improved infant and maternal outcomes for centuries, economic analyses of breastfeeding have slowly emerged in the last 50 years. Early studies evaluated fairly modest topics, such as the cost of infant formula verses the cost of an enhanced maternal diet for breastfeeding. Later, in the 1990s, rising health care costs and the advent of managed care directed researchers to compare more complex questions such as costs of health care over the first year of life for breast and formula fed infants.

By 2001, economic analyses included multiple disease states influenced by infant feeding type. Weimer's analysis, which preceded Bartick and Reinhold's, looked at health care costs in the first year of life associated with otitis media, gastroenteritis and NEC. Unfortunately, Weimer's analysis was based on breastfeeding data derived from the formula industry, which did not distinguish between partial and full mothers’ milk feeds. His study inferred these rates were exclusive breastfeeding rates but instead, they were rates of any breastfeeding. His error highlights, in part, the lack of accurate, timely breastfeeding data prior to national yearly surveys by Federal agencies. It also illustrates the difficulty of interpreting breastfeeding data. Even now, multiple definitions of breastfeeding – exclusive, partial, minimal – are problematic for epidemiologists and economists asking very basic questions related to the incidence and duration of breastfeeding.

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Bartick and Reinhold evaluated the economic impact of more disease states than any previous authors. Like Weimer’s study in 2001, their analysis also considered the cost of premature death, that is, the cost of a person dying early in life as a result of preventable illness. Bartick and Reinhold used Weimer’s cost-of-death approach and estimate, adjusted to 2007 dollars. However, while Weimer considered only premature death from necrotizing enterocolitis (NEC), Bartick and Reinhold calculated premature death costs related to multiple diseases: NEC, SIDS, lower respiratory tract infections, asthma, leukemia and type I diabetes. These costs are separate from the health care costs of treating these diseases.

In Bartick and Reinhold’s study, each death was valued at $10,560,000. In both of Bartick and Reinhold’s cost estimates (exclusive breastfeeding at 90% and 80%), premature deaths account for approximately 74% of the overall savings. This figure, $10,560,000, is called the value of a statistical life. These types of calculations are economic tools used in cost effectiveness studies to provide a structure for analysts evaluating public health programs. These estimates do not imply the worth of a life nor do they explicitly acknowledge parental suffering that comes with the death of an infant or young child. However, understanding of these calculations gives us a better understanding of cost analysis results.

Bartick and Reinhold included both direct and indirect costs related to each of the ten disease states considered in their analysis. Direct costs included inpatient and outpatient care and hospital fees. Specifically mentioned indirect costs included loss of parental wages and unidentified “personal expenses.” Other family indirect costs not identified in this study could have included costs of childcare for other children when parents are away from home, transportation costs to and from hospitals and clinics, decreased quality of life associated with permanent consequences of illnesses, and costs associated with breastmilk production. Each of these indirect costs is a burden of the family rather than the healthcare system, shifting the focus to more human aspects of human milk production. In the next section, we will examine a study specific to milk production costs for hospitalized preterm infants.


Background

Although mothers’ own milk is the preferred nutrition for preterm infants, mothers often encounter non-reimbursed economic burdens related to the cost of milk expression. If pump-dependent mothers are not able to secure hospital-grade electric breast pumps and collection kits, they risk inadequate milk production, which in turn, may lead to infant supplementation with human donor milk and/or preterm infant formula.

The purpose of this study was to determine the initial cost of producing 100 mL of maternal milk and to compare this amount to the cost of alternatives, donor human milk and preterm infant formulas, used in NICU settings.

This research is a secondary analysis of data from 111 NICU mothers who maintained pumping records, documenting expressed milk volumes and the time of pumping sessions during the first month postpartum. A total of 13,273 pumping sessions were considered in the analysis.

