
Neuroblastoma Incidence in Illinois: 1986-1994

Neuroblastomas are childhood tumors of the autonomic nervous system. The annual incidence rate among children under 15 years of age in the United States is nine to 11 cases per million. In Illinois, according to data reported to the Illinois State Cancer Registry for 1986 through 1994, the annual incidence rate was 10.3 per million. Table 1 lists numbers of neuroblastoma incidence among children less than 15 years of age by county in Illinois from 1986 through 1994. As one would expect, counties with a large population, such as Cook and Du Page, tend to have more cases.

In order to detect unusually high incidence of neuroblastoma, numbers in Table 1 need to be related to their population denominators, compared with the expected number of cases based on the overall neuroblastoma incidence in Illinois, and expressed in terms of probabilities. This was done by calculating Poisson probabilities. The higher a Poisson probability (range is from 0.0 to 1.0) of observing less than the actual number of cases, the more likely that the observation is not due to chance. Thus, in Figure 1, using the conventional formula $1-\alpha$, or 0.95, and not correcting for multiple statistical comparisons, five counties—Adams, Christian, Madison, McHenry, and Vermilion had statistically higher-than-expected incidence during the period, 1986 to 1994.

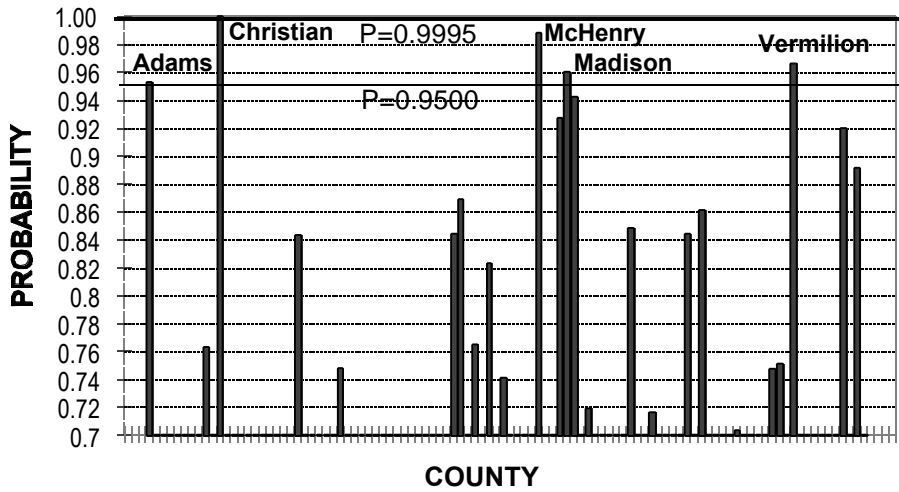
The same statistical test was applied and corrected for multiple comparisons in order to avoid the likelihood of detecting a statistically higher-than-expected, but false, incidence as the number of tested counties increased. The Bonferroni adjustment was used to correct the conventional probability level. This raised the probability level by which an incidence number was evaluated for statistical significance to $p=0.9995$ ($=1-0.05/n$, where $n=102$, the number of counties). Also shown in Figure 1, the only county that reached this level of significance was Christian County, which had six cases and a probability of observing less than six cases equal to 0.99992.

The significantly higher neuroblastoma incidence in Christian County was not accompanied by a similar pattern in nearby counties; adjacent counties showed similar-to-expected incidence. This was true even when the significance level was lowered to $p=0.90$ to increase the sensitivity of detecting cluster patterns around Christian County (Figure 2).

The time trend of Poisson probability of neuroblastoma incidence by county is depicted in Figure 3, at three-year intervals from 1986 to 1994. Higher-than-expected incidence, as judged by the probability greater than 0.95, was observed for several counties in one but not two time periods. Again, only Christian County had the higher-than-expected incidence for two time periods (i.e., 1986 to 1988 and 1989 to 1991).

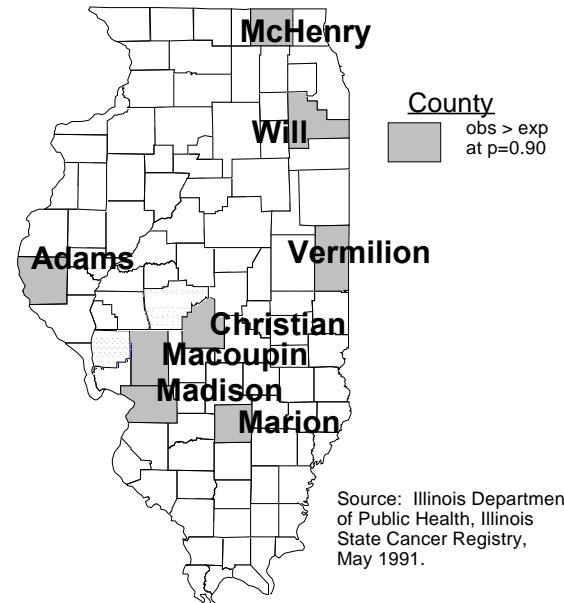
This descriptive analysis of county-level neuroblastoma incidence indicated that the spatial and temporal distributions of neuroblastoma incidence at the county level were not homogenous in Illinois. In particular, a higher-than-expected incidence was observed for Christian County. Although chance cannot be completely ruled out, the high incidence in this county warrants close monitoring of future events.

