

Investigation of Potential Clustering of Invasive Cancers among Children, Adolescents and Young Adults in Sandusky County, Ohio, 1996-2006

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May 28, 2009



Introduction

- In 2007, the Ohio Department of Health (ODH) conducted an assessment of cancer among childhood (ages 0-19) residents of Clyde City and Green Creek Township in Sandusky County, Ohio for the years 1996-2006. This assessment revealed a higher than expected burden of childhood cancer in the region.
- As a follow-up to this assessment, the Comprehensive Cancer Center and James Cancer Hospital and Solove Research Institute at The Ohio State University, in partnership with ODH, conducted a spatial (geographic) analysis to identify areas of Sandusky County where clustering of childhood cancers is most likely to occur.

Purpose

To determine whether or not there was clustering of invasive cancers among children residing in Sandusky County during the years 1996-2006.

Objectives

There were two primary objectives for this analysis:

1. To determine the geographic regions in Sandusky County and the surrounding area where the most likely clustering of cancers among children was occurring.
2. To determine the probability (**p-value**), or likelihood, that the cluster occurred by chance. A **p-value** of less than **0.05** was considered statistically significant.

Methods

Case Definition: Child age 0-19 diagnosed with invasive cancer during 1996-2006 while a resident of two geographic regions:

1. Sandusky County (38 cases)
2. Sandusky County and surrounding area, which included Ottawa and Seneca Counties and portions of Erie, Hancock, Huron, Lucas, Wood, and Wyandot Counties (277 cases)

Methods

Data Source: The Ohio Cancer Incidence Surveillance System (OCISS), the central cancer registry for Ohio

NOTE: Only those cases reported to the OCISS by a hospital, clinic, physician, or laboratory were included in the analysis.

Methods

Analysis software: SatScan, a software program that scans for high rates (clusters)

- SatScan identifies the most likely clusters in the geographic area.
- A **p-value** is calculated for each cluster to determine the probability that the cluster occurred by chance.

NOTE: SatScan will ALWAYS identify a cluster. Clustering can occur by chance, or it may be due to one or more factors.

Methods

Census tracts were selected as the geographic unit of analysis in SatScan. Cancer cases were aggregated to a geographic point in the census tract (the “centroid”) in two ways:

1. As the center of the census tract
2. As the weighted center of the cases/population within the census tract

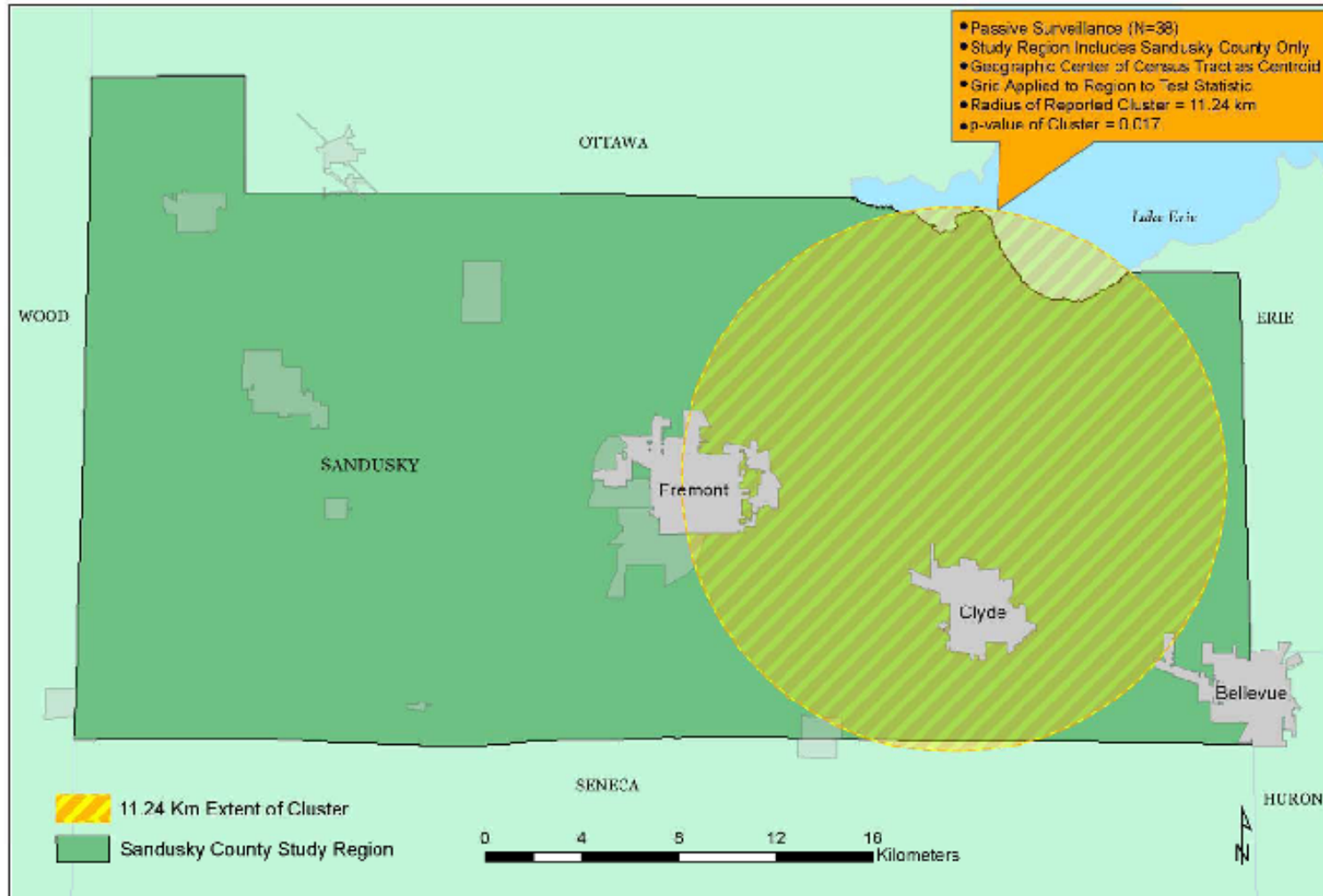
Methods

Two populations and two centroids were used, resulting in four methods:

- **Method 1:** Population = Sandusky County; Centroid = Center of the census tract
- **Method 2:** Population = Sandusky County; Centroid = Weighted center of cases within the census tract
- **Method 3:** Population = Sandusky County and surrounding area; Centroid = Center of the census tract
- **Method 4:** Population = Sandusky County and surrounding area; Centroid = Weighted center of population within the census tract