Three variables related to milk expression were considered in the cost analysis: the cost of breast pump rentals, breast pump collection kits and maternal pumping time. This last variable was denoted “maternal opportunity cost.”
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Results: Cost Estimates of Variables

Breast pump costs (rental and kit) were calculated based on two formulas: actual hospital charges for these items and published market values. Estimated charges for these items were as follows:

- **Breast pump rental fee for one month**
  - Hospital charge: $35
  - Published market price: average $69.92; range $49.02 - $90.92

- **Breast pump collection kit cost (one time charge)**
  - Hospital charge: $57
  - Published market price: average $50.08; range $40.94 - $59.22

- **Combined one month pump rental and collection kit costs**
  - Hospital charge: $92
  - Published market price: average $120.00; range $89.96 - $150.04.

Maternal opportunity costs, defined as the monetary value of mothers’ time spent breast pumping, were calculated by multiplying maternal hourly wage by the total hours spent pumping. The mean amount of time spent pumping was 98.7 minutes a day (SD 38.6 minutes; range 0-295 minutes).

Maternal opportunity costs involved in obtaining 100 mL of milk were calculated 2 ways:

- By multiplying the average time it took to pump 100 mL by the federal minimum hourly wage in 2008 ($6.55/hour). An estimate extrapolated from the study was an average of $2.24 per 100 mL of milk.

- By calculating the average time it took to pump 100 mL by a mother’s predicted hourly wage based on maternal characteristics and geographic location (referred to as “imputed wage”). This formula takes into account variations in workforce wages based on factors such as education and age. An estimate extrapolated from the study was an average of $4.64 per 100 mL of milk.

Lastly, hospital costs of alternative milks were calculated and compared to the cost of providing mothers’ own milk. Cost estimates included sterile water for dilution when indicated.

- The average cost of 100 mL of donor milk: $13.59
- 100 mL of preterm Infant formula (20-22 Cal/ounce)
  - Regular powdered formula: $0.63
  - Specialty formulas: $0.89
  - Ready-to-feed preterm infant formula: $2.97

Results: Cost Estimates for 100 mL of Mothers’ Own Milk

The authors calculated the average cost of 100 mL of mother’s milk two ways – with and without maternal opportunity costs. The cost of maternal time devoted to pumping accounted for the greatest variation in the expense of milk.

- **Without maternal opportunity cost**, the estimate for 100 mL mothers’ own milk was
  - $0.95 if hospital pump rental and pump kit charges were used
  - $1.24 if the average market values were used.

- **With maternal opportunity cost**, the estimate for 100 mL mothers’ own milk was
  - $3.19 if minimum wage and hospital costs for rental and kit were used
  - $3.48 if minimum wage and average market prices were used
  - $5.58 if imputed wage and average market prices were used.

Conclusions

Regardless of which pump rental and kit costs were used, if maternal opportunity costs are not factored into the estimate, the cost of 100 mL of mothers’ milk is less than the cost of preterm ready-to-feed formula.

Using either formula calculation of maternal opportunity cost (minimum wage or imputed cost) and the highest prices for pump rental and kit, the total cost of a mother’s producing 100 mL of milk for her NICU infant was less than the cost of 100 mL of donor milk.

As maternal milk supply increases over the first few weeks after delivery, the cost of human milk production declines; mothers are able to produce more milk in less time and the pump kit is an initial cost, not a recurrent cost. Therefore, cost estimates for mothers’ own milk in subsequent months are likely to be lower.

The authors note hospitals that supply breast pumps and kits to pump-dependent mothers have higher rates of human milk feedings. Removing cost barriers to milk production – reimbursing for or providing breast pumps and kits -- could be cost effective for hospitals and health payers. These conclusions are based on comparisons of the cost of different preterm infant feeds and do not consider the ability of human milk to decrease infant morbidities and mortality.
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Commentary

Jegier and associates call attention to the almost invisible contribution of breast pumping women to their infants’ health. By evaluating maternal opportunity costs — the monetary value of mothers’ time spent breast pumping — Jegier et al directly address an important aspect of mothers’ commitment to the health and well being of their infants. In this study, when maternal pumping time was factored into the cost equation, the costs of producing 100 mL of mother’s milk were higher than the cost of 100 mL of any infant formula but lower than the cost of the same volume of donor milk.

