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Time trends and factors associated with breastfeeding in the state of Pernambuco, Northeastern Brazil

ABSTRACT

OBJECTIVE: To analyze time trends in the duration of exclusive breastfeeding and associated protection factors.

METHODS: Prevalances for total breastfeeding and exclusive breastfeeding in a population of four-month-old infants were analyzed. Data were obtained from population surveys carried out in 1991, 1997, and 2006, with 935, 2081, and 1568 infants respectively. The data were retrieved from interviews answered by parents or guardians. The prevalences were analyzed by Poisson regression in regard to: environmental, behavioral and socioeconomic conditions, maternal variables, and biological factors of infant.

RESULTS: The median duration of total breastfeeding rose from 89 days (1991) to 106 days (1997), and finally to 183 days (2006). The median duration of exclusive breastfeeding remained around 30 days between 1997 and 2006. In the multivariate analysis, from the ten variables studied, only maternal schooling and age, address, and female gender of infant were maintained in the final explanatory model.

CONCLUSIONS: Despite the significant increase in terms of total breastfeeding duration, the same did not occur with the duration of exclusive breastfeeding.

DESCRIPTORS: Breast Feeding, epidemiology. Risk Factors. Socioeconomic Factors. Maternal and Child Health. Time Series Studies.

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INTRODUCTION

Results from epidemiological, clinical, behavioral, and experimental studies in virtually all regions of the world and carried out under various conditions have all reached consensus concerning the importance of maternal breastfeeding as an unequalled factor for promoting maternal and infant protection.^{8,11,a} In poorer countries breastfeeding is responsible for significant differences in childhood morbidity and mortality patterns, while preventing poverty-related diseases and infectious diseases, and while mitigating their pathogenic course, thus avoiding premature deaths and enabling physical and mental development at such a crucial moment for human biology, that is, during the first months and years of a child's life.^{3,7,16,24} The beneficial effects of breastfeeding stretch across the entire human life cycle, reducing the risk and severity of conditions that manifest later on, such as the complex group of non-transmissible chronic diseases (e.g. diabetes mellitus type 2), heart and circulatory disorders and their complications, overweight/obesity, osteoarthropathies and other comorbidities related to adult life and aging.^{8,12,14}

The various and interactive protective effects of breastfeeding on infant health and survival throughout adult life corroborates the universal recommendations to encourage the practice.^a However, despite the recommendations of the United Nations and the commitments and targets of government policies and programs of countries worldwide, in Brazil, early weaning is still a serious public health issue.^{1,2,4,5,10}

The most recent data on breastfeeding in Brazil are from the Second Survey on Breastfeeding Prevalence in Brazilian Capital Cities and the Federal District [*II Pesquisa de Prevalência de Aleitamento Materno nas Capitais Brasileiras e Distrito Federal*], carried out in 2009.^b The survey found prevalence rates of, respectively, 19.8% and 8.4% of exclusive breastfeeding at four and six months of age in Northeastern Brazil. In the city of Recife, state of Pernambuco, these trends corresponded to 18.6% and 6.1%, respectively. In 2006, the National Survey on the Health and Demographics of Women and Children [*Pesquisa Nacional de Demografia e Saúde da Mulher e da Criança (PNDS)*]^c found that more than 95% of

infants had been breastfed on one occasion. In infants from four to six months of age, the rate of exclusive breastfeeding was 15.3%, whereas predominant and supplementary breastfeeding occurred in 8.2% and 62.4%, respectively.

The objective of this study was to analyze time trends in the duration of exclusive breastfeeding and its protective factors.

METHODS

The data examined were obtained from the Pernambuco State Survey on Health and Nutrition [*Pesquisa Estadual de Saúde e Nutrição de Pernambuco (PESN)*], where household surveys on maternal and infant health and nutrition, including breastfeeding, were conducted in 1991^d, 1997^e and 2006.^f

The III PESN provides a description of health and nutrition conditions of the population, with emphasis on the maternal and infant groups, and it comprehends 18 cities in the state of Pernambuco, and is statistically representative of the urban and rural population of the state. The cities that made up the sample were Recife, Cabo, Jaboatão, Olinda, Paulista, Caruaru, Camocim de São Félix, São Bento do Una, Triunfo, Itaíba, Palmares, Ribeirão, Panelas, Belém de São Francisco, Bodocó, Goiana, Itaquitinga, and Orobó. The sample was randomly selected in three stages: a random draw of the cities based on a criterion almost proportional to their population; a random draw of the census tracts (sample units of the *Instituto Brasileiro de Geografia e Estatística – IBGE*) in each city; and a draw of the families within the selected census tracts.

