2020 NPCR TENNESSEE CANCER REGISTRY SUCCESS STORY

STORY TOPIC: Cancer Cluster Investigation

STORY CATEGORY: Public Health Impact

STORY TITLE: A Community/Cancer Registry, Collaborative Effort to Evaluate Cancer Burden in a Rural Community in Southeastern TN

STORY AUTHOR: Dr. Martin Whiteside

SUMMARY

In January of 2019, a concerned citizen of a small, rural community located in Grundy County, TN contacted a staff member at the University of the South, about a potential clustering of cancer cases. Through a chain of email contacts, this concern was communicated to the TCR Director who collaborated with the Grundy County Community Cancer Organization (GCCCO) to complete a detailed cluster investigation and send a final report by December 2019.

CHALLENGE

The first challenge when completing cancer cluster investigations is the lack of TCR staff trained in epidemiology. The TCR Director is the only TCR staff member trained in epidemiologic methods and was the only one responsible for completing these investigations.

A second challenge encountered with this cluster investigation was the rurality of the location under study. The 2013 rural-urban classification published by the National Center for Health Statistics (https://www.cdc.gov/nchs/data/series/sr_02/sr02_166.pdf) demonstrates that Grundy County is a so-called “Noncore” county with no cities of greater than 10,000 population and, therefore, it’s largely rural in nature. Rural counties tend to have many nontraditional addresses (e.g. rural routes (RR)) that often do not have a street number and identifiable street name, as typically observed in urban areas. During this analysis, it was discovered that nearly 40% of all addresses could not be geocoded using ArcGIS software due to a significant number of PO Boxes, Highway Contract Routes (HCR), and RR among the addresses submitted to the TCR.

A third challenge encountered was significant time invested to train an intern to help with cluster investigation. The intern was a master’s-level biostatistics student from Middle TN State University who had little or no training in epidemiologic methods.

SOLUTION

To address the lack of trained and available staff to perform epidemiologic investigations, TCR hosts student interns from local colleges and universities. Dr. Whiteside has been a member of the advisory committee of the Master of Science in Professional Science program at Middle TN State University (MTSU) for many years and has hosted numerous interns from the Biostatistics Core program. While these students have no formal epidemiologic training, they do have very

good biostatistical training, and many also have exceptional Statistical Application System (SAS) software skills. Without these students, completing cancer cluster investigations would be significantly more difficult given current staffing levels.

To resolve the inability to accurately geocode many of the provided, nontraditional addresses in TCR's main cancer database, the TCR Director utilized different strategies. Firstly, the TCR Director collaborated with the Grundy County Community Cancer Organization (GCCCO), a 501(c)3 organization formed by concerned citizens of Grundy County. GCCCO used different social media platforms and word of mouth to spread cancer concerns to the community, and the organization's website allowed interested followers to provide information on cancer patient diagnoses. This information was extremely valuable to the TCR Director during the cluster investigation, as many patients could be cross-referenced with patients in the TCR's main cancer database, which enabled the registry to update nontraditional address information. For example, a Highway Contract Route was converted to an address with a street number and name.