Studies consistently demonstrate use of human milk, especially mothers’ own milk, improves infant outcomes and reduces costs in a dose response manner.1,19-21 Some benefits — such as decreased gut permeability and reduction in NEC — occur with relatively short but early use of human milk feedings.19,22 Therefore, supporting even short term milk production in the NICU is financially beneficial. Human milk also has dose-response benefits associated with duration of mothers’ milk feedings. Jegier and colleagues considered projected costs for pumping beyond the first month, concluding support for breast pumping over the duration of lactation makes sound economic sense.

This study in particular demonstrates that supporting the costs of pump rental and collection kits is economically beneficial to hospitals when compared to paying for preterm ready-made infant formulas or donor milk. However, study calculations assumed the outcomes of human milk and formula feedings are the same. If this study had included the costs of treating preterm illnesses associated with formula feeds, the cost benefit of providing breast pumps would probably have been much greater.


Background

The authors of this study reported Louisiana has the lowest breastfeeding rate in the nation. Comparing Louisiana’s 2006 actual breastfeeding rates (from the CDC 2009 Report Card) to the Healthy People 2020 goals, they clearly demonstrated the gap between national ideals and their state’s reality.

<table>
<thead>
<tr>
<th>Louisiana rates (%)</th>
<th>Healthy People 2020 (%)</th>
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<tbody>
<tr>
<td>Ever Breastfed</td>
<td>49.1</td>
</tr>
<tr>
<td>Any Breastfeeding at 6 months</td>
<td>20.7</td>
</tr>
<tr>
<td>Any Breastfeeding at 12 months</td>
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<tr>
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Using Bartick and Reinhold’s cost analysis framework and formulas, they calculated cost savings and numbers of preventable infant deaths if 90% and 80% of Louisiana’s families exclusively breastfed for at least 6 months. They also calculated the cost savings if Louisiana could meet the 2020 Healthy People Breastfeeding Goals. Unlike Bartick and Reinhold, these authors considered the economic impact of four, rather than ten, of the disease states affected by breastfeeding.

The disease states considered in this study were lower respiratory tract infections, gastroenteritis, NEC and SIDS.

Results

A total of $216,103,368 could be saved and 18 infant deaths prevented if 90% of newborns in Louisiana were exclusively breastfed for the first 6 months of life. A total of $186,371,125 could be saved and 16 infant deaths prevented if 80% of newborns in Louisiana were exclusively breastfed for the first 6 months of life.

Using Healthy People 2020 Goals, which are less ambitious that the Bartick and Reinhold goals, they estimated a savings of $99,972,477 and prevention of 8.5 infant deaths.

Conclusions

The authors concluded, “Healthy People 2020 goals and beyond would yield significant cost savings to Louisiana. Other US states can use the presented framework to demonstrate cost savings associated with breastfeeding promotion and support interventions in their respective states.” (1st page) In the discussion section of this article, the authors discuss efforts necessary to increase breastfeeding rates. Beyond public health education related to the benefits of breastfeeding, documented barriers to breastfeeding must also be addressed. Some suggested interventions included comprehensive lactation support and counseling, improved maternity care practices and workplace accommodations for lactating women.
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This study in particular demonstrates that supporting the costs of pump rental and collection kits is economically beneficial to hospitals when compared to paying for preterm ready-made infant formulas or donor milk. However, study calculations assumed the outcomes of human milk and formula feedings are the same. If this study had included the costs of treating preterm illnesses associated with formula feeds, the cost benefit of providing breast pumps would probably have been much greater.


Background

The authors of this study reported Louisiana has the lowest breastfeeding rate in the nation. Comparing Louisiana’s 2006 actual breastfeeding rates (from the CDC 2009 Report Card) to the Healthy People 2020 goals, they clearly demonstrated the gap between national ideals and their state’s reality.

