

Regional Survey of Mosquito Control Knowledge and Usage in North Carolina

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Why do we need mosquito control?

- Mid-Atlantic states (DE, GA, MD, NC, PA, SC, TN, VA, WVA) so far in 2016
 - 5 of the reported 11 US cases of La Crosse encephalitis.
 - 27 of the reported 1,175 US cases of West Nile.
 - 70 of the reported 469 US cases of imported dengue.
 - 19 of the reported 91 US cases of imported chikungunya.
 - 581 of the reported 3,713 US cases of imported Zika.

Background

- North Carolina Department of Natural Resources, Public Health Pest Management Section
 - Formed in the 1970s, Disbanded in 2011 (state budget cuts)
- In 2014, additional budget cuts eliminated all of the state-funded mosquito control resources (i.e. “state aid” for municipal and county programs).
- In 2016, NC experienced the first imported cases of Zika virus and a statewide survey of container-ovipositing mosquitoes (potential vectors of Zika virus) was initiated.
- In 2016, a new state medical entomologist was hired.

Background

- Private mosquito control programs (e.g. Mosquito Authority, Mosquito Squad, etc.) are thriving.
- Residual barrier spray of vegetation surrounding residence every 3 weeks.
- Community residents can pay these companies for mosquito control in their back yards.

Research Questions

- Factors that determine whether people are willing/able pay for private mosquito control.
- Estimate number of households using these services and/or other types of services/products for mosquito control.

Study Objectives

- 1) Assess knowledge and usage of mosquito control in NC communities.
- 2) Assess the extent to which differences exist in communities in different regions (eastern, central, and western), socioeconomic statuses (low, medium, high), and community types (urban, suburban, rural) with respect to disease risk.

Benefits of the Study

- Information about the extent to which mosquito control knowledge and use exists across NC will:
 - Empower local mosquito control agencies (public and private).
 - Assist local health departments developing public awareness campaigns for vector control and prevention of vector-borne disease.
 - Enhance public health protection.

Methods

- NC regions:
 - Pitt County (eastern - coastal)
 - Wake County (central - piedmont)
 - Henderson County (western - mountain)
- Community classification (socioeconomic):
 - *Based on dwelling tax value and county.*
 - Low
 - Medium
 - High

Methods

- Community type:
 - *Based on information from geographic information systems*
 - Urban (neighborhoods within city limits)
 - Suburban (neighborhoods outside of city limits)
 - Rural (sparsely populated areas without defined neighborhoods)
- Addresses in each category were randomized.

Methods

- Survey (26 questions) mailed to households
 - 270 [June] + 180 [August] = 450 surveys in each county
 - 1,350 surveys mailed (47 undeliverable)
 - 408 surveys received
 - Pitt (n=140), Wake (n=139), Henderson (n=129)
 - 31% response rate
 - Collect data on personal mosquito control efforts, perceptions of risk (mosquito-borne disease, insecticide exposure), and demographics.
 - Each participant received a \$5 gift card when survey completed (incentive to complete the survey).

