

**Report on Perceived Excess of
Infant and Fetal Deaths
In O'Fallon, Missouri: An Update Through 2001**

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Background

This report updates an epidemiological investigation completed by the Office of Epidemiology at the Missouri Department of Health and Senior Services (DHSS) in September of 2001. The original investigation was the result of an inquiry received by the DHSS in January 2001 from a resident of the city of O'Fallon, Missouri. The inquirer believed there was an increase in infant and fetal deaths in the city of O'Fallon, Missouri in year 2000. The original investigation included the following analytical works: 1) case-series study with cases from the O'Fallon area where the inquirer thought cases were clustering; 2) review of all deaths from 1990 to 2000 using codes in the international classification of deaths, volume 9 (ICD-9); 3) cluster study with calculated statistical differences between observed and expected events and computation of Ohno and Grimson testing for spatial clustering of cases in the O'Fallon community. The original investigation found 22 different causes of deaths among the 40 infant and fetal deaths reported in O'Fallon from 1990 to 2000. It also found that there was no statistically significant evidence that infant and fetal deaths recorded in O'Fallon in year 2000 were different from those expected in Saint Charles County or Missouri reference populations over the same time period. In spite of the findings, a 24-month active surveillance on these indicators in Saint Charles and O'Fallon was recommended for two reasons. First, adding more years of data to the studied case series would increase the power of the statistical analysis. Second, if an environmental contaminant were, and is still causing infant deaths in the community, over time, cases of infant deaths attributed to the contaminant would have to increase. More complex analysis was not deemed necessary at this time because simpler statistics are sensitive to detect elevation in the number of observed cases.

Goals

The goals of updating this investigation through 2001 were twofold. First, it seems to increase the statistical power of the original analysis by including one more year of data of infant and fetal deaths events recorded in O'Fallon in 2001; and second, it will fulfill the 24-month active surveillance follow-up recommended by the previous investigation.

Methods

Data and Study Population

The investigation used death record datasets maintained by the Missouri Department of Health and Senior Services Center for Health Information, Management and Evaluation (CHIME). The investigation included data on live births, neonatal deaths (infant deaths < 28 days of age), post-neonatal deaths (infant deaths 28 days through one year) and fetal deaths (deaths in uterus at 20 or more weeks of pregnancy) for the state of Missouri, Saint Charles County and for the zip codes that compose the city of O'Fallon. Because the interest was to determine whether excesses of fetal and infant deaths existed and clustered in O'Fallon individual zip codes, as well as in the whole O'Fallon area, investigators kept the same geographic compositions used in the previous investigation for the city of O'Fallon (i.e., zip codes 63304, 63366, 63376 and all zip codes combined).

Analysis

Similar to the original investigation, investigators compared fetal and infant deaths rates indicators for Missouri and Saint Charles County to O'Fallon fetal and infant deaths. Investigators calculated fetal, neonatal, post-neonatal and total infant (neonatal and post-

neonatal) deaths rates, per 1000 live births for Missouri, Saint Charles County and O'Fallon (single zip codes and all zip codes combined). Investigators used mortality rates for Missouri and Saint Charles County to estimate expected infant and fetal deaths events for the city of O'Fallon as a whole and for the individual zip codes, and computed the ratio of observed by expected events for Saint Charles County and O'Fallon. In addition to the ratio of observed to expected events, investigators used standardized z-statistics to determine whether differences between observed and expected number of cases were statistically significant.

Results

Table 1 displays live births, fetal and infant deaths (neonatal and post-neonatal) and rates per 1,000 live births for Missouri, Saint Charles, and the individual and combined zip codes that compose the city of O'Fallon. Figures 1-8 display annual rates for fetal and infant deaths in each of the geo areas under consideration.

Overall, infant and fetal death rates declined in Missouri and remained stable in Saint Charles, O'Fallon and O'Fallon studied Zip codes (63366, 63376 and 63304) (Table 1 and Figures 1-8). Infant and fetal death rates for O'Fallon and O'Fallon specific Zip codes are similar to those in Saint Charles and Missouri.

