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An Analysis of Deaths among Infants and Children Born Into the *Children First* Program, 1997-2004

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In 2006, a brief study was conducted to examine the deaths among children who were born into Oklahoma's *Children First* program between 1997-2004.

This study found that:

- **The infant mortality rate for *Children Fir*st participants is approximately half of the rate for other first-time births in Oklahoma (3.4 vs. 8.2 deaths for every 1,000 live births).**
- **This *Children First* infant mortality rate meets goals set by Healthy People 2010 (3.4 vs. 4.5).**
- **Compared to all *Children First* participants, a greater percentage of those participants who experienced an infant or child death reported an annual household income of less than $15,000.**
- **Areas for programmatic improvement include strengthening efforts to prevent preterm delivery and low birthweight, and helping parents prevent Sudden Infant Death Syndrome and unintentional injuries.**

Background

Children First

The *Children First* program is a nurse home-visitation program that utilizes the Nurse-Family Partnership model. Women are eligible to participate if they are first-time mothers, are less than 29 weeks pregnant, and are at or below 185% of the federal poverty level. Services are available until the child is 24 months old. The program is administered through the Oklahoma State Department of Health and is available in all 77 counties in Oklahoma. Nurse home visitors serve over 5,000 families per year. Goals of the program include preventing poor health outcomes and preventing child maltreatment.

Infant Mortality Rate (IMR)

The infant mortality rate is the number of infant deaths per 1,000 live births. In 2002, the IMR in Oklahoma was 8.1 compared to the national rate of 7.0. The Healthy People 2010 goal is to reduce the national infant mortality rate from 7.0 to 4.5.

Study Objectives

- To examine deaths among children whose mothers were enrolled in *Children First* at the time of the child's birth;
- To compare the participation of *Children First* clients who experienced an infant/child death to all *Children First* clients;
- To describe how infant mortality rates among *Children First* participants compare to rates in Oklahoma.

Methods

- Birth forms in the *Children First* database between 1997-2004 were matched against death certificates entered into the Vital Statistics database to identify children in the program who had since died. Missing or erroneous data were completed using death certificate hardcopies. The sample frame was limited to *Children First* mothers who had given birth while participating in the program.
- For enrollment and visit characteristics, the means and proportions of the sample (children who died and their mothers) were tested against all *Children First* participants during the same time period.
- In examining mortality rates, 1997 and 1998 were excluded due to lack of data in the *Children First* database. The years 1999 and 2000 were excluded from statewide mortality statistics because "unknown" previous births were unusually high for those years in Oklahoma, which would artificially inflate infant mortality rates for first-time births. Death certificates of infants whose mothers were OK residents at the time of first-time birth matched to birth certificates were included. Rates were not adjusted for age. Cause-specific IMR for *Children First* participants were compared to state rates for all births during the time period.

Results

Child Characteristics

- Between 1997-2004, 63 children died whose mother gave birth to them while participating in *Children First*.
- Most children who died were infants with the greatest proportion dying in the postneonatal period [See Table 1].
- The majority of deaths were due to natural causes [See Table 1].
- Two-thirds of accidental deaths were to children older than 24 months; 84.1% of natural deaths were of infants ages 0-12 months. Among the homicide victims, two were 0-6 months old and one was two years old.
- There were nine accidental deaths, with six being of children who had aged out of the *Children First* program. Causes: four exposures to uncontrolled fires in structures or buildings, one ingestion of food that obstructed respiratory tract, one drowning in natural water; two injured in motor vehicle accidents, and one unspecified threat to breathing.
- Of the 39.7% children born with low birthweight, most were very low birthweight (VLBW) [See Table 1]. Ninety percent of deaths to infants born preterm and/or LBW were due to natural causes and 90.0% occurred in infancy.
- Almost half of deaths to infants born preterm and/or LBW occurred in the neonatal period, compared to approximately 10% of deaths to non-preterm/LBW infants.

Table 1. Characteristics of Children Who Died

	N	%
SEX		
M	36	57.1
F	27	42.9
AGE		
Neonatal, 0-28 days	17	27.0
Postneonatal, >28 days, <1 year	31	49.2
>= 1 year, <2 years	6	9.5
>=2 years, <3 years	5	7.9
>=3 years, <4 years	2	3.2
>=4 years, <5 years	1	1.6
>=5 years	1	1.6
AGE CATEGORY		
Infant <12 months	48	76.2
Child >= 12 months	15	23.0
BIRTH WEIGHT		
Very Low Birthweight	18	28.6
Low birthweight	7	11.1
Not low birthweight	38	60.3
PREMATURITY		
Premature	27	42.9
Not premature	32	50.8
Unknown	4	6.3
MANNER OF DEATH from Death Certificate		
Natural	44	69.8
Accident	9	14.3
Could Not Be Determined	7	11.1
Homicide	3	4.8

Maternal Characteristics

- Mothers in the sample (whose child died) generally resembled all *Children First* mothers enrolled during same time frame [See Table 2] except that a greater proportion of mothers in the sample reported their annual household income as less than $15,001 ($p<0.05$).