The data used were based on the identification forms (area and address), personal information (age and gender of child; age, schooling and occupation of mother), information on the household and income (number of people in the household, water supply), child information (number of prenatal appointments, information on breastfeeding during prenatal care, kind of delivery, weight at birth, enrollment with the Family Health Program [*Programa Saúde da Família – PSF*], and breastfeeding information).

^a World Health Organization. Evidence on the long-term effects of breastfeeding: systematic reviews and meta-analyses. Geneva; 2007. [cited 2008 Nov 18]. Available from: http://whqlibdoc.who.int/publications/2007/9789241595230_eng.pdf

^b Ministério da Saúde. Secretaria de Atenção à Saúde. Departamento de Ações Programáticas e Estratégicas. II Pesquisa de prevalência de aleitamento materno nas capitais brasileiras e Distrito Federal. Brasília; 2009. (Série C. Projetos, Programas e Relatórios)

^c Ministério da Saúde. Centro Brasileiro de Análise e Planejamento. Pesquisa nacional de demografia e saúde da criança e da mulher (PNDS): relatório final. Brasília; 2008. [cited 2008 Nov 18]. Available from: http://bvsm.sau.gov.br/bvs/pnds/img/relatorio_final_pnds2006.pdf

^d Governo do Estado de Pernambuco. Crianças e adolescentes em Pernambuco: saúde, educação e trabalho. Recife: Unicef; 1992.

^e Governo do Estado de Pernambuco. II Pesquisa estadual de saúde e nutrição: saúde, nutrição, alimentação e condições sócio-econômicas no Estado de Pernambuco. Recife; 1998.

^f III Pesquisa Estadual de Saúde e Nutrição de Pernambuco, realizado entre maio e outubro de 2006, financiada pelo Ministério da Saúde e realizada conjuntamente pelo Departamento de Nutrição da Universidade Federal de Pernambuco e Instituto de Medicina Integral Professor Fernando Figueira, com o apoio do Conselho Nacional de Desenvolvimento Científico e Tecnológico – CNPq (processo no 505540/2004-5) [dados inéditos].

In regard to the first study carried out in 1991,^a a representative sample was chosen taking into account the representation of a set of indicators totaling 11 interest factors, among which 'prevalence and duration of milk feeding'. This sample was made up of 935 children under age five for the state of Pernambuco and other states in the Northeast.

In the second survey (1997),^b the reference sample had an estimated prevalence of 8.3% deficit in weight/age (< 2 DP), with a maximum error rate of 2%, and a 95% confidence interval, which additionally enabled disaggregation by region (the metropolitan Recife area, the urban inner state region, and the rural inner state region). Therefore, the sample resulted in 1,892 children, to which a safety margin of 10% was added, totaling in the end 2,081 individual observations.

The reference sample for the III PESN, carried out in 2006, was estimated based on several outcomes of interest (prevalence of protein-energy malnutrition, anemia, hypovitaminosis A, diarrhea, and acute respiratory infection) from the main survey that made up the database, and on a population of children less than five years of age in the state of Pernambuco. The outcomes, their respective prevalence rates and margin of error between 1.5 and 3.0%, resulted in different sized samples, which were consolidated in a single and maximum amount of 1,650 children, considering an additional 10% in order to account for possible losses and stratification for hypothesis testing. The results of the II PESN and of other surveys (PNDS/1996 and 2006) ensure representativeness of a sample of 1,568 children aimed at assessing breastfeeding prevalence in the state of Pernambuco. This sample thusly makes up a sub-sample, which can be considered a byproduct file of this study.