Infant deaths rate in Missouri declined from 10.2 events per 1000 live births in 1991 to 7.4 in 2001 (Table 1 and Figure 1). The fetal deaths rate declined from 6.6 events per 1000 live births in 1990 to 5.4 events per 1000 live births in 2001. In Saint Charles County the rate of infant deaths decreased from 6.4 deaths per 1000 live births in 2000 to 4.3 deaths per 1000 in 2001. The rate of fetal deaths on the other hand, increased from 3.1 events per 1000 live births in 2000 to 5.0 events per 1000 live births in 2001 (Table 1 and Figure 5).

The rate of infant deaths in O'Fallon decreased from 5.6 per 1000 live births in 2000 to 3.3 per 1000 live births in 2001. On the other hand, the fetal deaths rate increased from 3.4 events per 1000 live births in 2000 to 4.8 events per 1000 live births in 2001, but remained below the Missouri and Saint Charles rates of 5.4 and 5.0, respectively (Table 1 Figure 5).

In Zip code area 63366, the infant deaths rate decreased from 7.7 deaths per 1,000 live births in year 2000 to 1.6 deaths per 1,000 live births in 2001 (Table 1 and Figure 6). This decline was due to decreases in the neonatal deaths rate from 6.8 neonatal deaths per 1000 live births in 2000 to 1.6 in 2001, and post-neonatal deaths from about one per 1000 live births to zero in the same period. Fetal deaths also declined in 2001 in this geo-area; the rate per 1000 live births went from 4.3 in 2000 to 3.3 in 2001. In zip code 63376 infant deaths rate slightly increased from 5.6 in 2000 to 6.7 deaths per 1000 live births in 2001 (Table 1 and Figure 3), and fetal deaths increased from 2.3 to 5.6 deaths per 1000 live births from 2000 to 2001 (Table 1 and Figure 7). In zip code 63304 the increase in the infant deaths rate was very small, 0.10 per 1000 live births (Table 1 and Figure 4) leaving 1.8 infant deaths per 1000 live births in 2001, but the fetal death rate increased from 3.3 to 7.1 deaths per 1000 live births during the same period (Table 1 and Figure 8). Rate changes over time were not statistically significant (not in tables or figures). The observed variations in the infant and fetal rate (i.e., increases or decreases) during the investigation period in Saint Charles, O'Fallon and O'Fallon Zip Codes (63366, 63376 and 63304) are due to the small number of records and subsequent random variation.

In Saint Charles County, O'Fallon and O'Fallon specific Zip codes during the 1990-2001 interval the accumulated observed infant and fetal deaths were lower than the expected deaths, except for post-neonatal deaths in O'Fallon Zip code 63376 and fetal deaths in O'Fallon Zip code 63304, (Table 2). In other words, the number of observed minus expected events was less

than one standard deviation from the mean of all events occurring in the past 12 years. Greater than expected number of cases of post-neonatal deaths in O'Fallon Zip code 63376 and fetal deaths in O'Fallon Zip code 63304 were not statistically significant.

Conclusions

The analysis of historical data on fetal and infant deaths rates for the past 12 years in the city of O'Fallon, Missouri does not show any statistically significant evidence of an increase in the number of events reported in this area. This finding is validated by comparison of infant and fetal deaths experience for O'Fallon with those reported for Saint Charles County and the state of Missouri for the 12-year period. Furthermore, the previously reported lack of a specific risk factor or cause of death does not support evidence of an environmental cause of infant and fetal deaths in O'Fallon or Saint Charles County in year 2001. Finally, previous reports by DEHCD-DHSS and DNR did not confirm findings of any environmental exposure that could threaten the health of O'Fallon residents during this investigation period (1990-2001).

Previously, a more complex analysis of these data utilizing clustering methodology did not suggest point environmental source or statistically community clusters of infant or fetal deaths. The just completed analysis presented above adds considerable power to the initial analysis with the addition of one more year of data (2001). We recommend that we continue with the original plan for an additional analysis of year 2002 data, when available, to complete the investigation.