Program Involvement

- There were no differences between the sample group and all *Children First* participants in terms of weeks gestation at enrollment or completed home visits received (after excluding infants who lived <28 days) [See Table 2]. In addition, their reasons for dropping out of the program did not appear to differ from those of the general *Children First* population.

- Forty-one of the children were 'active' in the program at the time of death (had received a completed home visit in the past 12 weeks); 22 were not. Eight children (12.7%) died past the age of 24 months.
- Among the 55 children < 25 months old, 74.5% were active in the program at death.
- A greater proportion of 'active' children died of natural causes than those who were not active (77.5% vs. 56.5%). This difference is probably due to the number of natural deaths to infants.

Table 2. Maternal Characteristics

	Sample Mothers, 1997-2004				All Children First, 1997-2004			
DEMOGRAPHICS	Mean	SE	N	%	Mean	SE	N	%
Age	20.85	0.67	-	-	20.08	0.27	-	-
Completed Years Education	11.13	0.27	-	-	11.46	0.16	-	-
Single, Never Married	-	-	37	58.7*	-	-	14,718	66.3
Household Income <$15,001	-	-	43	68.2**	-	-	13,003	58.6
Non-Hispanic/Latino Ethnicity	-	-	57	90.5	-	-	19,132	87.2
Self-reported White Only race	-	-	35	55.6	-	-	13,960	83.0
Sees Baby's Biological Father Daily	-	-	44	69.8	-	-	16,150	72.7
PROGRAM INVOLVEMENT	Sample Mothers, 1997-2004				All Children First, 1999-2004			
Weeks Pregnant at Enrollment	17.68	0.94	-	-	17.52	0.06	-	-
Completed Home Visits Received	16.38*	1.45	-	-	20.20	0.11	-	-
Subset, Completed Home Visits Received for Mothers Whose Infant Lived >=28 days	18.82	1.83	-	-			-	-

*p<0.10; **p<0.05

Infant Mortality

- Between 2001-2004, the IMR among non-*Children First* participants (at the time of birth) with first-time live births was almost 2.5 times the IMR for *Children First* participants [Figure 1].
- *Children First* infants had cell sizes >0 for six of the top 20 causes of infant death in Oklahoma [See Table 3]. For these, the IMR among non-*Children First* participants (at the time of birth) was between 1.6 and 3.3 times the IMR for *Children First* participants. Only congenital anomalies and short gestation were statistically significant.

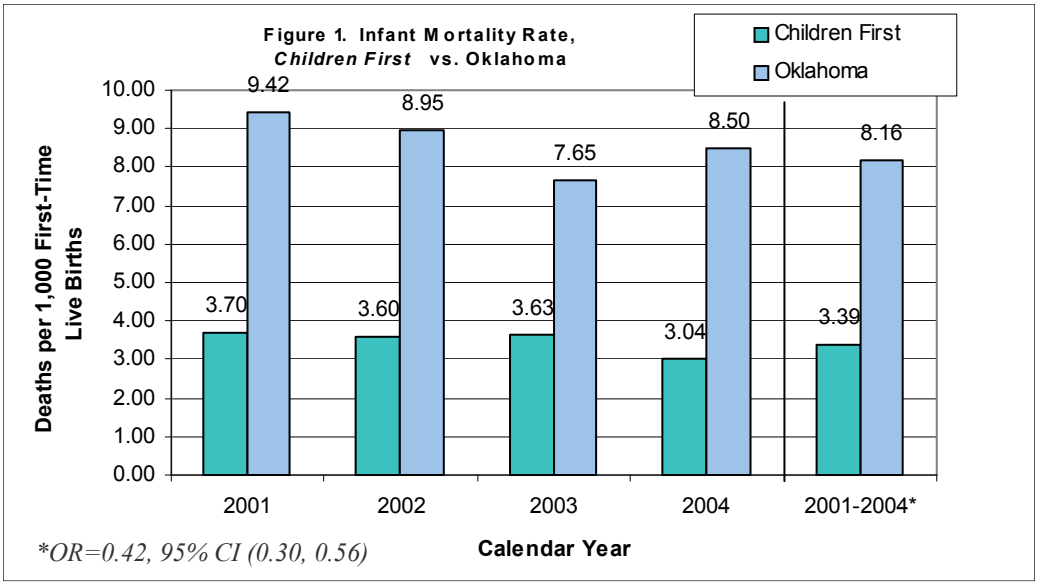

Table 3. Cause-specific Infant Mortality Rates for Children First Participants vs. General Population of Oklahoma, 1999-2004