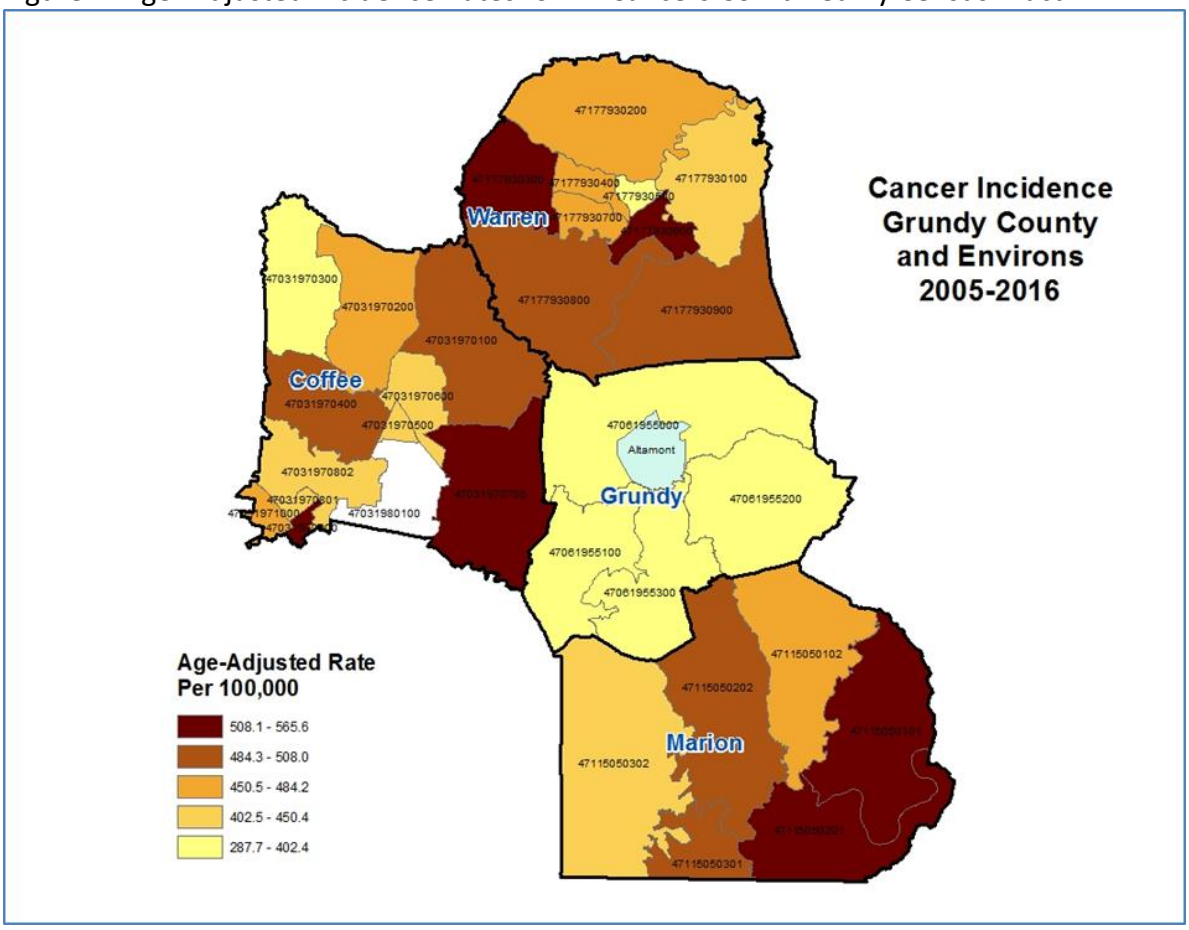
Another solution to the problem of nontraditional address information was to perform the analysis not only by census tracts, but also by zip code. The TCR Director assumed that individuals with nontraditional address information lived in the same zip code reported for the individual, and collaboration with the GCCCO enabled the TCR Director to confirm for 92.1% of the sample of nontraditional addresses for Grundy County, that the patients actually lived in that zip code, thus confirming the validity of the assumption above.

RESULTS

TCR analyzed data for the 12-year period, 2005-2016, and examined the distribution of 47 different cancer types by census tract for the following counties: Grundy, Marion, Warren and Coffee counties. All comparisons were performed to Census Tract #47061955000 (#9550), the center of cancer cluster concern. Of the forms of cancer examined for #9550, only those forms which had at least 3 incident cases during the study period were included, and after examining these cases, the following cancers were selected for further analysis: lung, female breast, Non-Hodgkin Lymphoma, pancreas and liver.