Based on the literature, mainly in the studies carried out in Brazil^{4,5,9,10,15,21,23} and abroad,²⁰ a number of variables based on known factors of risk or protection for exclusive breastfeeding were selected. After being grouped into blocks, these variables were included in a hierarchical causal model of exclusive breastfeeding. In the first group: socioeconomic factors and demographics (maternal schooling, per capita income, maternal age, number of people in the household, area - urban or rural-, situation of the household, and water supply). In the second group, the variables were related to obstetric and healthcare factors (prenatal care, prenatal guidance, prenatal appointments, kind of delivery and enrollment with the PSF), which could influence the behavior of biological factors (third group) concerning the infant,

such as gender and weight at birth, which were positioned at the most proximal level of the model.

Exclusive breastfeeding at fourth months, representing the outcome, was defined as the situation of the infant fed exclusively with human milk, - breastfed or pumped with no added water and/or other liquid,^c - and divided into yes/no categories. The 'yes' category was made up of infants fed exclusively with breast milk for fourth months or more. The 'no' category was made up of infants who were on exclusive breastfeeding for a period under four months, children who were not on exclusive breastfeeding, and those who never received breast milk.

The bivariate analyses identified a set of 14 explanatory variables, having this study adopted as a screening criterion the associations with p-value < 0.20. The statistical significance of each variable was calculated using Wald test for heterogeneity. Next, an adjusted analysis was carried out through Poisson multiple regression, with robust estimation of standard error, the adjusted prevalence ratios were estimated, as well as their respective 95% CI and assessment of statistical significance through the same tests mentioned above. The analyses were performed using Stata 9.2 SE software.

This research was approved by the Research and Ethics Committee in Human Beings at the *Instituto de Medicina Integral Prof. Fernando Figueira* (record number 1321).

RESULTS

The development of the duration of breastfeeding between 1991 and 2006 is shown in the picture below. The median duration of total breastfeeding increased from 89 to 183 days. In the 1991 survey, there were no data on the prevalence of exclusive breastfeeding at six months. In 1997, this prevalence was estimated at 1.9%, rising to 8.5% in 2006. The median duration for exclusive milk feeding in 1997 was of 30 days (Percentile 25 = 7 days, Percentile 75 = 90 days), whereas in 2006 it was of 29 days (P25 = 4 days; P75 = 90 days). In the most recent survey (2006), 71.9% of infants had been weaned and 4.9% had never been breastfed.

The Table shows the results of the univariate and multivariate analyses of the associated factors for exclusive breastfeeding at six months. In the univariate analysis, maternal schooling and maternal age ranging between 20 and 35 years of age, urban area, address in the Recife metropolitan area, water supply with household plumbing, breastfeeding education

^a Governo do Estado de Pernambuco. Crianças e adolescentes em Pernambuco: saúde, educação e trabalho. Recife: Unicef; 1992.

^b Governo do Estado de Pernambuco. II Pesquisa estadual de saúde e nutrição: saúde, nutrição, alimentação e condições sócio-econômicas no Estado de Pernambuco. Recife; 1998.

^c World Health Organization. Division of Child Health and Development. Indicators for assessing breast-feeding practices. Geneva; 1991. [citado 2008 abr 8]. Disponível em: http://whqlibdoc.who.int/hq/1991/WHO_CDD_SER_91.14.pdf

Table. Prevalence for exclusive breastfeeding in blocks of hierarchical factors, and adjusted and crude prevalence ratios. State of Pernambuco, Northeastern Brazil, 2006.

