

Does Federal Funding for Breastfeeding Research Target Our National Health Objectives?

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ABSTRACT. *Objective.* To determine the number and dollar amount of federally funded research projects in the area of infant nutrition/breastfeeding/lactation from 1994 to 1996, and the impact of these funded projects on the achievement of our national goals for increasing the rates of breastfeeding initiation and duration.

Methods. Data were obtained from the Computer Retrieval of Information on Scientific Projects database, available through the National Institutes of Health. Abstracts of funded projects were identified, printed, and subjected to content analysis. Key information identified from the abstracts included: National Institutes of Health institute, center, or division funding the project; type of extramural funding; amount of federal dollars awarded; and a classification of the project's impact (direct, indirect, or none) on achievement of the Healthy People 2000 goals for breastfeeding.

Results. The final sample consisted of 362 abstracts in the broad category of infant nutrition/breastfeeding/lactation, which were awarded approximately \$40.4 million in federal research funds over the 3 years addressed in this study. Of this amount, only 13.7% (\$5.6 million) was awarded to projects determined to have either a direct or indirect impact on achieving the Healthy People 2000 goals for increasing the incidence and duration of breastfeeding. A total of 27 (7.5%) funded projects in this category, reflecting \$4.1 million, had no relationship to breastfeeding per se, as they involved the use of human milk composition and technologies to improve artificial milks and develop new pharmaceuticals and therapies.

Conclusions. These findings suggest an incongruity between the national priorities for breastfeeding and the funding of scientific research in this content area, and provide important information for researchers and policymakers with respect to identification and redirection of funding priorities. *Pediatrics* 2003;111:e360–e364. URL: <http://www.pediatrics.org/cgi/content/full/111/4/e360>; *federal funding and research, human milk, human lactation, infant nutrition, health policy, Healthy People 2000, Healthy People 2010, breastfeeding initiation and duration.*

ABBREVIATIONS. LBW, low birth weight; CRISP, Computer Retrieval of Information on Scientific Projects; NIH, National Institutes of Health.

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Given the numerous infant health benefits of breastfeeding, the American Academy of Pediatrics recommends that "breastfeeding continue for at least 12 months, and thereafter for as long as mutually desired."¹ US health officials have translated this important relationship between infant feeding and health outcomes into public policy that encourages more frequent and a longer duration of breastfeeding among new mothers. From a public health perspective, breastfeeding represents a cost-effective strategy for reducing the incidence and/or severity of numerous adverse infant outcomes such as acute gastrointestinal and respiratory infections, otitis media, allergic disease, and several prematurity-specific complications.^{2–4} In addition, enhanced neurocognitive development and visual acuity have been reported for both term and preterm infants who receive human milk.^{3,5–7}

Since 1984, the Surgeon General's office has issued serial publications^{8,9} that have focused on increasing the rates of breastfeeding initiation and duration for both healthy and vulnerable populations, eg, low birth weight (LBW; <2500 g) infants; and low income, minority, and employed women. A national health objective for breastfeeding for the year 2000 was to "increase to at least 75% the proportion of mothers who breastfeed their infants in the early postpartum period and to increase to at least 50% the proportion who continue breastfeeding until their infants are 5 months old to 6 months old."¹⁰ Although there has been a gradual increase in the rate of breastfeeding among certain groups of women between 1988 and 1997,¹¹ the national breastfeeding goals were not attained in 2000, and thus remain unchanged for the year 2010. Without a critical examination of why the Healthy People 2000 goals for breastfeeding were not achieved, there is no reason to believe that these same objectives will be accomplished by 2010.

Currently, our empirical knowledge about the immunologic and nutritional properties of human milk and its effect on the recipient infant is sizable.^{3,12–20} This basic science research has provided the foundation for our national breastfeeding priorities and objectives. In contrast, applied research that focuses on testing interventions to assist women in the initiation and continuation of breastfeeding is relatively limited. This imbalance in the knowledge generated by basic versus applied science prompts the question as to whether sufficient federal dollars have been targeted toward applied research that may ultimately

increase the rates of breastfeeding initiation and duration. Thus, the purpose of this study was to determine the number and dollar amount of federally funded research projects in the area of infant nutrition, breastfeeding, and lactation from 1994 to 1996, and the impact of these studies on the achievement of our national goals for breastfeeding.