		Non-Children First (N=236,921)		Children First(N=12,474)			
Rank in Oklahoma	Cause of Death	Cases	Rate per 1,000 live births*	Cases	Rate per 1,000 live births	OR	95% CI
1	Congenital anomalies **	429	1.811	7	0.561	0.305	(0.14, 0.64)
2	Short gestation**	227	0.958	4	0.321	0.329	(0.12, 0.88)
3	SIDS	217	0.912	8	0.641	0.678	(0.33, 1.37)
7	Unintentional injuries	58	0.245	2	0.160	0.633	(0.15, 2.59)
8	Bacterial sepsis	56	0.241	1	0.080	0.333	(0.05, 2.41)
12	Homicide	27	0.114	1	0.080	0.678	(0.09, 4.99)

*Denominator represents all live births excluding births to Children First mothers; Children First births are first-time births

**Assume to be counded by parity >1 and higher maternal age in the general population

Conclusions

- The infant mortality rate for *Children First* participants appears to be approximately half, and may be closer to one-third that of the general population of first-time births in Oklahoma.
- The infant mortality rate for *Children First* participants exceeds goals set by Healthy People 2010 (3.4 v. 4.5).
- While it appears that *Children Fi*rst participants had statistically significantly lower IMR for congenital anomalies and short gestation than the general population of Oklahoma, higher maternal age and multiparity in the comparison group are factors that could likely result in a higher IMR from these causes as compared to younger, primiparous *Children First* mothers. For the other cause-specific infant mortality rates, *Children First* participants did not differ significantly from the general population of Oklahoma [See Table 3].
- The population of *Children First* mothers who experienced an infant or child death was not distinguishable from the

Children First population as a whole except that a greater proportion reported <$15,001 income.

- Areas for programmatic improvement include strengthening efforts to address issues related to preterm delivery and low birthweight, and helping parents prevent SIDS (Sudden Infant Death Syndrome) and unintentional injuries.

Limitations

- The sample size was small (n=63).
- This study was dependent on data recorded on death certificates and entered into a database. Death certificate data are not always recorded or collected in a consistent manner. Two out of 63 death certificates reviewed for this study had the wrong manner of death entered into the death certificate database, and seven were missing manner of death in the database. Those missing manner of death were coded as "natural" according to the ICD-10 code for cause of death.
- It is possible that an infant/child formerly enrolled in *Children First* died in another state or country and that his/her death certificate was never entered into the Oklahoma database. It is also possible that, for reasons beyond the control of this study, information about a birth to an active *Children First* client was never collected or entered into the database.
- *Children First* data from 1997 and 1998 were excluded for analysis purposes because, during those two years of program startup, data collection is considered to have been inconsistent.
- The sample only included those women who gave birth while actively participating in the *Children First* program. Including women who dropped out or were lost to the program during pregnancy may have enriched the picture of infant and child mortality among participants.
- The comparison groups for infant mortality (first-time live births in Oklahoma) and for cause-specific infant mortality (all births in Oklahoma) were not age adjusted. In general, a greater proportion of women in Children First are younger than 25 years old than women with first-time live births in the state of Oklahoma (83.9% vs. 65.6% in 2005). While it is reasonable to expect 20-25 year olds to have a lower IMR, a greater proportion of *Children First* mothers are low-income, unmarried, <20 years old, and African American - all risk factors for infant mortality[3]. Further analysis would need to be conducted to determine if adjusting for age and other variables would affect the results.

Public Health Implications

Results from this study add to the body of evidence supporting home visitation as an effective approach to preventing poor birth outcomes. The infant mortality rate among *Children First* participants meets Healthy People 2010 goals and is significantly lower than the statewide infant mortality rate for first-time births in Oklahoma. The results of this study highlight some areas of potential programmatic improvement in order to make the program more effective at preventing infant mortality and unintentional injury.

Sources:

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For more information about the *Children First* program, please contact the *Children First* office at (405) 271-7611.