Table 1. Infant and Fetal Deaths and Rates for Missouri, Saint Charles and O'Fallon

Infant and Fetal Deaths and Rates	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
Missouri												
Live Births	79135	78468	76005	75146	73279	72804	73733	73940	75242	75366	76329	75290
Fetal Deaths	525	520	497	493	423	434	440	446	450	448	430	410
Fetal Deaths Rate	6.6	6.6	6.5	6.6	5.8	6.0	6.0	6.0	6.0	5.9	5.6	5.4
Neonatal Deaths	448	489	397	385	358	334	357	350	370	381	364	367
Neonatal Deaths Rate	5.7	6.2	5.2	5.1	4.9	4.6	4.8	4.7	4.9	5.1	4.8	4.9
Post-Neonatal Deaths	298	309	250	245	239	205	201	212	203	200	183	188
Post-Neonatal Deaths Rate	3.8	3.9	3.3	3.3	3.3	2.8	2.7	2.9	2.7	2.7	2.4	2.5
Infant Deaths	746	798	647	630	597	539	558	562	573	581	547	555
Infant Deaths Rate	9.4	10.2	8.5	8.4	8.1	7.4	7.6	7.6	7.6	7.7	7.2	7.4
Saint Charles - Live Births												
Live Births	3886	3744	3735	3724	3681	3730	3971	3905	4095	4071	4244	4178
Fetal Deaths	20	14	17	12	19	14	17	16	15	11	13	21
Fetal Deaths Rate	5.1	3.7	4.6	3.2	5.2	3.8	4.3	4.1	3.7	2.7	3.1	5.0
Neonatal Deaths	13	12	10	14	12	10	15	21	14	16	21	13
Neonatal Deaths Rate	3.3	3.2	2.7	3.8	3.3	2.7	3.8	5.4	3.4	3.9	4.9	3.1
Post-Neonatal Deaths	2	10	6	5	6	10	7	6	9	6	6	5
Post-Neonatal Deaths Rate	0.5	2.7	1.6	1.3	1.6	2.7	1.8	1.5	2.2	1.5	1.4	1.2
Infant Deaths	15	22	16	19	18	20	22	27	23	22	27	18
Infant Deaths Rate	3.9	5.9	4.3	5.1	4.9	5.4	5.5	6.9	5.6	5.4	6.4	4.3
O'FALLON (Zipcode 63366)												
Live Births	603	633	613	684	748	738	857	874	988	991	1172	1228
Fetal Deaths	2	2	3	2	2	3	4	7	2	1	5	4
Fetal Deaths Rate	3.32	3.16	4.89	2.92	2.67	4.07	4.67	8.01	2.02	1.01	4.27	3.26
Neonatal Deaths	1	2	2	4	5	1	2	3	2	2	8	2
Neonatal Deaths Rate	1.7	3.2	3.3	5.8	6.7	1.4	2.3	3.4	2.0	2.0	6.8	1.6
Post-Neonatal Deaths	0	0	1	1	1	2	0	0	1	2	1	0
Post-Neonatal Deaths Rate	0.0	0.0	1.6	1.5	1.3	2.7	0.0	0.0	1.0	2.0	0.9	0.0
Infant Deaths	1	2	3	5	6	3	2	3	3	4	9	2
Infant Deaths Rate	1.7	3.2	4.9	7.3	8.0	4.1	2.3	3.4	3.0	4.0	7.7	1.6
O'FALLON (Zipcode 63376)												
Live Births	891	948	1029	942	941	915	898	951	892	950	885	895
Fetal Deaths	4	3	3	2	6	4	5	2	3	1	2	5
Fetal Deaths Rate	4.5	3.2	2.9	2.1	6.4	4.4	5.6	2.1	3.4	1.1	2.3	5.6
Neonatal Deaths	0	2	3	2	3	1	1	3	4	4	4	4
Neonatal Deaths Rate	0	2.1	2.9	2.1	3.2	1.1	1.1	3.2	4.5	4.2	4.5	4.5
Post-Neonatal Deaths	0	4	3	1	1	2	2	1	3	3	1	2
Post-Neonatal Deaths Rate	0	4.2	2.9	1.1	1.1	2.2	2.2	1.1	3.4	3.2	1.1	2.2
Infant Deaths	0	6	6	3	4	3	3	4	7	7	5	6
Infant Deaths Rate	0.0	6.3	5.8	3.2	4.3	3.3	3.3	4.2	7.8	7.4	5.6	6.7
O'FALLON (Zipcode 63304)												
Live Births	0	151	435	453	498	544	556	502	559	604	603	567
Fetal Deaths	0	0	1	1	3	4	3	2	1	4	2	4
Fetal Deaths Rate	0	0.0	2.3	2.2	6.0	7.4	5.4	4.0	1.8	6.6	3.3	7.1
Neonatal Deaths	0	0	0	2	0	1	3	5	2	3	0	0
Neonatal Deaths Rate	0	0.0	0.0	4.4	0.0	1.8	5.4	10.0	3.6	5.0	0.0	0.0
Post-Neonatal Deaths	0	0	0	1	0	2	2	0	1	0	1	1
Post-Neonatal Deaths Rate	0	0.0	0.0	2.2	0.0	3.7	3.6	0.0	1.8	0.0	1.7	1.8
Infant Deaths	0	0	0	3	0	3	5	5	3	3	1	1
Infant Deaths Rate	0	0	0.0	6.6	0.0	5.5	9.0	10.0	5.4	5.0	1.7	1.8
Combined O'FALLON: Zipcodes 63366, 63376, 63304)												
Live Births	1494	1732	2077	2079	2187	2197	2311	2327	2439	2545	2660	2690
Fetal Deaths	6	5	7	5	11	11	12	11	6	6	9	13
Fetal Deaths Rate	4.0	2.9	3.4	2.4	5.0	5.0	5.2	4.7	2.5	2.4	3.4	4.8
Neonatal Deaths	1	4	5	8	8	3	6	11	8	9	12	6
Neonatal Deaths Rate	0.7	2.3	2.4	3.8	3.7	1.4	2.6	4.7	3.3	3.5	4.5	2.2
Post-Neonatal Deaths	0	4	4	3	2	6	4	1	5	5	3	3
Post-Neonatal Deaths Rate	0.0	2.3	1.9	1.4	0.9	2.7	1.7	0.4	2.1	2.0	1.1	1.1
Infant Deaths	1	8	9	11	10	9	10	12	13	14	15	9
Infant Deaths Rate	0.7	4.6	4.3	5.3	4.6	4.1	4.3	5.2	5.3	5.5	5.6	3.3