Variable	Exclusive breastfeeding		PR crude	95% CI	p ^a	PR adjusted	95% CI	p ^a
	Sample	Yes n %						
Socioeconomic and demographic factors								
Maternal schooling					0.000			0.042
None	111	10 9.0	1			1		
1st to 4th grade	603	76 12.6	1.4	0.7;2.6		1.2	0.7;2.3	
5th to 8th grade	486	92 18.9	2.1	1.1;3.9		1.7	0.9;3.2	
9th grade and above	360	76 21.1	2.3	1.2;4.4		1.8	1.0;3.4	
Not available	8	- -	-	-		-	-	
Per capita income (in minimum wages)					0.880			-
< 0.5	341	52 15.2	1			-	-	
0.5 to 0.99	295	48 16.3	1.1	0.7;1.5				
> 1	901	148 16.4	1.1	0.8;1.4				
Not available	31	- -	-	-				
Maternal age					0.014			0.045
< 20 years	165	28 17.0	1.7	1.0;2.9		1.5	0.9;2.5	
20 to 35 years	1147	201 17.5	1.8	1.2;2.6		1.6	1.1;2.4	
36 or more	256	25 9.8	1			1		
Maternal occupation					0.940			-
Yes	119	19 16.0	1			-	-	
No	1448	235 16.2	1.0	0.6;1.5				
Not available	1	- -	-	-				
Number of people in the household					0.384			-
1 or 2	12	3 25.0	1.5			-	-	
3 or more	1556	251 16.1	1	0.6;54.1				
Area					0.001			0.586
Urban	810	155 19.1	1.5					
Rural	758	99 13.1	1	1.7;1.8		1.1	0.8;1.5	
Location of the household					0.000			0.004
RMA	416	92 22.1	1.6	1.2;2.0		1.4	1.1;1.8	
Inner state	1152	162 14.1	1					
Water supply					0.013			0.624
With household plumbing	913	166 18.2	1.3	1.1;1.7		0.9	0.7;1.3	
No plumbing	655	88 13.4	1					
Obstetric and healthcare factors								
Information on breastfeeding during prenatal care					0.015			0.055
Yes	1269	226 17.8	1.7	1.1;2.6		1.5	0.9;1.4	
No	192	20 10.4	1					
No prenatal care	68	- -	-	-		-	-	
Not available	39	- -	-	-		-	-	
Number of prenatal appointments					0.031			0.232
≤3	125	11 8.8	1					
4 or 5 appointments	298	45 15.1	1.7	0.9;3.2		1.5	0.8;2.8	
6 or 20 appointments	1003	182 18.1	2.1	1.1;3.7		1.6	0.9;2.9	
Not available	68	- -	-	-		-	-	

To be continued

Table continuation

Variable	Exclusive breastfeeding		PR crude	95% CI	p ^a	PR adjusted	95% CI	p ^a
	Sample	Yes n %						
Type of delivery					0.042			0.276
Vaginal	1101	165 15.0	1					
C-section	466	89 19.1	1.3	1.0;1.6		1.1	0.9;1.5	
Not available	1	-	-	-		-	-	
Enrollment with the Family Health Program					0.669	-	-	-
Yes	1068	177 16.6	1.1					
No	499	77 15.4	1					
Not available	1	-	-					
Biological factors of infant								
Gender					0.020			0.015
Male	803	113 14.1	1					
Female	765	141 18.4	1.3	1.0;1.6		1.3	1.1;1.7	
Weight at birth					0.127			0.221
< 2500g	129	15 11.6	1					
≥ 2500g	1398	238 17.0	1.5	0.9;2.4		1.3	0.8;2.2	
Not available	41	-	-	-		-	-	

^a Wald test for heterogeneity

The variables in bold were included in the final hierarchical model.

RMA: Recife Metropolitan Area

during prenatal care, number of prenatal appointments between six and 20, delivery by c-section, and female gender of the child, showed significant associations with the situation of the child in regard to exclusive breastfeeding for four months.

The results of the adjusted multivariate models are shown in more detail in the Table. In the final model, the remaining variables were maternal schooling and maternal age, address in the Recife metropolitan area, and female gender of the child.

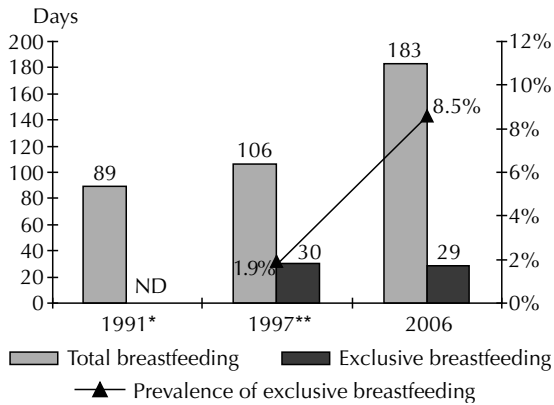
DISCUSSION

The most relevant information is the significant increase of the duration of breastfeeding in the state of Pernambuco. In the last 15 years, the median duration of total breastfeeding doubled from 89 days in 1991 to 183 days in 2006. In the same period, exclusive breastfeeding at six months, which was the main focus of this paper, increased from 1.9% in 1997 to 8.5% in 2006. Furthermore, this also appears to be the trend in other areas in Brazil.²² However, due to the lack of studies, variety of concepts and criteria, as well as diversity of sampling, there are still no hard data on the subject.