Results: Method 1

Figure 1



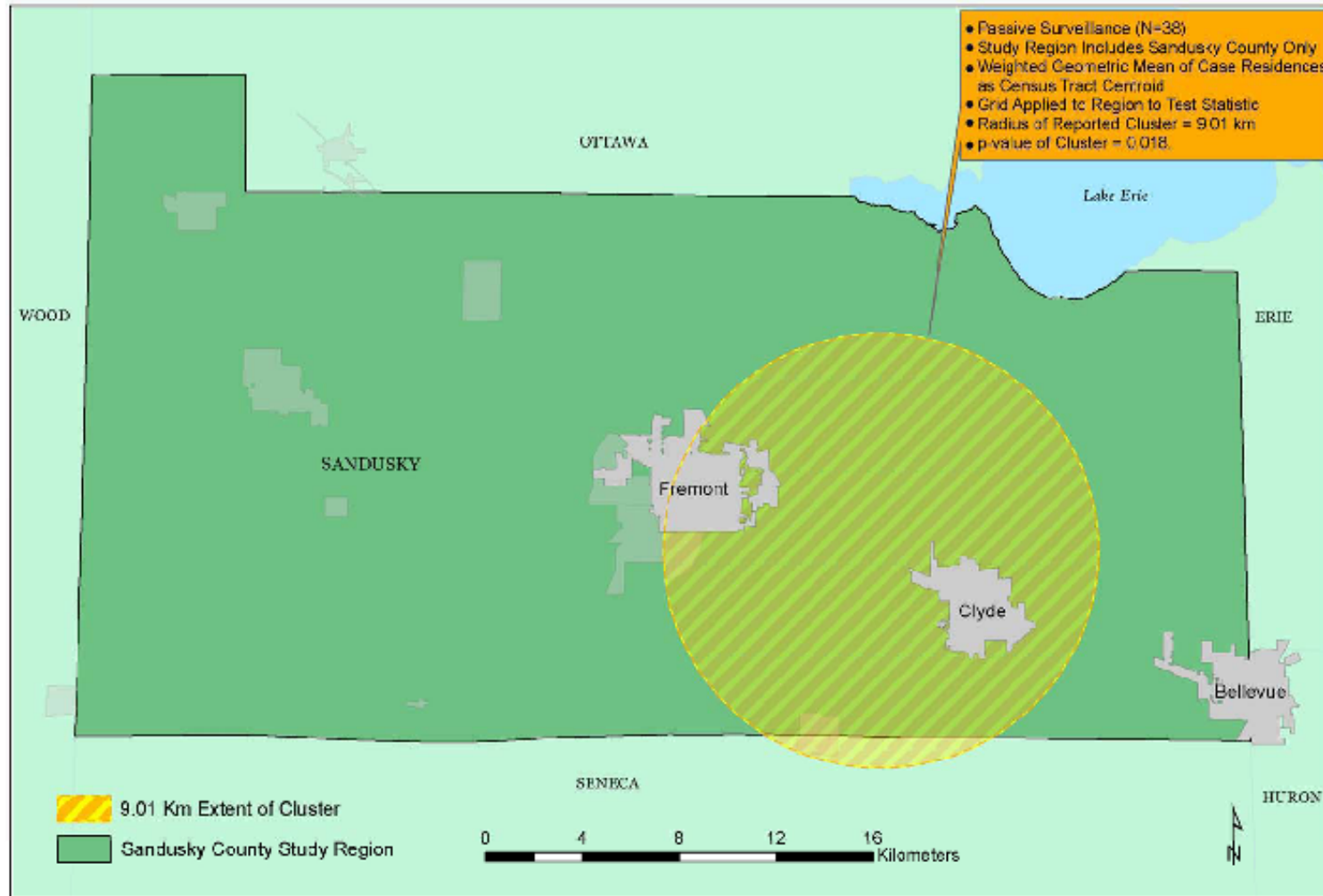
Results: Method 1

Population = Sandusky County
Centroid = Center of the census tract

- The most likely cluster occurred in the eastern portion of Sandusky County.
- Radius of cluster = 6.98 miles
- P-value = 0.017, which is statistically significant