Table 2. Infant and Fetal deaths Observed and Expected, Ratios and Probability of Dying; Saint Charles County and O'Fallon: 1990-2001

Area	Type of Death	Observed Events	Expected Events	Observed/Expected	Z-Value**
Saint Charles County	Fetal	189	286	0.66	-5.74
	Neonatal	171	239	0.72	-4.40
	Post-Neonatal	78	142	0.55	-5.37
	Infant	249	381	0.65	-6.76
O'Fallon (Zipcode 63366)	Fetal	37	41	0.90	-0.62
	Neonatal	34	37	0.92	-0.49
	Post-Neonatal	9	17	0.53	-1.94
	Infant	43	54	0.80	-1.50
O'Fallon (Zipcode 63376)	Fetal	40	45	0.89	-0.75
	Neonatal	31	41	0.76	-1.56
	Post-Neonatal	23	18	1.28	1.18
	Infant	54	59	0.92	-0.65
O'Fallon (Zipcode 63304)	Fetal	25	22	1.14	0.64
	Neonatal	16	20	0.80	-0.89
	Post-Neonatal	8	9	0.89	-0.33
	Infant	24	29	0.83	-0.93
O'Fallon (combined zipcodes)	Fetal	102	108	0.94	-0.58
	Neonatal	81	97	0.84	-1.62
	Post-Neonatal	40	44	0.91	-0.60
	Infant	121	142	0.85	-1.76

