Geographical clustering of sexually transmitted infections in rural Ohio

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BACKGROUND/INTRODUCTION

There are an estimated 20 million newly diagnosed sexually transmitted infections (STIs) each year (Aral, Fenton & Lipshutz, 2013)

The cost of STIs to the United States health care system is estimated to be anywhere from $16 billion (Owusu-Edusei et al., 2013) to $17 billion in diagnosis, treatment, and care costs (Chesson, 2004)

Geographical spatial mapping is a powerful public health tool that identifies populations at risk and clusters of disease

Spatial mapping of STIs has yet to be done in a rural county of the United States. Most of the intervention and prevention resources for STIs are within local health departments

OBJECTIVE

To map the distribution of STIs (chlamydia, gonorrhea, hepatitis A, hepatitis B, hepatitis C, syphilis and HIV) and identify clusters of cases to optimize intervention strategies in the rural area of Williams County, Ohio

MATERIALS AND METHODS

Cases were abstracted from 2014-2016 Morbidity and Mortality Weekly Reports, collected through the Ohio Disease Reporting System (ODRS)

Yearly incidence rates were calculated using new case reports of each STI reported and zip code population data

Descriptive statistics were determined using univariate analyses of sex, age, and race/ethnicity using Microsoft® Excel® 2016

Risk ratios were calculated for each STI by zip code using SAS 9.4. Bryan, Ohio (43506) was used as the reference zip code due to the area having the highest population and at least one case per each disease/year for comparison.

The Grand Valley State University Human Research Review Committee (HRRC) determined that this project did not meet the definition of covered human subjects research and was deemed exempt from approval by the HRRC.

RESULTS

The average county-level incidence rate of chlamydia increased by 117% (182.7 cases per 100,000 population in 2014 vs 397.1 cases per 100,000 population in 2016)

Hepatitis C had a county-level increase of 268% (48.4 cases per 100,000 population in 2014 to 178.3 cases per 100,000 population in 2016)

Table 1

Incidence[1] of Reported Sexually Transmitted Infections in Williams County, Ohio by Year per 100,000 Population

Reportable Disease[2]	Incidence per Year[5,6]		
	2014	2015	2016
Chlamydia	182.7	264	397.1
Gonorrhea	18.8	21.6	16.2
Hepatitis A	2.7	5.4	8.1
Hepatitis B	2.7	5.4	13.5
Hepatitis C	48.4	115.8	178.3
Syphilis[3,4]	0	0	0
HIV[3]	8.1	0	2.7

Note. [1] Duplicate cases were removed prior to data analysis to restrict multiple positive results of the same illness occurring in the same individual.
[2] De-identified data used was obtained from the Morbidity and Mortality Weekly Report, collected from the Ohio Disease Reporting System as of May 5, 2017.
[3] HIV and Syphilis data collected from Toledo-Lucas County Health Department records.
[4] No cases of syphilis were recorded between years 2014 to May 5, 2017.
[5] Population data obtained from U.S. Census Bureau Statistics.
[6] Population data not available for 2017 and not included in this table.

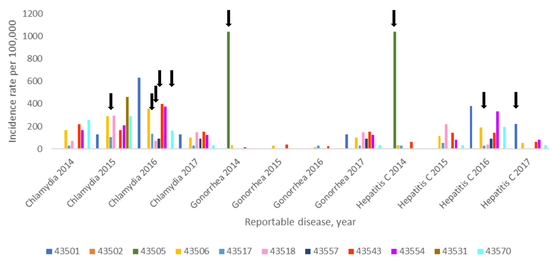
43506 (Bryan, Ohio) and 43543 (Montpelier, Ohio) saw the highest incidence rates between 2014 and 2017 for chlamydia, hepatitis C and gonorrhea

There were 0 cases of syphilis and 5 cases of HIV reported between 2014 and May, 2017

The zip code 43505 (Blakeslee, Ohio) had a significant increase in cases of gonorrhea and hepatitis C compared to zip code 43506 (Bryan, Ohio) in 2014

Figure 1

Incidence Rate per 100,000 population by Zip Code in Williams County, Ohio (2014-May, 2017)

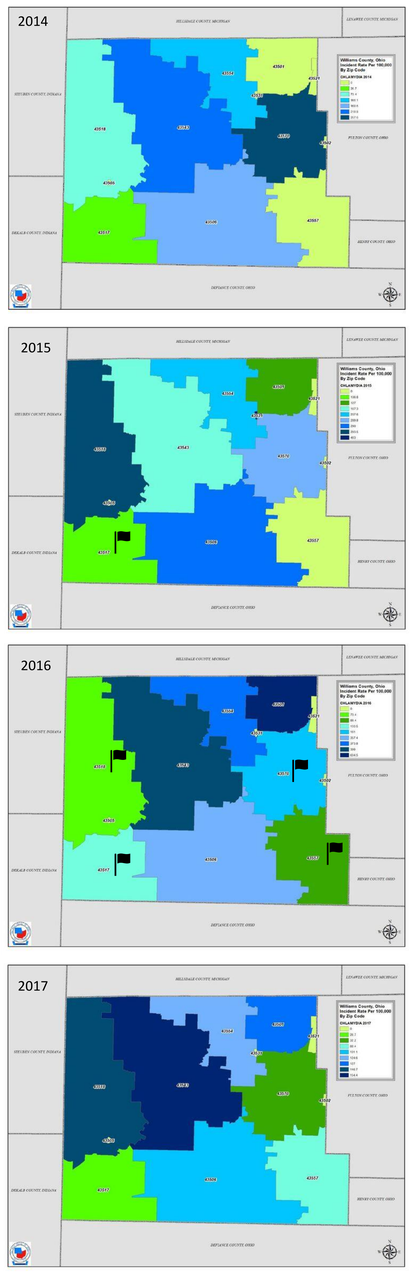


When compared to 43506, zip codes 43517, 43518, 43557, and 43570 had a significant decrease in risk of Chlamydia in 2016. Additional significant incident rates are marked on *Figure 1* by black arrows.

RESULTS continued

Figure 2

Chlamydia cases mapped per 100,000 from years 2014 to 2017

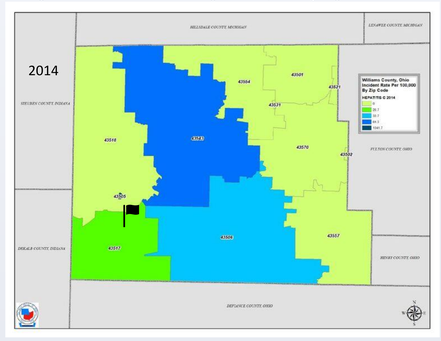


Flag symbols are located in areas where STI incidence rates are either significantly increased or decreased compared to the reference zip code (43506).

RESULTS continued

Figure 3

Hepatitis C incidence rate per 100,000 by zip code



CONCLUSIONS

This study successfully identified areas in Williams County, Ohio where incidence rates were consistently increased, specifically, in 43506 and 43543. The zip code with the highest reportable disease incidence rate varied from year-to-year.

Overall, cases were predominantly white, 18-28 year-olds.

Chlamydia incidence rates in 2016 had the greatest significant variability among zip codes.

Local health departments could use this technique to identify areas that have higher incidence rates per year. If local health departments have access to spatial mapping software, the same technique may be used for identifying areas of high STI incidence rates.

Future studies may use this same technique in more urban areas as well to see if clusters of STI incidence rates can be identified.

Intervention and prevention efforts can be directed towards areas that are predicted to have high incidence rates based on similar mapping techniques.

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