METHODS

Design

Data for this descriptive study were obtained from the Computer Retrieval of Information on Scientific Projects (CRISP) database, available through the National Institutes of Health (NIH). CRISP is a major biomedical database containing information on research projects supported by the US Public Health Service, of which the NIH is a constituent.²¹ Although the database contains information on several categories of funding, most of the research falls within the category of extramural projects and can be retrieved by various search fields such as the project title, abstract, principal investigator, and keywords. For a more thorough description of the CRISP database²¹ and the NIH nomenclature,²² readers are referred to the previous publications by these investigators.

Procedure for Sample Acquisition

Through consultation with information specialists in the Information Systems Branch of the NIH, CRISP Thesaurus descriptors (more commonly known as keywords) were used to identify all possible funded projects in the category of infant nutrition/breastfeeding/lactation. These descriptors are terms from the CRISP Thesaurus that are assigned to project abstracts by CRISP information specialists at NIH. This search was limited to the "primary emphasis level," which is official CRISP terminology indicating that the abstract's primary focus can be determined by the descriptor term used in the search.²³ The resultant CRISP Thesaurus descriptors used in the search included: developmental nutrition, infant nutrition disorder, infant food, breastfeeding, human milk, colostrum, milk, lactation, and lactation disorder.

This search and analysis were restricted to projects that were funded during the 3 fiscal years of 1994, 1995, and 1996. The start date of 1994 was selected because the Healthy People 2000 goals were published in 1990. We reasoned that the average interim between publication of these goals and the funding of grant applications that targeted their achievement would be 3 to 4 years. The year 1996 was the designated endpoint of data collection because it was the last year that the award amount for scientific projects was available on the CRISP database.

The abstract for each of the identified projects in the search was then printed. Content analysis²⁴ at the manifest level was performed by a panel of 3 experts in the field of maternal-child health according to the following procedures. First, a coding form was developed to standardize the process for abstracting information and to ensure that relevant data were collected in a consistent format. Then, each abstract was reviewed by the panel members to determine eligibility for inclusion in the analysis. Of the 462 abstracts generated by the search, 362 abstracts (78.4%) were identified as appropriate for the sample. The remaining 100 abstracts (21.6%) were excluded from analysis for reasons described in Table 1. The majority of the excluded projects were retrieved under the search terms "milk" and "developmental nutrition," which included many projects beyond the objective of the intended search.

TABLE 1. Exclusion Criteria for Abstracts

- Addressed age groups beyond infancy
- Reflected funding of a symposium or an intramural project (\$0 noted on abstract)
- Reflected a parent abstract whose subproject abstract also appeared in the search (we excluded the parent abstract and used only the subproject abstract to avoid duplication)
- Did not contain written description/specific aims of the proposed project or contained unclear aims, which precluded the ability to perform content analysis

Following agreement on inclusion in the analysis, 10% ($n = 37$) of the resulting dataset was randomly selected to be coded independently by the 3 panel members to establish inter-rater agreement. For this procedure, raters either agreed or disagreed on the coding for each abstract; 95% ($n = 35$) of abstracts were coded identically by the panel members. The remaining 5% ($n = 2$) served as a mechanism to clarify coding procedures; each coding inconsistency was discussed until a consensus was reached by the panel. This process minimized interrater variability for coding of the remaining dataset and resulted in minor revisions of the coding form (Table 2). Next, each of the 3 panel members assumed responsibility for independent coding of all abstracts for a specific year: 1994, 1995, or 1996. When an individual panel member was uncertain about coding for an item in an abstract, the abstract was discussed by all panel members until consensus was reached, thereby minimizing variability.

RESULTS

For the 3-year period (1994–1996) examined in this inquiry, \$40.4 million were awarded to 362 projects that fell under the category of infant nutrition/breastfeeding/lactation. However, of those 362 funded projects, only 6 were determined to have a direct impact (eg, either breastfeeding initiation or duration rates were included in the specific aims) on the achievement of the Healthy People 2000 Objectives for breastfeeding. These 6 projects represented 1.7% of the number of funded projects and only 3.9% of the \$40.4 million awarded to studies in this content area (Table 3).

For the same time period, 25 (6.9%) of the 362 projects were determined to have an indirect impact on increasing the rates of breastfeeding initiation and duration. The specific aims for these projects did not directly address initiation and duration, but they targeted interventions that were likely to result in increased breastfeeding rates (Table 2). Thus, only 31 projects (8.6%) in the category of infant nutrition/breastfeeding/lactation were determined to have any impact, direct or indirect, on achieving our nation's breastfeeding goals (Table 3). These 31 projects were awarded 13.7% of the funds in this category. The remaining 90.3% of the projects funded in this content area were determined to have no impact on achieving our national breastfeeding goals. However, they were awarded nearly \$35 million, or 86.2% of the overall funding in this topical area.