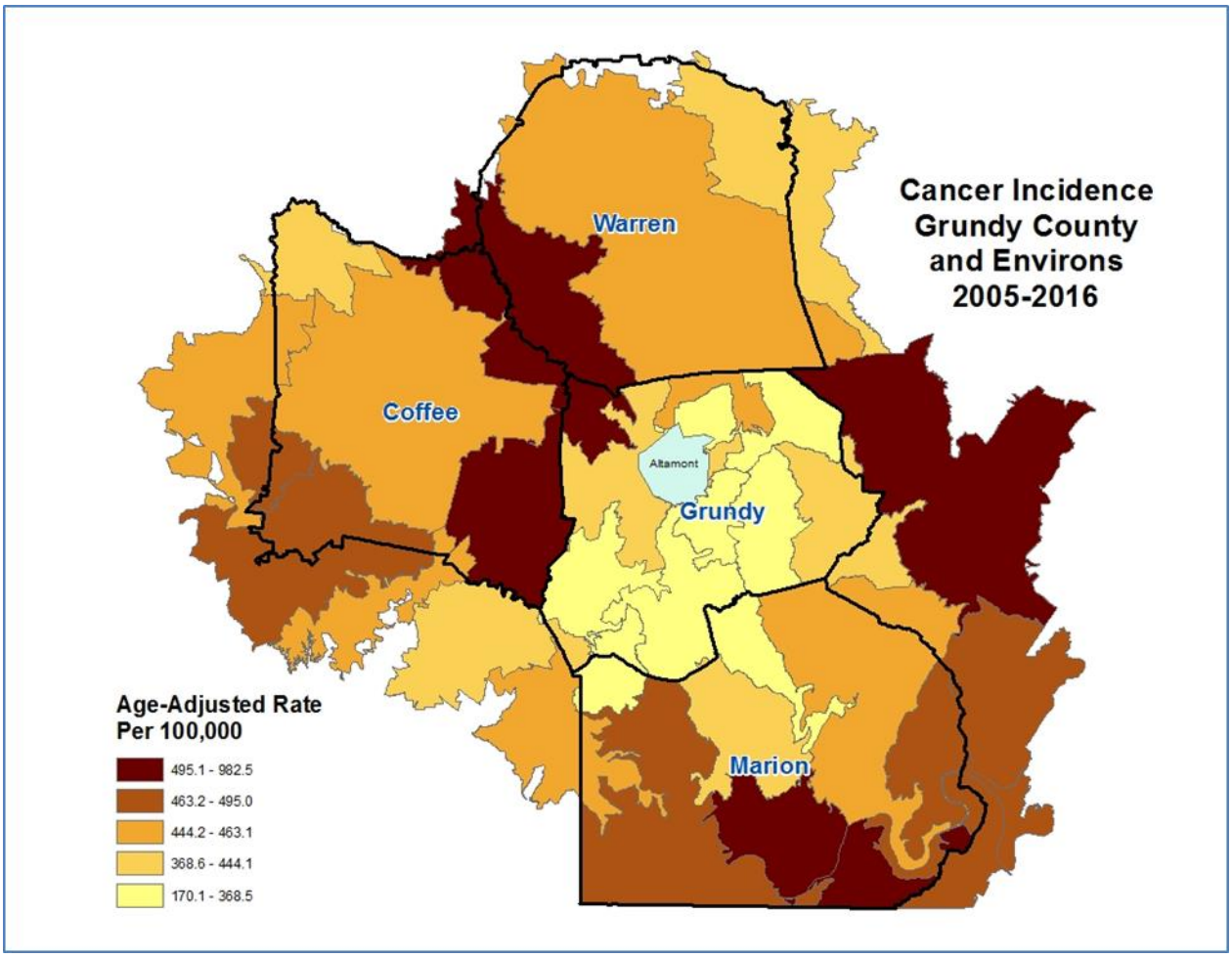
There was a total of 126 cancers diagnosed in #9550 during the 12-year period under study out of a population of 2770 as measured during the 2010 Census. TCR originally attempted to map observed age-adjusted rates for all cancers combined for the four counties under study (see Figure 1), but nearly 40% of all cases for Grundy County could not be mapped due to the large number of nontraditional addresses. For this reason, the experimental protocol was modified such that analyses were also done at the zip code level, both including and not including post office boxes.

Figure 1. Age- Adjusted Incidence Rates for All Cancers Combined By Census Tract.