Considering internal comparisons, that is, studies carried out in the state of Pernambuco, these developments can be considered positive; however, they are modest developments when compared to the international targets set by the New York Summit.^a During this meeting, the political commitment was to ensure, by the year 2000, the necessary conditions for exclusive breastfeeding of all infants up to six months of age. In Brazil, several projects are underway to promote and support breastfeeding, such as initiatives at the *Hospital Amigo da Criança*, Human Milk Banks, *Amamenta Brasil* network, and education initiatives during prenatal care. We can also mention the work of the International Baby Food Action Network (IBFAN), in addition to the mass media communication, such as the initiatives from society at large.¹⁸

By making time-related and geographical changes to the prevalence levels of exclusive breastfeeding (or other modalities) practices one expects changes in the factors that act upon them at the population level. Therefore, it is expected that, in the 15 years following 1991, there would have been changes in the configuration of the factors conditioning breastfeeding practices in the state of Pernambuco. It is estimated that associated factors would hypothetically represent the causal network

^a Fundo das Nações Unidas para a Infância. Estratégia para melhorar a nutrição de crianças e mulheres nos países em desenvolvimento: um exame de políticas. New York; 1990.



NA= Not available (median duration and prevalence of exclusive breastfeeding)

* I State Survey on Health and Nutrition

** I State Survey on Health and Nutrition

Figure. Median duration (in days) of total and exclusive breastfeeding and prevalence (%) of exclusive breastfeeding at six months of age. State of Pernambuco, Northeastern Brazil, 1991, 1997 and 2006.

of the breastfeeding process and that these factors be subjected to 'inside and outside' changes, that is, changes in frequency, intensity and interaction with other co-factors. Furthermore, the dynamism of these relations in time and space hinders or are an obstacle to building a single model capable of explaining the problem.^{4,5,9,10,15,21,23}

In the case of this study, out of the 14 variables distributed across the three levels of the explanatory model, ten were considered statistically significant ($p < 0.20$), and were included in the multivariate analysis. Among the latter, factors which were initially considered important, such as income, occupation, number of people in the household and enrollment with the Family Health Program, were excluded. After the adjustment of the prevalence ratios, almost all differences lost their statistical significance. As a result, in the final model only maternal age and schooling, address in the Recife metropolitan area, and gender of infant, remained as protective factors for exclusive breastfeeding. Likewise, female gender of infant was also considered a protective factor in the *II Pesquisa de Prevalência de Aleitamento Materno nas Capitais Brasileiras e Distrito Federal*⁹ and in the Pelotas trend study.²² Perez-Escamilla et al¹⁷ (1999), in a study of women in Latin America (Mexico, Honduras and Brazil), suggests that probably mothers and/or healthcare agents would think that boys may be more nutritionally demanding and, as a result, are likely to receive supplementary food earlier than girls. According to Scott et al¹⁹ (1999), a cultural construct of a gender may influence in the decision-making of

mothers and, as a result, a qualitative approach about how this woman feels in regard to prioritizing a given practice based on the gender of the infant.

Despite having revealed a borderline significance level ($p=0.055$) in the univariate analysis, breastfeeding guidance during prenatal care is considered conceptually relevant and has been empirically validated. Therefore, it should not be overlooked as a basic component of prenatal care.¹

In Carvalhaes et al's study⁵ (2007) carried out in the city of Botucatu, Southeastern Brazil, in the final model the factors in block 1 applied to the mothers (schooling, occupation, maternity leave, and age), as well as block 2 factors (parity, hospital of delivery, type of delivery, and weight at birth), lost their statistical significance. As a result, only more immediate factors (difficulty in the beginning of breastfeeding, and use of pacifier, which were in block 3) were found to be associated to the outcome.