Figure 1. Infant Deaths Rates in Missouri, St. Charles and O'Fallon All Zipcodes

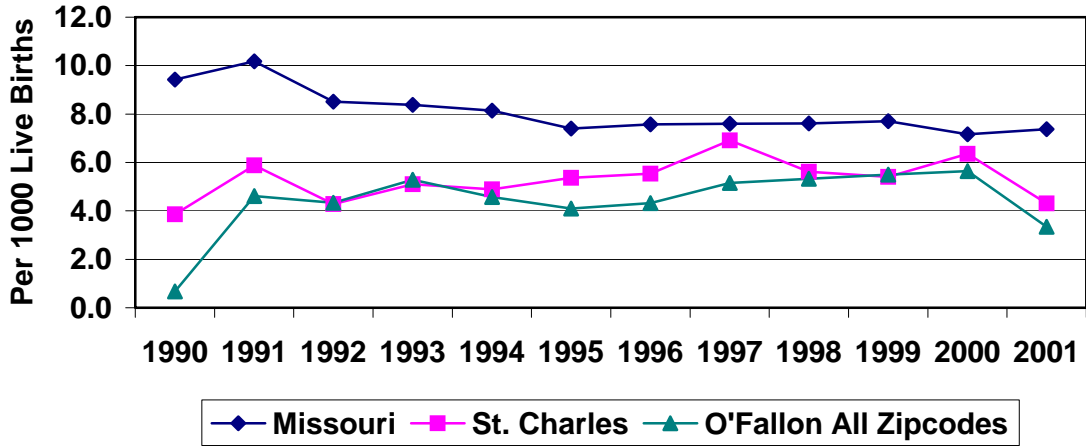


Figure 2. Infant Deaths Rates in Missouri, St. Charles and O'Fallon Zipcode 63366

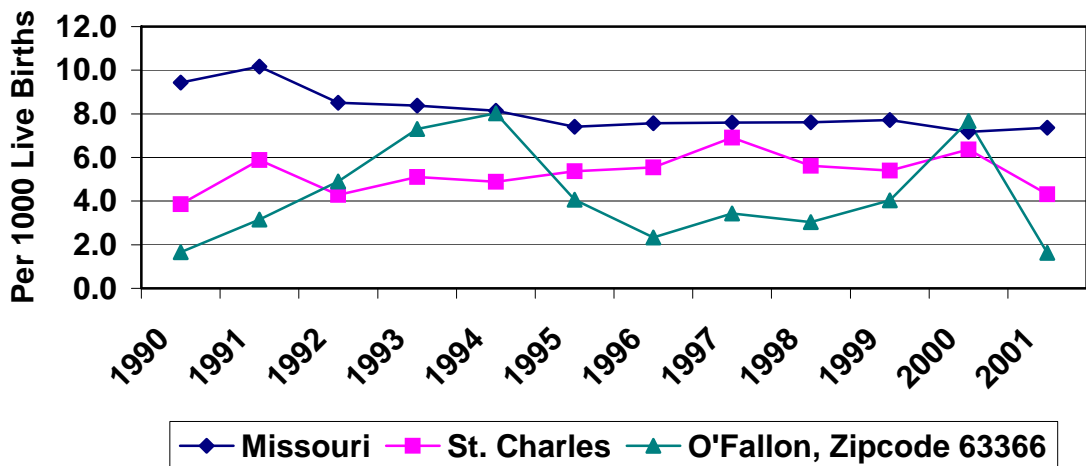


Figure 3. Infant Deaths Rates in Missouri, St. Charles and O'Fallon Zipcode 63376