Of the total 362 projects, the M01 (General Clinical Research Centers Program) was the most commonly used mechanism of funding (37.6%), followed by the R01 (Traditional Research Projects; 33.1%), and the P01 (Research Program Projects; 12.7%). Among the subgroup of projects ($n = 31$) considered to have an impact on attaining the national breastfeeding goals, the majority (61.3%) were funded as R01, followed by P01 (12.9%), M01 (9.7%), and R29 (FIRST Award; 9.7%).

The majority of the 362 projects were funded by the National Center for Research Resources (41.2%) and the National Institute for Child Health and Human Development (40.6%). The subgroup of projects ($n = 31$) considered to have an impact on the national breastfeeding goals were funded by the National Institute for Child Health and Human Development ($n = 24$), National Institute of Nursing Research ($n = 4$), and the National Center for Research Resources ($n = 3$).

TABLE 2. Description and Examples of Selected Variables From Project Abstracts

Variable	Definition	Example(s)
Activity code	3-digit code that specifies category of funding	P01-Research program projects; M01-General Clinical Research Centers Program
ICD code	Institute, Center, or Division administering the award	RR-National Center for Research Resources. HD-National Institute for Child Health and Human Development
Award amount	Dollars awarded to project for the specified fiscal year	\$139 000; \$2.5 million
Human milk science for improving composition of artificial milk	Asks whether project involved the application of human milk science to improve content of infant formula	Yes: Study of antiviral properties of human milk to develop a product for prevention and/or treatment of rotaviral diarrhea; implications for product to be added to infant formula ²⁷
Human milk science for technology development	Asks whether project involved the application of human milk science to develop new technologies or pharmaceutical products	Yes; Define specific inhibitor of HIV transmission in human milk, as basis for developing therapeutic/prophylactic agent ²⁸
Preterm/LBW infant	Asks whether project involved preterm/LBW infants (vulnerable population)	Yes; Compare the effects of sequential versus simultaneous double breast pumping on milk volume in mothers of preterm infants ²⁹
Impact	Impact, if any, that project will have on achievement of Healthy People 2000 goals for breastfeeding:	
	Direct impact studies involve clinical interventions and identify either initiation and/or duration of breastfeeding as outcome measure(s)	The effect of comprehensive and structured breastfeeding services on breastfeeding duration rates for mothers of LBW infants ³⁰
	Indirect impact studies are those that can affect breastfeeding initiation and/or duration through education, policy, or descriptive findings that can inform future intervention studies	Evaluation and expanding physicians' knowledge about breastfeeding counseling ³¹
	No impact studies have no effect on increasing rates of breastfeeding initiation or duration	Using a suckling rat model to understand the regulation of breast milk carnitine transport into the body ³² ; Delineating the role of glycoprotein components of the human milk fat globule membrane in inhibiting viral receptor binding and infectivity ³³
	Studies whose impact cannot be determined are those with a title/subtitle that appears to indicate a breastfeeding project but whose abstract contains limited information to allow for determination of the level of impact	Title: "General Clinical Research Center" Subtitle: "Maternal calorie restriction on breast milk production" Abstract: "Breast milk production in well-nourished, lactating women." ³⁴

TABLE 3. Categorization of Funded Projects (1994–1996) by Impact Towards Achievement of the National Breastfeeding

Impact of Project on Achieving National Breastfeeding Goals	Number of Projects (% of Total <i>n</i> = 362)	Award Amount of Projects (% of Grand Total \$40 412 207)
Direct impact	6 (1.7%)	\$1 556 199 (3.9%)
Indirect impact	25 (6.9%)	\$3 944 273 (9.8%)
No impact	327 (90.3%)	\$34 839 678 (86.2%)
Cannot be determined	4 (1.1%)	\$72 057 (0.2%)
Total	362 (100%)	\$40 412 207 (100%)

Among those projects that involved vulnerable populations (preterm/LBW infants; low income, minority, employed women), only 2 and 3 projects, respectively, were identified as having either a direct or indirect effect on breastfeeding initiation and duration. These 5 awards represented only 1.4% of the total funded projects in this category, and received just 3.5% of the total monies.