Results: Method 2

Figure 2



Results: Method 2

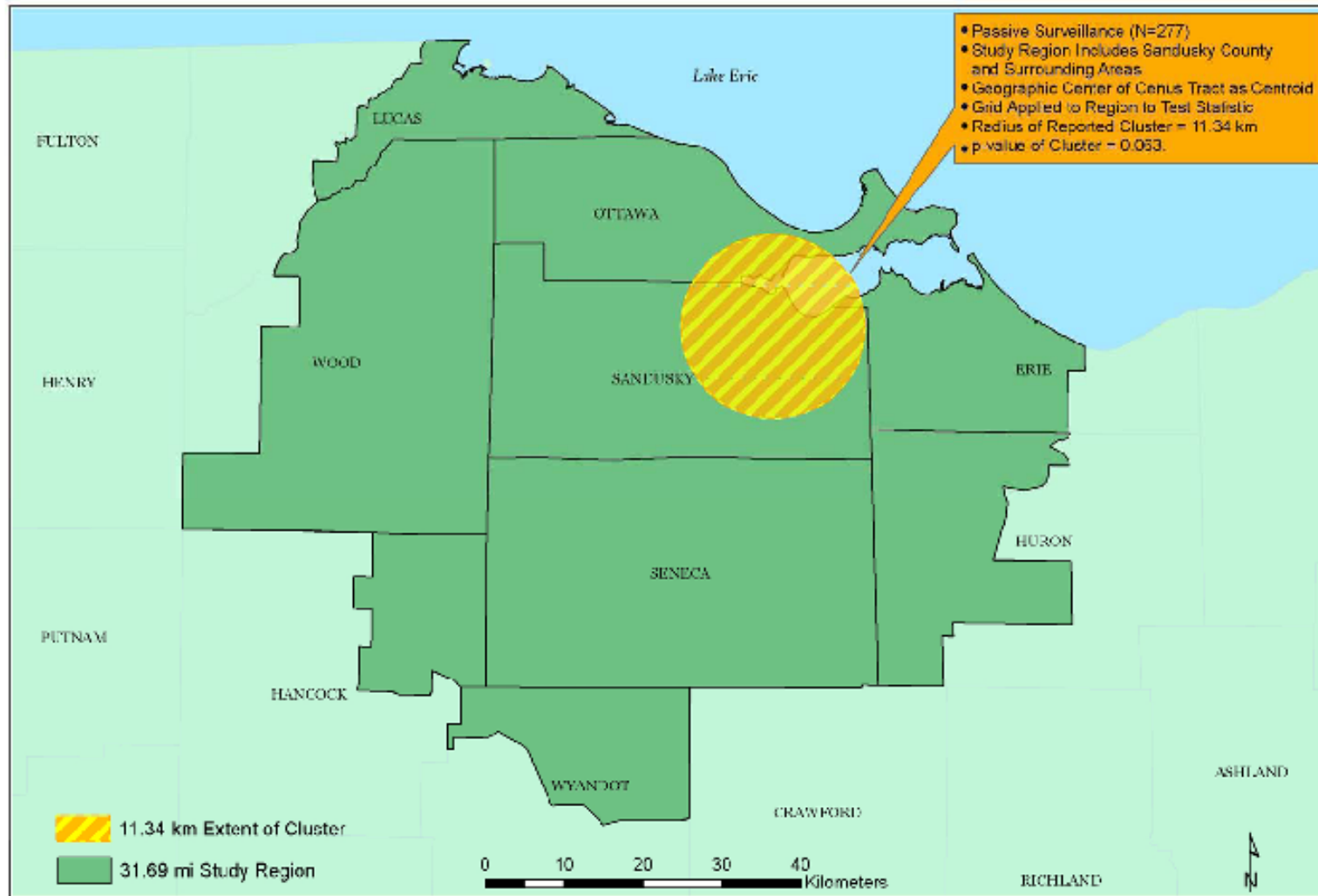
Population = Sandusky County

Centroid = Weighted center of cases within the census tract

- The most likely cluster occurred in the eastern portion of Sandusky County.
- Radius of cluster = 5.60 miles
- P-value = 0.018, which is statistically significant

