



NATIONAL CENTER *for* CHILDREN & FAMILIES
ADVANCING POLICY, EDUCATION, & DEVELOPMENT

TEACHERS COLLEGE COLUMBIA UNIVERSITY

RESEARCH BRIEF

**Associations Between Feeding Behaviors During Infancy
and Child Illness at Two Years**

September 2008

National and international recommendations for the best methods of infant feeding generally favor exclusive breastfeeding in the first six months of life (see box, p. 2). Common health benefits associated with breastfeeding initiation and duration include protection against childhood infections and disease. Despite the known benefits of breastfeeding, many infants also receive formula and solid foods before the recommended time. However, it remains unclear how specific food combinations, particularly those which include solid foods, are associated with child health.

Research Objective and Methodology

Researchers at the National Center for Children and Families analyzed three common infant feeding practices (breastfeeding, formula feeding and solid foods) in an attempt to explore how various combinations of these infant feeding practices are associated with illnesses such as asthma, respiratory infections, gastrointestinal infections and ear infections in toddlerhood. Based on a large sample of U. S. children, the following research questions were addressed:

1. What percentage of children were introduced breast milk, infant formula, and finger/solid food during the first six months of life?
2. In what combinations were these foods most commonly fed in the first six months?
3. Are feeding combinations associated with child illness (the occurrence of asthma, respiratory infections, gastrointestinal infection, ear infections) in the first two years of life?

We sought to answer these questions using the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), sponsored by the U.S. Department of Education, National Center for Education Statistics. The ECLS-B features a nationally representative sample of children born in the United States during 2001 who were followed from nine months of age through kindergarten. The analytic sub sample included approximately 7,900 children. Data from the 9-month and 2-year waves were analyzed using frequency statistics and logistic regression. Models examining the associations between feeding combinations and child illness controlled for child and family characteristics as well as pre- and post-natal factors.



RESEARCH TEAM

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The goal of our research was to explore associations between various combinations of infant feeding practices and child illness.

Current National and International Feeding Recommendations

The American Association of Pediatrics (AAP) has established recommendations for feeding newborns and infants. Visit <http://www.aap.org> for more information.

- The AAP recommends exclusive breastfeeding for the first six months of life.
- Although infant formula is not as rich in nutrients and not as beneficial in terms of immunity to infection as breastfeeding, children who are not breastfed or are being weaned before six months of age should be fed iron-fortified formula.
- The AAP recommends not feeding children any form of cow's milk during the first year of life (as it is low in iron and often difficult for infants to digest) and if used in the second year of life limiting it to whole (as opposed to low-fat or fat-free) cow's milk.
- The AAP recommends the introduction of solid foods (e.g., jarred baby food) and finger foods (e.g., biscuits or cheerios) beginning at six months of age.

The United Nations Children's Fund (UNICEF) and the World Health Organization (WHO) also recommend exclusive breastfeeding for six months before complementary foods are introduced.

Results from Analyses

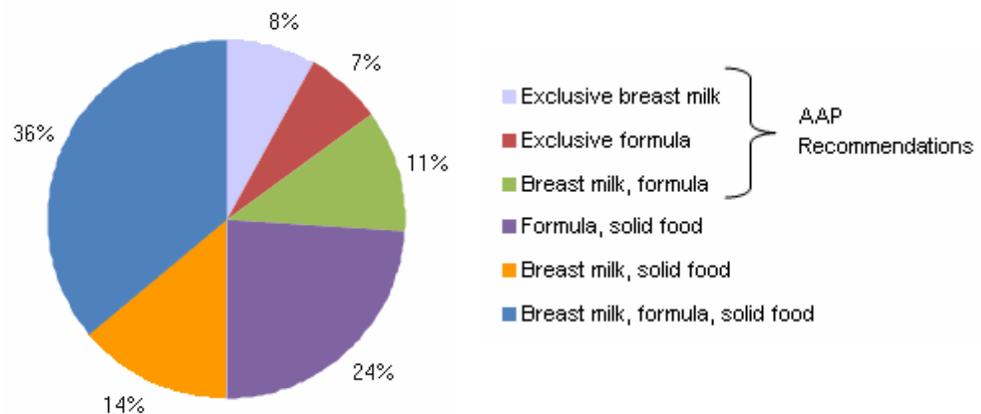
Question One

What percentage of children were introduced breast milk, infant formula, and finger/ solid food during the first six months of life?

Nearly 70% of the children were breastfed during the first six months, with an average duration of almost four months. During this same period of time, 78% of children were fed formula, generally starting around two months of age. In terms of non-liquid foods, 74% of children were fed solid food (e.g., babyfood) and 15% were fed finger food (e.g., cheerios) during the first six months, with an average initiation age of four and seven months, respectively.

Question Two

In what combinations were these foods most commonly fed in the first six months?