Data Analysis

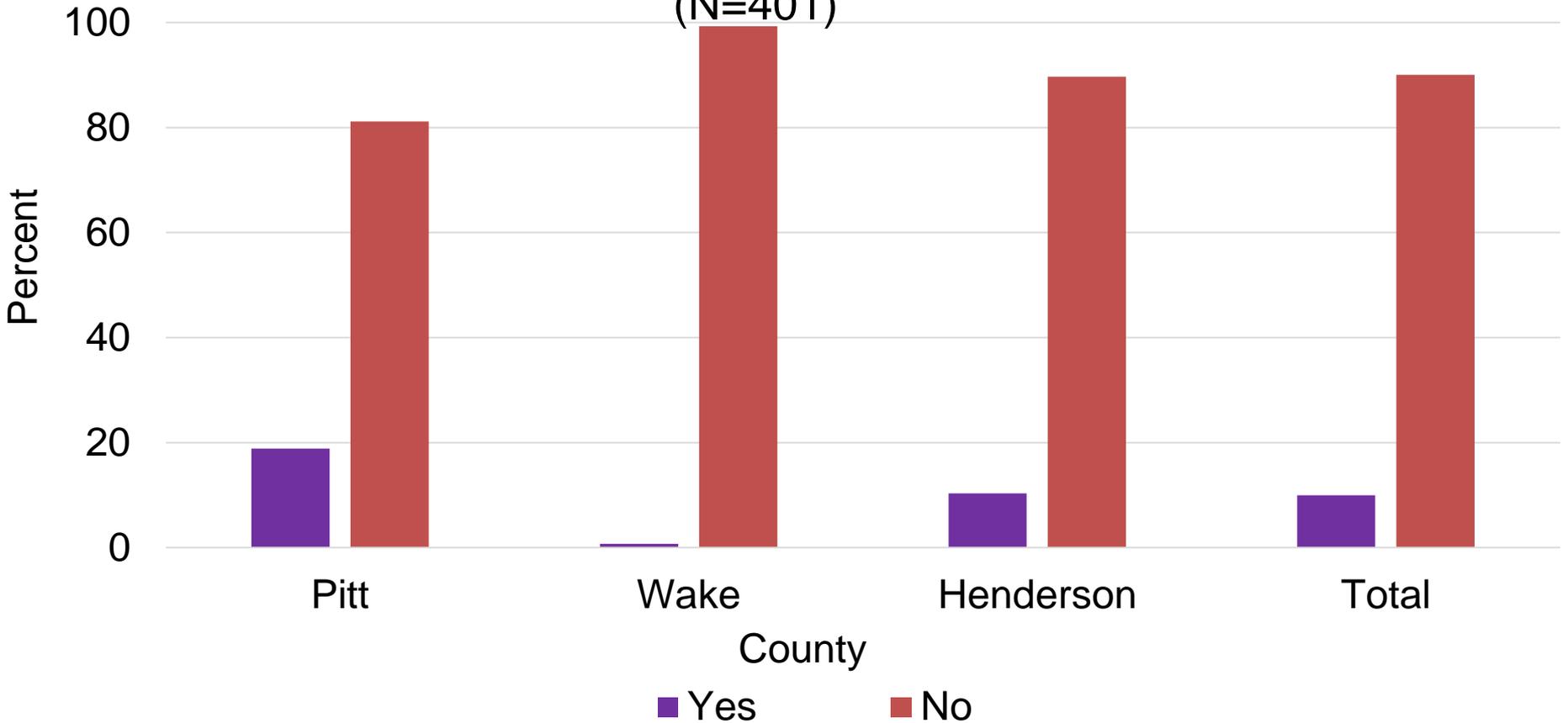
- Chi-square analyses to analyze survey results for each question by socioeconomic category, type of community, and county.

Data Analysis

- Characteristics of respondents (low to high)
- Henderson
 - Community: 33% urban, 33% suburban, 35% rural
 - Socioeconomic: 23% low, 31% medium, **46% high**
- Pitt
 - 31% urban, 33% rural, 36% suburban
 - 21% low, 34% medium, **46% high**
- Wake
 - 29% suburban, 34% urban, 37% rural
 - 24% medium, 29% low, **47% high**

Are you aware of any municipal or county mosquito control program that treats your neighborhood for mosquitoes?

(N=401)



*Pearson chi-square = 25.135; df = 2; p = 0.000**

- There was a significant difference in the knowledge of existence of operational control programs.
- Most are not aware of mosquito control programs.
- Pitt and Henderson have spray programs; Wake does not have a spray program.