Results: Method 3

Figure 3



Results: Method 3

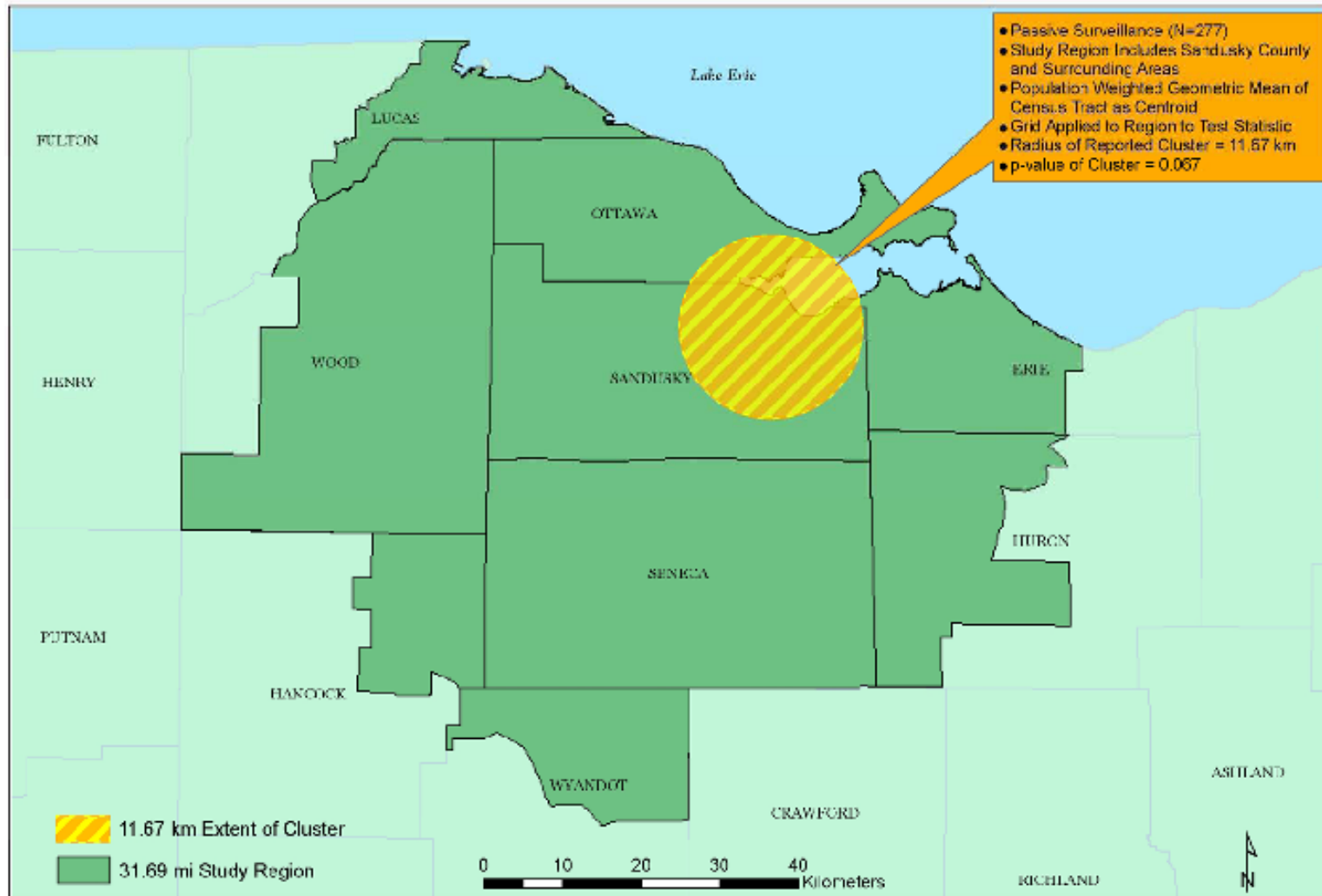
Population = Sandusky County and surrounding area

Centroid = Center of the census tract

- The most likely cluster occurred in the northeastern portion of Sandusky County, extending into southeastern Ottawa County and northwestern Erie County.
- Radius of cluster = 7.05 miles
- P-value = 0.063, which is **not statistically significant** but is still considered low

Results: Method 4

Figure 4



Results: Method 4

Population = Sandusky County and surrounding area

Centroid = Weighted center of population within the census tract

- The most likely cluster occurred in the northeastern portion of Sandusky County extending into southeastern Ottawa County and northwestern Erie County.
- Radius of cluster = 7.25 miles
- P-value = 0.067, which is **not statistically significant** but is still considered low

Results

Note: The four methods used in this investigation were independent of one another. That is, the lowest of the four p-values is not the most likely cluster of the four methods.

Conclusions

- Results of the four analyses suggest cancer clustering in the eastern/northeastern portion of Sandusky County, extending into southeastern Ottawa County. The probability of observing these clusters due to chance alone was low.
- The most likely clusters identified in Methods 1 and 2 were statistically significant; the most likely clusters identified in Methods 3 and 4 were not statistically significant but were still considered low.

Questions?