Finally, 2 of the 362 projects that were categorized as breastfeeding research actually involved the analysis of human milk components to determine how to modify and improve the composition of artificial milk preparations. Twenty-four additional projects involved the application of human milk science for the purpose of developing new technologies or phar-

maceutical products (Table 2). One project involved the application of human milk science for both the improvement of artificial milk preparations and the development of a new pharmaceutical product. The cumulative dollar amount for these 27 projects totaled \$4.1 million, and represented 10.2% of the total allocated funds in this category.

DISCUSSION

The findings from this study demonstrate a significant disproportion in both the number and dollar amount of NIH projects targeted toward basic versus applied lactation and human milk science. This funding imbalance has resulted in an extensive knowledge about the composition of human milk and the

physiology of lactation, but relatively little evidence about effective interventions to promote and sustain the practice of breastfeeding.

Our findings are consistent with previously published concerns²⁵ about the scientific chasm between basic and applied research, and must be critically examined and addressed. A major question, which remains unanswered in our study, is whether projects that addressed the rates of breastfeeding initiation and duration during this 3-year period were adequate, but did not receive funding because they were not appropriately prioritized. A related consideration is whether the inherent methodological differences between basic and applied breastfeeding research functioned to limit funding for the latter. Unlike basic science work, applied breastfeeding science seldom permits randomization of "breastfeeding" or control over all extraneous variables, and may include some outcome measures that are not as precise as laboratory values. As such, these studies may have been perceived as unscientific or insufficiently rigorous by review panels whose membership may have consisted primarily or exclusively of basic science investigators.

Awards for 2 subcategories within this content area were particularly concerning. First, although certain populations have been identified to be at risk for poor breastfeeding outcomes,⁸⁻¹¹ our data clearly demonstrate that currently funded projects are insufficient in scope and funding to address these priority areas. For many vulnerable mothers, the desire to breastfeed is present but the service delivery models and interventions to support breastfeeding given the women's unique circumstances have yet to be determined and tested.²⁶ These models must be different and innovative, because traditional models of service delivery have not demonstrated success with these groups.

Second, 27 of the funded studies within the breastfeeding category involved the adaptation of human milk science to improve or develop other foods and technologies, giving the erroneous impression that the corresponding \$4.1 million was awarded to fund breastfeeding studies. Three of these studies were directed toward improving the composition of artificial milk preparations, raising the question of priorities for the allocation of taxpayer-generated resources. Although the need for artificial milk and nutritional products for a small proportion of infants is recognized, should NIH direct millions of dollars toward the improvement of infant formulas (for example, finding a substitute for secretory IgA), when a superior, naturally occurring infant food exists, but is not used?

The remainder of the 27 studies in this grouping focused on the application of human milk science for the development of new products and technologies. Although we recognize the applicability of human milk to these emerging pharmaceuticals and technologies, the concern is the misleading classification of those types of projects as breastfeeding research. This erroneous classification inflates the number of projects and the dollar amount of federal funds that are allocated to breastfeeding research, which may

compromise the subsequent funding of strong applications, especially those addressing our national health objectives.

Limitations

The project abstracts in our sample were retrieved by CRISP Thesaurus terms that were assigned to projects by CRISP information specialists, and the individuals involved in this coding process may have used inconsistent methodology. Consequently, the terms that were used in our search may not have captured all potential research projects of interest. However, the CRISP technical information specialist, with whom this project was discussed, indicated that the validation procedures undertaken for each abstract made this possibility remote. For this process, NIH information specialists read the entire grant proposal and assigned indexing terms to the grant abstract; then, the principal investigator for the grant validated the relevance and accuracy of the indexing terminology (Marie Parker, personal communication, October 1995).

Data for this project were retrieved from 1 source, leaving the possibility that potential research in this content area funded by federal agencies other than the US Public Health Service and its major branch, the NIH, may have been omitted from the search. However, the CRISP database contains information on the vast majority of federally funded projects, and the NIH is the federal entity entrusted with a major role in facilitating breastfeeding research efforts.

CONCLUSION

With so much research documenting the overwhelming benefits of human milk, we must ask why so many women still do not choose to initiate and sustain lactation? The findings from this study confirmed that NIH-funded projects have had limited impact on facilitating the achievement of the Healthy People 2000 goals for breastfeeding. Our findings do not negate in any way the significance of basic science research in human milk and lactation. However, they have important implications for reprioritizing federal research funding in this content area. Careful consideration of the composition of NIH review panels, clear NIH priorities, and implementation of specialized requests for proposals will be essential mechanisms. Without an active and strategic program of activities to bring balance to this issue, we will continue to learn about the benefits and composition of human milk while our society does not participate in those benefits.

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