In the city of Pelotas, Southern Brazil, Victora et al²² (2008), using a research database of three cohort studies initiated in 1982, 1993 and 2004, showed considerable duration-related developments in breastfeeding, especially in the exclusive breastfeeding category, which went from an initial figure close to zero in the first assessment to approximately 30% in 2004. In the first study, higher family income was preponderant in breastfeeding duration, whereas in the most recent study, trends in exclusive breastfeeding were found to favor lower-income segments of society. The authors stress the role of family income and low birth weight as risk factors of early weaning. Still in the city of Pelotas, the assessment carried out by Mascarenhas et al¹⁵ (2006), in regard to a population of 940 infants aged one to three months, found that low level of schooling of the father, and mother working outside the home, and use of pacifier, were considered the main factors related to early weaning. Venâncio et al²¹ (2002), in a study carried out in 84 cities in the state of São Paulo, found that in 30% of the cities, exclusive breastfeeding lasted for four months. In the multivariate analysis, the main risk factors for early weaning were low maternal schooling rate, lack of a *Hospital Amigo da Criança*, primiparity, and early motherhood. In the city of Cuiabá, center western region, França et al⁹ (2007) studied 920 children under one year of age. They found early weaning to be statistically related to maternal age (under 20 years), primiparity, and use of pacifier. Bottle-feeding in the first month, offering teas, and low maternal schooling were variables that were maintained in the final logistic regression model. In the Cuiabá study, as well as in the study carried out in Pernambuco, the variables were:

^a Governo do Estado de Pernambuco. II Pesquisa estadual de saúde e nutrição: saúde, nutrição, alimentação e condições sócio-econômicas no Estado de Pernambuco. Recife; 1998.

maternal occupation, type of delivery, access to healthcare services, and maternal schooling.

In the city of Porto Alegre, Southern Brazil, França et al¹⁰ (2008) studied, for 30 days, 211 pairs of mother and child, and examined 15 factors related to breastfeeding practices during the first month of the infant's life. At seven days, 21.3% of infants were bottle-fed and, at 30 days, the rate was 46.7%. Teenage motherhood and nipple trauma were considered the more immediate explanatory effects for introducing bottle-feeding to supplement or to substitute breastfeeding. In another study in Rio Grande do Sul, Weiderpass et al²³ (1998) found, based on a cohort study with 655 infants observed during the first three months of life, that the kind of delivery (elective c-section) had a statistically significant effect in the duration of exclusive breastfeeding, together with income, early prenatal care, and proximity to healthcare services. These findings were similar to the conclusions in another study⁴ (1997) carried out in the state of Pernambuco, in which maternal schooling, early prenatal care (first trimester), number of prenatal appointments, surgical delivery, medical care during delivery, and using private healthcare services were considered protective factors for exclusive breastfeeding. In the present study, the protective factors were found to be family income, early prenatal care, and proximity to healthcare services.

Comparing studies carried out in Brazil is difficult due to the different kinds of studies (cross-sectional, cohort, intervention), independent variables, cut-off points to establish outcomes, conceptual models organized to establish factor hierarchies, populations studied, among others. Additionally, conditioning factors seem to vary across space and time, and according to socioeconomic characteristics, above all family income and maternal

schooling. In a number of recent studies, proximal factors (use of pacifier, nipple trauma) have appeared in the models for duration of exclusive breastfeeding. In other studies, the influence of more structural factors, such as area (urban/rural) and income, are decreasing in regard to exclusive breastfeeding. In line with this, the findings of the present study, based on the surveys carried out in Pernambuco less than ten years apart (1997 and 2006), seem to evidence these time-related changes in breastfeeding practices.

The situation of total breastfeeding in the Northeastern region of Brazil was studied by Lima & Osório¹³ (2003) using data from the National Survey on Healthcare and Demographics [*Pesquisa Nacional de Demografia e Saúde*] revealing a median duration of 199.8 days, with a significant difference between rural (253 days) and urban (183 days) areas. Bottle-feeding was also considered crucial: duration of total breastfeeding in bottle-fed infants was 145 days, compared to 563 days for infants who did not receive bottle-feeding. Still in the state of Pernambuco, a community test cohort (350 mother and children followed-up for six months during home visits by healthcare agents) gave evidence of the possibility of prolonging exclusive breastfeeding, which reached a prevalence of 45% in the experimental group at six months.⁶ This rate is far above the findings published in Brazil, where the most significant changes usually refer to total duration of breastfeeding, in line with the findings in our study.

In conclusion, despite the significant increase in the duration of total breastfeeding, the same did not take place in regard to the duration of exclusive breastfeeding. Among the factors positively related to the latter are maternal age and schooling, residing in a metropolitan area, and female gender of infant.

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