<table>
<thead>
<tr>
<th></th>
<th>Louisiana rates (%)</th>
<th>Healthy People 2020 (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any Breastfeeding</td>
<td>49.1</td>
<td>81.0</td>
</tr>
<tr>
<td>Any Breastfeeding at 6 months</td>
<td>20.7</td>
<td>60.6</td>
</tr>
<tr>
<td>Any Breastfeeding at 12 months</td>
<td>9.9</td>
<td>34.1</td>
</tr>
<tr>
<td>Exclusive at 6 months</td>
<td>5.0</td>
<td>23.7</td>
</tr>
</tbody>
</table>

Using Bartick and Reinhold’s cost analysis framework and formulas, they calculated cost savings and numbers of preventable infant deaths if 90% and 80% of Louisiana’s families exclusively breastfed for at least 6 months. They also calculated the cost savings if Louisiana could meet the 2020 Healthy People Breastfeeding Goals. Unlike Bartick and Reinhold, these authors considered the economic impact of four, rather than ten, of the disease states affected by breastfeeding.

The disease states considered in this study were lower respiratory tract infections, gastroenteritis, NEC and SIDS.

Results

A total of $216,103,368 could be saved and 18 infant deaths prevented if 90% of newborns in Louisiana were exclusively breastfed for the first 6 months of life. A total of $186,371,125 could be saved and 16 infant deaths prevented if 80% of newborns in Louisiana were exclusively breastfed for the first 6 months of life.

Using Healthy People 2020 Goals, which are less ambitious that the Bartick and Reinhold goals, they estimated a savings of $99,972,477 and prevention of 8.5 infant deaths.

Conclusions

The authors concluded, “Healthy People 2020 goals and beyond would yield significant cost savings to Louisiana. Other US states can use the presented framework to demonstrate cost savings associated with breastfeeding promotion and support interventions in their respective states.” (1st page) In the discussion section of this article, the authors discuss efforts necessary to increase breastfeeding rates. Beyond public health education related to the benefits of breastfeeding, documented barriers to breastfeeding must also be addressed. Some suggested interventions included comprehensive lactation support and counseling, improved maternity care practices and workplace accommodations for lactating women.
Commentary

This research by Ma and associates reminds us each state has different breastfeeding rates and cost burdens related to suboptimal infant feeding. Just as important, the benefits of improving breastfeeding initiation and duration will vary from state to state, with those ranked lowest perhaps having the most to gain by increasing breastfeeding support.

Data from the CDC including mPINC scores and Breastfeeding Report Cards have helped states get a better understanding of how they compare to national averages, where they fall within national rankings and what evidence-based breastfeeding practices need to be improved. Concurrently, the US has seen significant growth in national programs to improve lactation care in healthcare facilities. For example, the Best-Fed Beginnings (BFB) project, led by the National Initiative for Children’s Healthcare Quality with support from the CDC, is assisting 90 US hospitals to achieve Baby-Friendly® status within a 22-month time frame. Baby-Friendly® hospitals must consistently and successfully assist mothers to breastfeed as well as show mothers how to maintain lactation if they are separated from their infants. Although the pathway to certification is well articulated, the process of achieving Baby-Friendly® status requires each hospital to tailor its strategies to its unique patient population and resources.

Concluding Remarks

Researchers continue to expand and evaluate our knowledge of costs and savings related to human milk. In 2011 Bartick calculated savings and expenses of pediatric health care, formula, maternal food and paid leave if 90% of mothers breastfed exclusively for 6 months with continued breastfeeding for at least the first year of their infants’ lives. She also considered costs associated with lactation support and increased births in Baby-Friendly® birthing facilities. Even with these additional costs, her analysis indicates breastfeeding and human milk feedings are cost effective.

Optimal health care of infants, particularly preterm or hospitalized infants, includes human milk feedings. In this discussion we have considered multiple perspectives related to the economic benefits of human milk and human milk products. Consistently, improved clinical outcomes translate into economic benefits for hospitals, parents and society. In her final comments in “The Economic Ramifications of Improving Maternity Practices,” Melissa Bartick eloquently states:

In conclusion, there is much we can do in the United States to improve breastfeeding. Some of it needs to come from legislation, some from regulation and policy, and some from providing incentives for best practices in the hospital setting. We need to build a national infrastructure to get this done. That means funding and collaboration across government agencies. To accomplish this task, we must share the vision that breastfeeding has real economic and social value and that women play a key role in our nation’s economy and health. (p.245)
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References


Cost Benefits of Breastfeeding and the Use of Human Milk