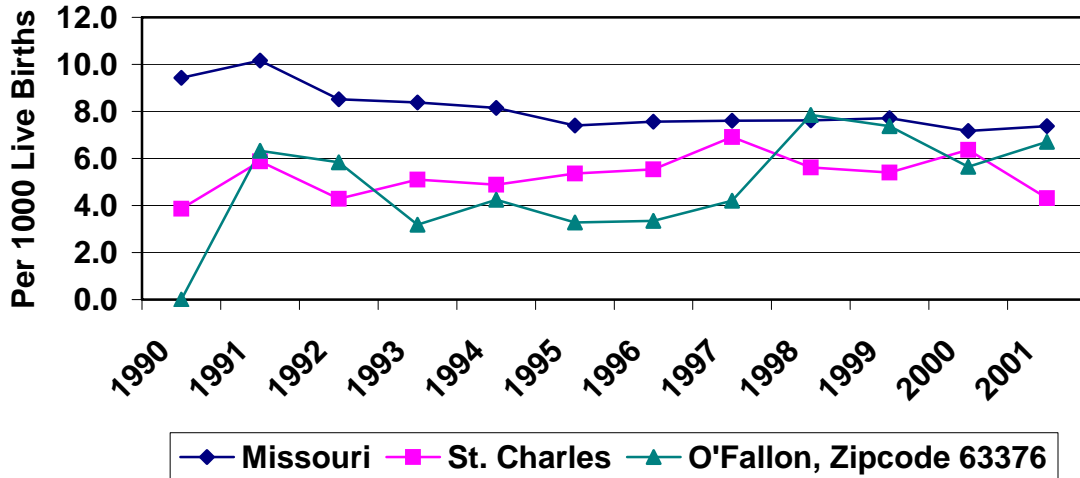


Figure 4. Infant Deaths Rates in Missouri, St. Charles and O'Fallon Zipcode 63304

