

Diving into the data wormhole: Creating a syndromic query to identify helminth infection in Alabama

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CATEGORY: **Syndromic Surveillance**

Advances in infrastructure and sanitation have reduced the prevalence of helminth infection in developed nations. However, inequalities in infrastructure and access to care persist, leaving certain communities at greater risk. The Alabama Department of Health (ADPH) developed a query for emergency department syndromic surveillance data to identify non-reportable parasitic worm infections in their state.

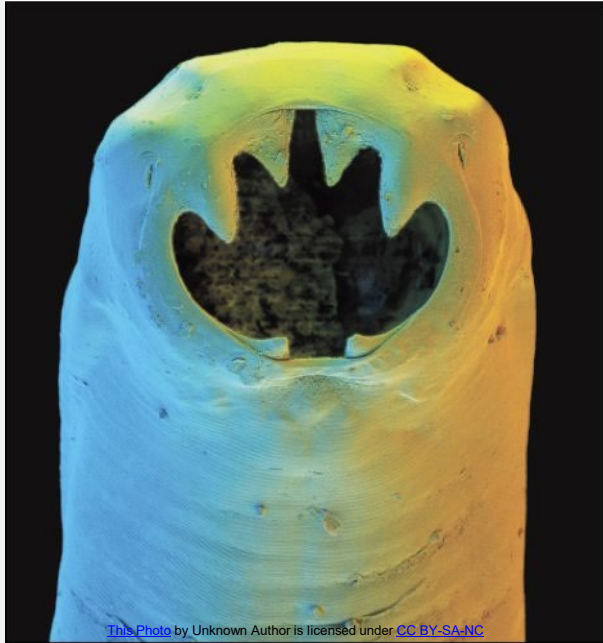
The “What”

Advances in infrastructure and sanitation have reduced the prevalence of helminth infection in developed nations. However, inequalities in infrastructure and access to care persist, leaving certain communities at greater risk. In 49 U.S. states, helminth infections are not reportable, limiting the ability to assess disease burden and identify affected populations. In the absence of traditional mandatory reporting data for this condition, the Alabama Department of Public Health (ADPH) sought to use an alternate data source. They developed a query using Emergency Department (ED) data from the Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE) to identify non-reportable parasitic worm infections statewide from 2018-2022.

ADPH observed the advantages and limitations of syndromic surveillance as a data source for this condition in their state. Two queries were evaluated with data for 2023. Query A used only inclusionary and exclusionary free text terms for “worm” and Query B used only ICD-10 codes specific to intestinal parasitic worm infection applied to multiple chief complaint and discharge diagnosis fields. ADPH compared free text and ICD code-only query approaches because Alabama facilities more consistently provide ICD-10 codes in reported data fields than text. For example, only 20% of facilities in the state consistently reported triage notes in submitted data. ADPH used ICD-10 codes specific to soil-transmitted helminths (STH), specifically hookworm, roundworm, whipworm, and strongyloides, non-soil transmitted helminths (NSTH) including tapeworm and pinworm, and unspecified helminthiasis (UH). Although several ICD-10 codes are specific to worm infection, they included the free text, term-only query to assess visits that may have been assigned a non-worm-related ICD-10 code.

After reviewing entries, ADPH classified ED visits as worm-related (WR), possible worm-related (PWR), or not worm-related (NWR) and compared the predictive values for each query. With this information, they decided to use Query B to pull data from 2018-2022 to observe demographic, spatial, and temporal trends for parasitic worm infection statewide over time.





potentially severe health outcomes, they also wanted to see if syndromic surveillance might identify other intestinal helminth infections such as pinworm infection, which can spread rapidly in schools or congregate living facilities, or tapeworm infection, which can sometimes be linked to specific food sources such as undercooked pork.

Classifying ED visits WR, PWR, or NWR, ADPH found that from 2018-2022, most WR ED visits were for pinworm infection (549, 80%). STH had the lowest WR visits (23, 3.4%). Unspecified helminthiasis visits made up 13.9% of WR ED visits. Most occurred in children 5-17 years old (316, 46%). Almost twice as many females (444, 65%) had WR ED visits as males (140, 35%). Most WR visit patients were white (452, 66%) and non-Hispanic (584, 85%). Most infections occurred in September, the month after school starts in Alabama.

There are considerable limitations to using syndromic surveillance data including data quality issues, risk of misinterpretation, lack of confirmatory testing reported, need for follow up diagnostic testing, and investigation for records of suspected infections. Data quality issues such as incomplete data and inconsistencies in data fields reported across different facilities were frequent.

As a result of this investigation, ADPH can advocate for improvements in data reporting through ESSENCE in their state and can more effectively develop queries to identify related ED visits, evaluate the validity of signals detected, and communicate findings.

The “So What”

Early detection is critical for effective intervention. This is especially true for rare conditions and events or for diseases that are not reportable to public health agencies. Alternate data sources can be used for this early detection or broad population monitoring. Community concerns about inequalities in infrastructure and sanitation, as well as concern for parasitic infection, became the impetus for investigating the utility of syndromic surveillance as a data source for monitoring helminth infection. While ADPH was most concerned about the health impacts of soil-transmitted helminth infection, especially hookworm due to its

The “Now What”

Although STH infections were the greatest health concern, WR ED visits for soil transmitted helminths were very low. Findings identified pinworms as the most common type of worm infection. With information on worm type, seasonality, age, race, sex, and patient county, ADPH can plan public health actions to reduce pinworm-related ED visits,

such as educational campaigns for schools in affected areas, in addition to provider messaging to alert providers to disease in their region. Although there are many limitations to ED data, syndromic surveillance remains an option for monitoring disease.

Key contributors to this project include coauthor Ana Oliveira, DrPH, Epidemiologist Supervisor, ADPH and 2023 query data validation contributors Lauren Niemi, MPH, Epidemiologist, ADPH and Gabriel Wood, MPH, Epidemiologist, ADPH.