West Nile Virus Infection, Harris County, Texas, 2002 to 2013

▪Leann Liu, MD, MS ▪Diana Martínez, PhD, MPH ▪Martin Reyna, MS ▪Roberto Gorena, PhD ▪Umair A. Shah, MD, MPH
Harris County Public Health (HCPH)

Harris County Public Health
Building a Healthy Community

Introduction

West Nile Virus (WNV) is the leading cause of domestically acquired arboviral disease in the United States[1]. It was first identified in Harris County, Texas, in 2002[2]. Since then, the mosquito-borne virus has become endemic in the region, with a surge in 2012.

Although majority of persons infected are asymptomatic, neuroinvasive infections often result in hospitalization, and may lead to adverse outcomes[3-7]. Based on clinical presentation and the purpose of surveillance, this analysis categorized the infection into two groups: neuroinvasive (WNVNI) and fever (WNVF).

Objectives

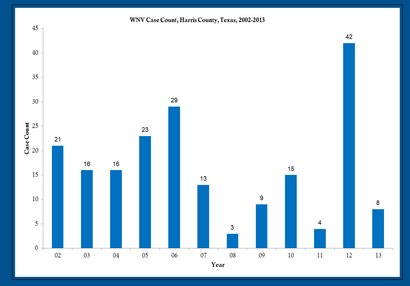
- Describe West Nile Virus infections (WNVI) in Harris County excluding Houston, Texas, 2002 to 2013
- Explore the differences between WNVNI and WNVF cases in regards to demographics and comorbidities
- Analyze risk factors of hospitalization of WNVI

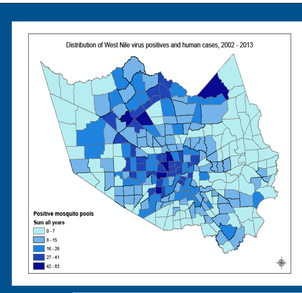
Methods

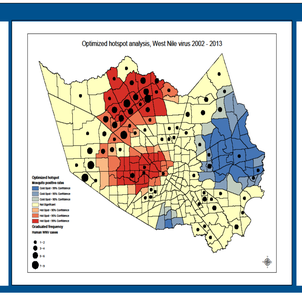
WNVI is a reportable condition in Texas. We analyzed the surveillance data for all reported infections, of which onset of symptoms occurred in 2002 to 2013, in Harris County, Texas, excluding City of Houston. Only confirmed and probable cases defined by surveillance case definition were included in the analysis.

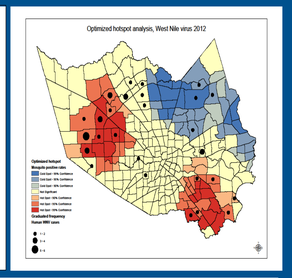
A four-step descriptive and analytic analysis was conducted by utilizing frequencies, percentages, Chi-Square tests, Fisher exact tests, and Logistic regressions. p=0.05 was used as the cutoff point for statistical significance in the analysis.

Figures: Human WNVI yearly counts; Human and mosquito WNVI yearly distributions across Harris County, Texas









Left: Choropleth distribution of WNV+ mosquito pools, 2002 – 2013. Darker color indicates more positive pools.
Middle: Hotspot analysis of WNV+ mosquito pools, 2002 – 2013, with human cases (dots) during same years.*
Right: Hotspot analysis of WNV+ mosquito pools, 2012, with human cases (dots) during same year.*

* Darker red indicates significant clustering (hotspot) of WNV+ mosquito pools, while darker blue indicates significantly lower (coldspot) WNV+ pools. Note large number of human cases observed in hotspots, indicated by larger size dots.

Results

A total of 199 cases were identified, including 149 WNVNI and 50 WNVF.

- The annual average age-adjusted incidence rate of WNVNI infection was 0.7 per 100,000; in 2012, the rate was 1.4.
- Over 68% of cases clustered in west and northwest of the county.
- The median age of patients was 54.8 (SE1.2) years; 62.8% were male.
- The onset of majority of cases (81.4%) concentrated in July to September.
- Overall, 75.4% of patients were hospitalized, 4.5% died.
- Almost half (46.9%) of patients reported never or rarely used mosquito repellent.
- The time from onset of illness to testing of WNV was shorter in WNVNI cases than WNVF ones (8.8 vs 12.9 days, 95% CI of the difference: 0.1-8.3, p=0.055).
- We did not detect statistically significant differences between WNVNI and WNVF cases in multivariate models.
- Neuroinvasive manifestation was found to be significantly associated with hospitalization (OR 22.6, 95% CI 7.9-65.1, p=0.000) after adjusting for demographics and chronic disease(s).

Discussions and Conclusions

Our findings were consistent with national patterns in terms of age and sex of patients, period of onset, and mortality[8-10].

GIS analyses revealed that human cases were consistently found in areas with high WNV activity in mosquito populations. Areas with highest densities of WNV positive mosquito pools also had highest numbers of human cases, as indicated by hotspot analysis and a significant correlation between these two (Pearson $r = 0.235$, $p < 0.001$, $N = 268$).

Noteworthily, almost half of the patients reported never or rarely used mosquito repellent. This result emphasizes the importance of public education for prevention for this disease.

No significant differences in demographics and comorbidities were observed between WNVNI and WNVF cases. It was possible due to the homogeneity of the small sample that clustered in older age.

References
Please contact Leann Liu, MD, MS at lliu@hcphes.org for references.

Acknowledgements
We wish to acknowledge the contributions of our colleagues in Epidemiology Program, Disease Control and Clinical Prevention, and Division of Mosquito Control, HCPH on the accomplishment of this project.

Poster #309551