Figure 1. Neuroblastoma incidence by county: Poisson probability of observing less than actual cases, 1986-1994, Illinois



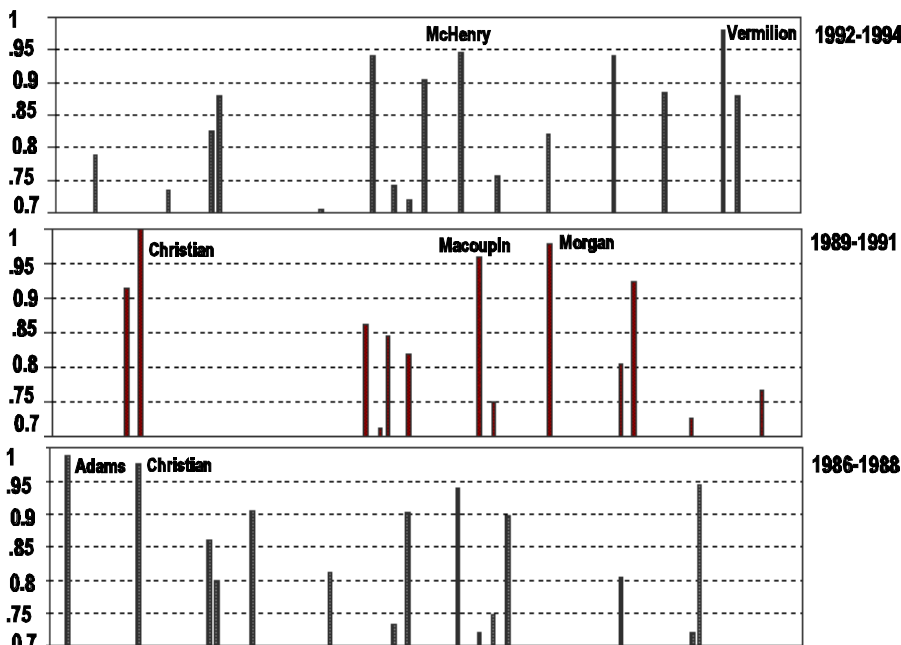
Source: Illinois Department of Public Health, Illinois State Cancer Registry, May 1996.
 Note: Counties with probability less than 0.7 were not shown. Counties with probability less than 0.95 were not labelled.

Figure 2. Counties with the number of observed cases > expected cases at Poisson probability of 0.90 or greater, 1986-1994, Illinois



Source: Illinois Department of Public Health, Illinois State Cancer Registry, May 1991.

Figure 3. Neuroblastoma incidence by county and time period: Poisson probability of observing less than actual cases, Illinois.



Source: Illinois Department of Public Health, Illinois State Cancer Registry, May 1996.
 Note: Counties with probability less than 0.7 were not shown. Counties with probability less than 0.95 were not labelled.

Table 1. Neuroblastoma incidence by county, Illinois, 1986-1994

County	No.	County	No.
ADAMS	4	MADISON	1
BUREAU	1	MARION	3
CASS	1	MASON	1
CHAMPAIGN	3	McHENRY	10
CHRISTIAN	6	McLEAN	2
COOK	101	MONTGOMERY	1
DOUGLAS	1	MORGAN	2
DU PAGE	21	PEORIA	2
EDGAR	1	PULASKI	1
FORD	1	RANDOLPH	2
HENRY	1	ROCK ISLAND	4
IROQUOIS	1	SANGAMON	5
JO DAVIESS	1	ST CLAIR	4
JOHNSON	1	STEPHENSON	2
KANE	4	TAZEWELL	4
KANKAKEE	2	VERMILION	5
KENDALL	2	WARREN	1
LA SALLE	2	WHITESIDE	1
LAKE	15	WILL	4
LAWRENCE	1	WILLIAMSON	1
MACON	1	WINNEBAGO	2
MACOUPIN	3	Total	232

Source: IDPH, Illinois State Cancer Registry, May 1996.
 Note: Counties with no cases were omitted.