A combination of all three foods (breast milk, formula, and finger/solid food¹) was the most common combination (36%). The next most common combination was formula and finger/solid food (24%). Almost one-half of children were fed some combination of foods. The AAP's recommendation of exclusive breastfeeding for six months was observed in only 8% of cases.

¹ Finger and solid food were considered together under the "solid food" category.

Question Three

Are feeding combinations associated with child illness (the occurrence of asthma, respiratory infections, gastrointestinal infection, ear infections) in the first two years of life?

Children were grouped according to their feeding combinations and then compared to the group who was fed breast milk exclusively for six months in each of four logistic regression models.

Asthma: After controlling for child and family background characteristics, children who were exclusively fed breast milk were no less likely than the other feeding groups to have had asthma.

Respiratory infection: After controlling for child and family background characteristics, the formula-only group, the formula and solid food group, the breast milk and solid food group, and the breast milk, formula, and solid food group all had greater odds (54%, 59%, 46%, and 63%, respectively) than the exclusive breast milk group of having had a respiratory infection.

Gastrointestinal infection: After controlling for child and family background characteristics, children who were exclusively fed breast milk were no less likely than the other feeding groups to have had a gastrointestinal infection.

Ear infection: After controlling for child and family background characteristics, the formula-only group, the formula and solid food group, the breast milk and solid food group, and the breast milk, formula, and solid food group all had greater odds (55%, 46%, 40%, and 51%, respectively) than the exclusive breast milk group of having had an ear infection.

Odds ratios (OR) from logistic regressions predicting child illnesses at age two from infant feeding combinations during the first six months of life

Feeding groups (ref: breast milk only)	Asthma	Respiratory Infection	Gastrointestinal Infection	Ear Infection
	OR	OR	OR	OR
Formula only	1.11	1.54*	0.99	1.55**
Formula, solid food	1.35	1.59**	0.82	1.46**
Solid food, breast milk	0.88	1.46*	0.96	1.4*
Formula, breast milk	0.92	1.39	0.99	1.1
Formula, solid food, breast milk	1.24	1.63**	0.28	1.51**

Note: ***p<.001, **p<.01, *p<.05; N = 7900; W2R0 weight applied adjusted for complex sampling design. Analytic sample included children who were younger than 23.4 months, whose parent respondent was the bio mother, had no long term disability, was not fed cows milk before 6 months, had a parent interview at the 9 mo and 2 yr waves, and had complete information on childhood illness variables; Child characteristics (child age at 9-month and 2-year waves, race, multiple birth status, birth weight, and sex), family demographics (number of children in household younger than 18 years, maternal age at 9 month assessment, maternal education, maternal birth place, maternal marital status at child's birth, WIC participation during pregnancy, maternal work status prior to pregnancy, maternal health status, maternal BMI, and maternal depression), child health (prenatal care adequacy and prenatal risk), home environment (non-parental child care before 6 months of age and household food security), and mother-child relationship (mother child NCATS interaction score) are included in all models as controls.

Source: U.S. Department of Education, National Center for Education Statistics, Early Childhood Longitudinal Study-Birth Cohort, 2-Year Restricted Data File.



Children who were in any of the feeding groups, with the exception of the breast milk and formula group, had significantly higher odds of having had respiratory and ear infections by two years than children in the breast milk only group.



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Conclusions

Even after controlling for a host of child and family background characteristics and pre- and post-natal factors, children who were in any of the feeding groups, with the exception of the breast milk and formula group, had significantly greater odds of having had a respiratory or ear infection by age two than children in the exclusive breast milk group. One possible explanation may be that breast milk provides protection against particularly invasive and contagious infections, but only when fed exclusively or supplemented only with formula, not when supplemented with solid foods within the first six months.

This study has important implications for informing parents, medical professionals, and policy makers in best practices for positive health outcomes for young children.

In the current sample about 26% of the participants adhered to AAP infant feeding recommendations for the first six months of life (feeding only breast milk and/or formula during the first six months), while only 8% adhered to the primary recommendation (feeding only breast milk). Low rates of adherence to recommendations suggest that they are not well known or are not realistic for many mothers. Further research about why many mothers do not follow AAP recommendations is needed. Possible reasons include mixed research findings on the optimal timing of introduction of formula and solid foods and inconsistent information from pediatricians. Other explanations may include limitations of maternal time, development of child allergies, or individual differences based on children's health needs (gestational age at birth, birth weight, growth during first year of life, micronutrient nutritional status, neurodevelopment, etc.). As recommended by the AAP, the health status of both the infant and the mother should be taken into account when making the decision to breastfeed. Information about the ideal food combinations for infants is especially important for mothers who do not breastfeed to inform what the second best option may be, and what, if any, potential impacts for optimal infant development there are in not adhering to the AAP recommendations.

For More Information

This brief is adapted from a forthcoming article which will appear in *Maternal and Child Health Journal*. Please contact Nina Philipsen Hetzner at nmp2102@columbia.edu for more details about the findings summarized in this brief and a list of related publications.