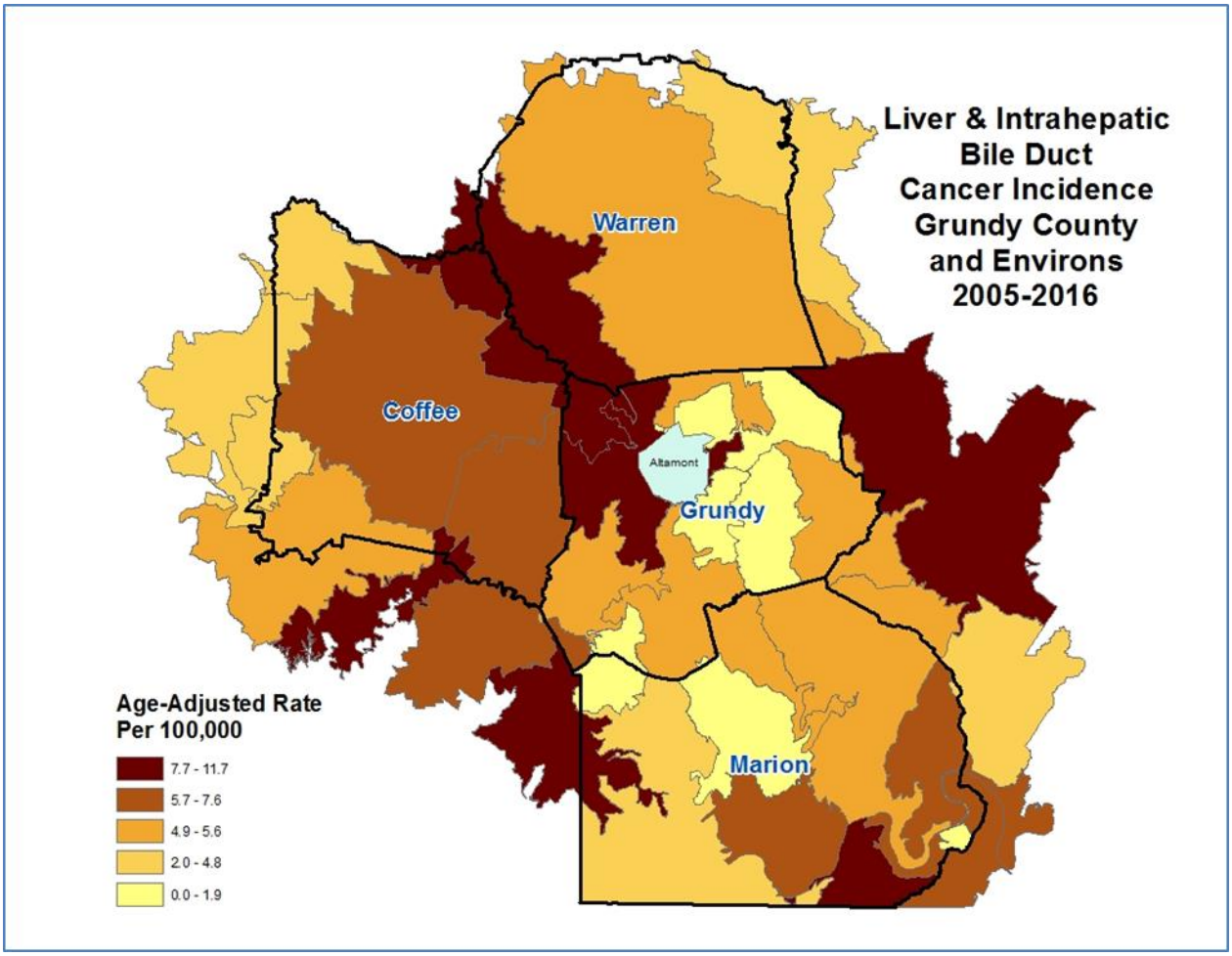
Data were re-extracted at the zip code-level which, unlike census tracts, may breach county boundaries and include counties NOT involved in the analysis. Age-adjusted rates were calculated and for the first analysis, individuals with post office boxes were NOT included in this analysis (Figure 2). There were generally lower rates of cancer observed in the Grundy County population for all cancers combined. Since individuals with a reported post office box were excluded from this analysis, rates presented are likely inaccurate and are below the true cancer incidence rate in #9550.

Figure 2. Age-Adjusted Incidence Rates for All Cancers Combined By Zip Code; Excludes Post Office Boxes.



Similar analyses for all cancers combined were completed by zip code but this time included reported post office boxes (Figure 3). By including post office boxes in this analysis, we assumed that the individual reported to us with a street address listed as a post office box, lives in the same zip code where the post office box is located. This assumption may not always be correct; however, our analysis of the Grundy County Community Cancer Collaboration (GCCCC) list of cases accessed on November 1st, 2019 suggests that this assumption may be a mostly valid one (see discussion below). The GCCCC is the community action group created by community volunteers advocating for environmental change in Grundy County.

Figure 3. Age-Adjusted Incidence Rates for All Cancers Combined By Zip Code; Includes Post Office Boxes.



Hotspot analysis was performed to determine whether there was significant clustering of cancer cases in Grundy County relative to the 3 comparison counties. Spatial autocorrelation using Global Moran's I was used to assess the degree of spatial clustering of cancer cases at the census tract and zip code levels. Like the analysis of age-adjusted rates presented above, the zip code-level analyses both included and excluded individuals with post office boxes. In general, regardless of the method of analysis, spatial autocorrelation using Global Moran's I indicated there was either no clustering of cancer cases in Grundy County, in other words, Grundy County represented a so-called cold spot, which indicates a clustering of low values of age-adjusted rates.

Lastly, the cases listed on the GCCCC list (140 total) were cross-referenced to cases included in the main database of the TCR. A total of 57 entries (40.7% of all cases) did not match a case included in the main cancer database of the TCR. A total of 3 entries (2.1% of all entries) were determined to be duplicate entries. A total of 80 entries (57.1% of all entries) were successfully matched to a case in the TCR's main cancer database. Of the 57 entries not matching an existing case in the TCR's main cancer database, twenty (20) of these cases (35% of the total non-matches) were 2018 and 2019 diagnoses.

SUSTAINING SUCCESS

Dr. Whiteside will continue to participate as a member of the advisory committee of the MTSU Master of Science in Professional Science program, which should enable the TCR to continue to host student interns to help with cluster investigations. The TCR will continue to collaborate with concerned citizens of each community that should enable TCR staff to obtain valuable confirmatory information to validate TCR cancer database entries.

REGISTRY CONTACT INFORMATION

Martin Whiteside, DC, PhD, MSPH | Epidemiologist 2
Tennessee Cancer Registry
Main Phone Line: 800-547-3558
https://www.tn.gov/health/health-program-areas/tcr.html