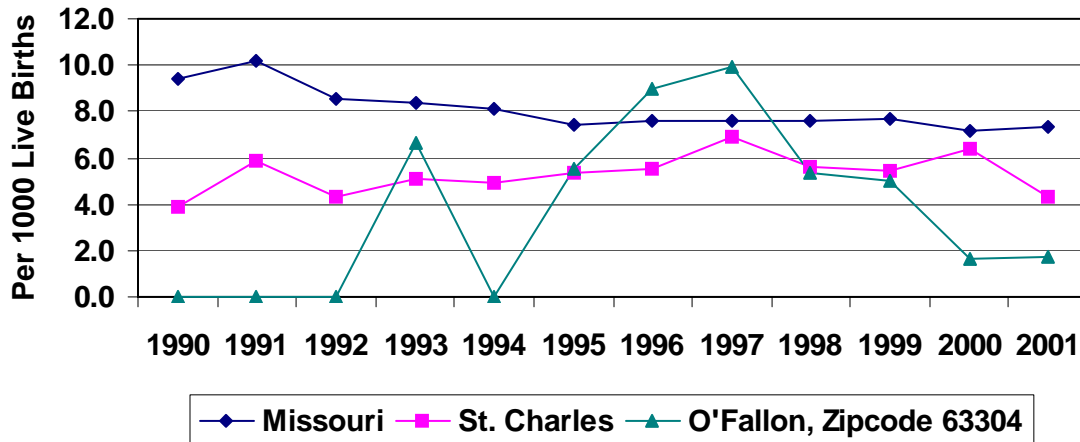


Figure 5. Fetal Deaths Rates in Missouri, St. Charles and O'Fallon All Zipcodes

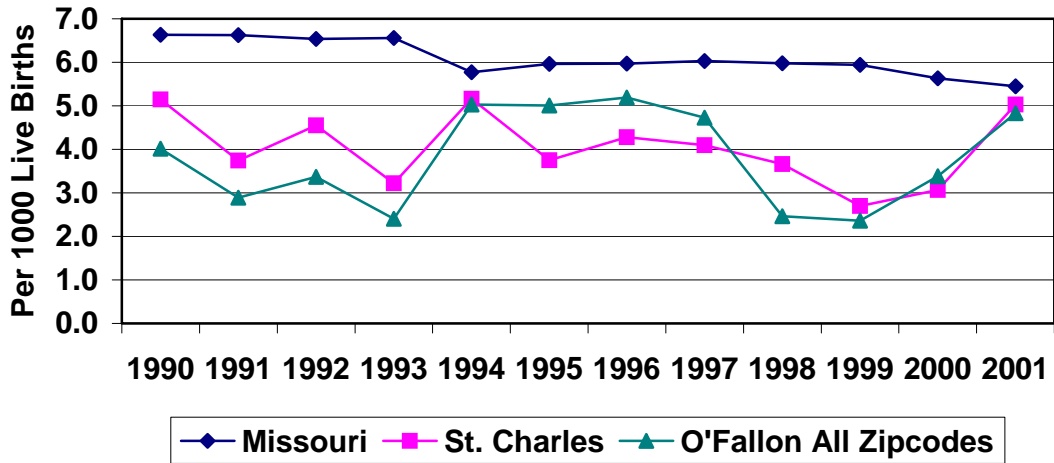


Figure 6. Fetal Deaths Rates in Missouri, St. Charles and O'Fallon Zipcode 63366

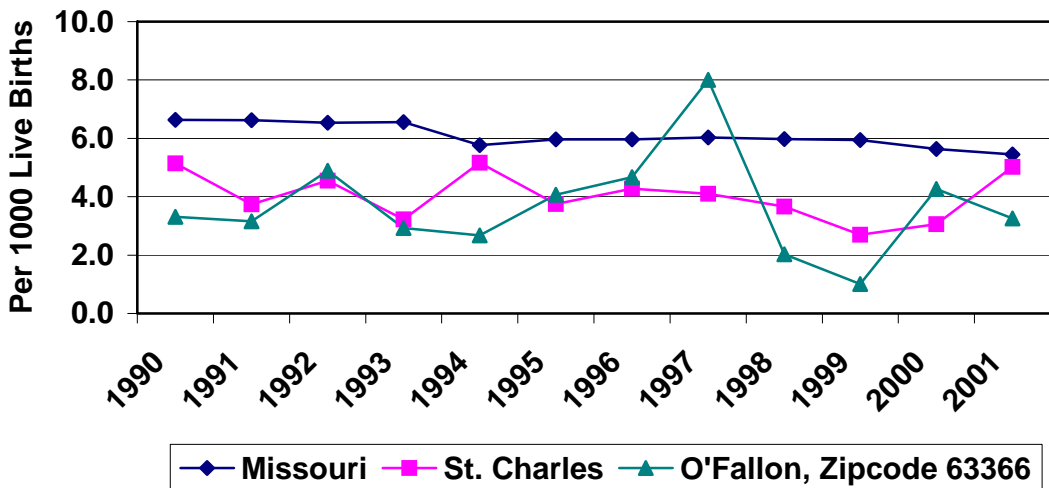


Figure 7. Fetal Deaths Rates in Missouri, St. Charles and O'Fallon Zipcode 63376

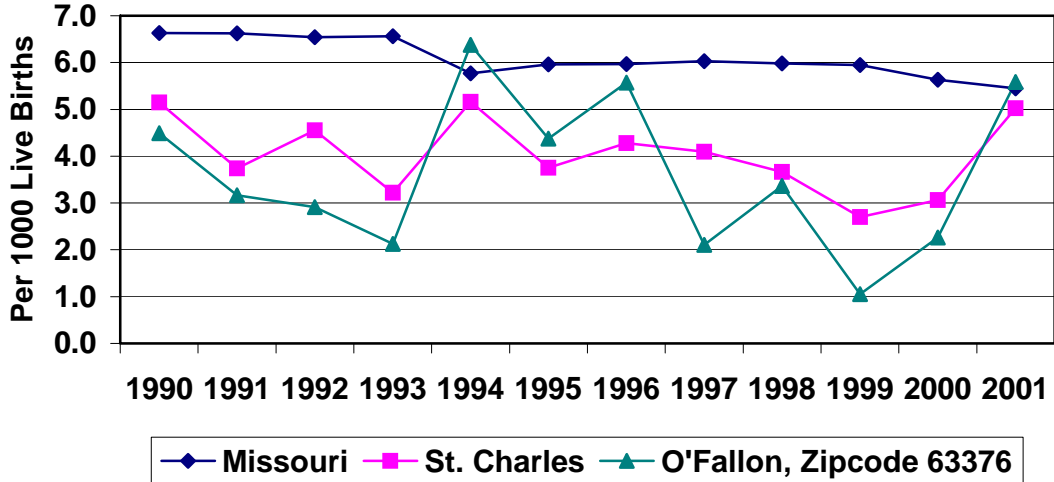


Figure 8. Fetal Deaths Rates in Missouri, St. Charles and O'Fallon Zipcode 63304