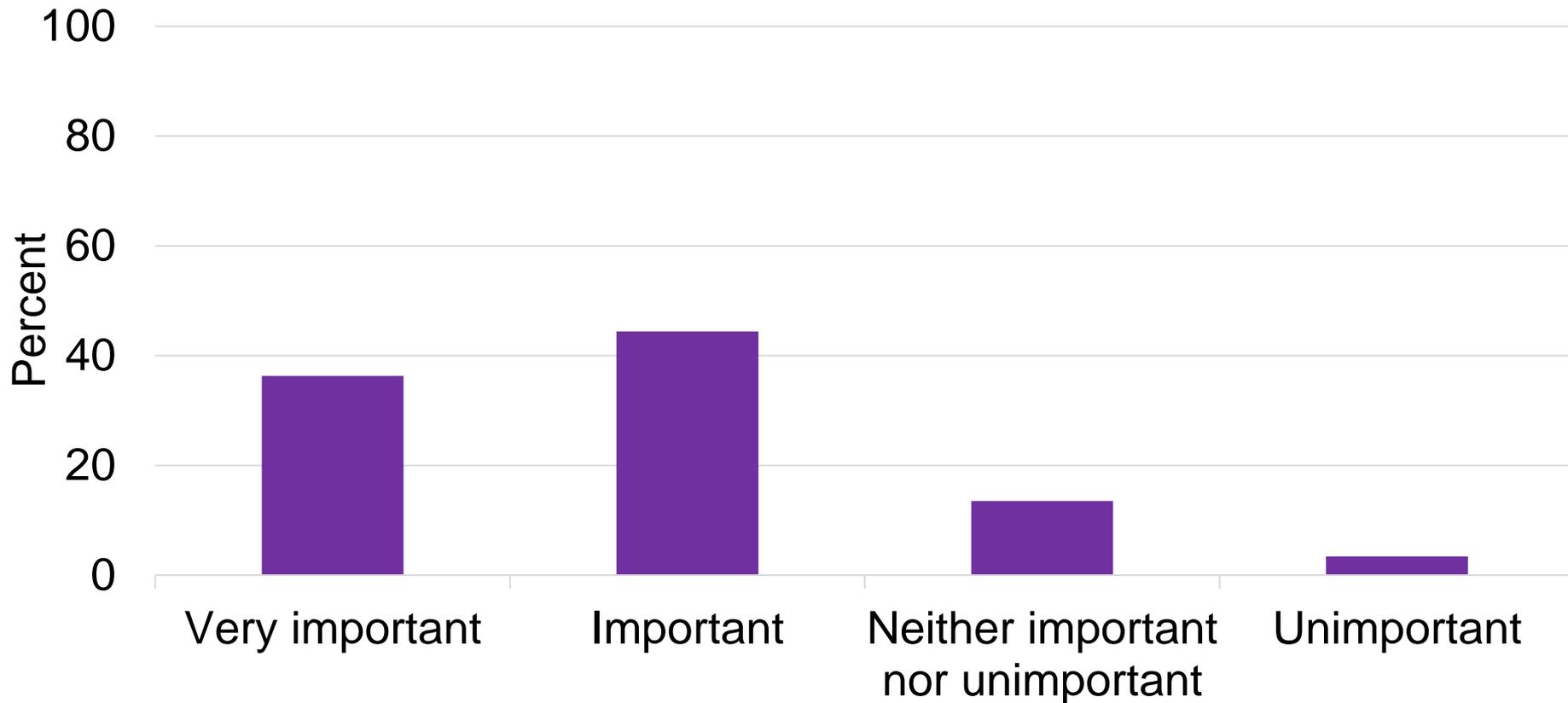
Survey Results

- 94% of respondents are not notified when sprays occur but 86% would like to be notified.
- 81% of respondents do not have the opportunity to opt out of sprays, but 82% would not want to opt out.
- 90% do not know what is being sprayed, but 86% would like to know what is being sprayed.

Survey Results

- 67% of respondents remove empty containers (tires, flower pots, bird baths)
- 45% keep their gutters free of debris.
- 31% apply pesticides targeting mosquitoes on their own (hand held fogger or liquid application with hose and sprayer).
- 5% have hired professional mosquito control services
(Terminix, Mosquito Authority, Mosquito Joe, Triangle Pest Control, Arrow Exterminating, Capital Pest, Clegg's, Hendersonville Pest Control, Mongo's Mosquito Service, Mosquito Free Yards, Mosquito Man NC).
- 44% wear clothing to protect themselves from mosquitoes.
- 74% wear repellent.

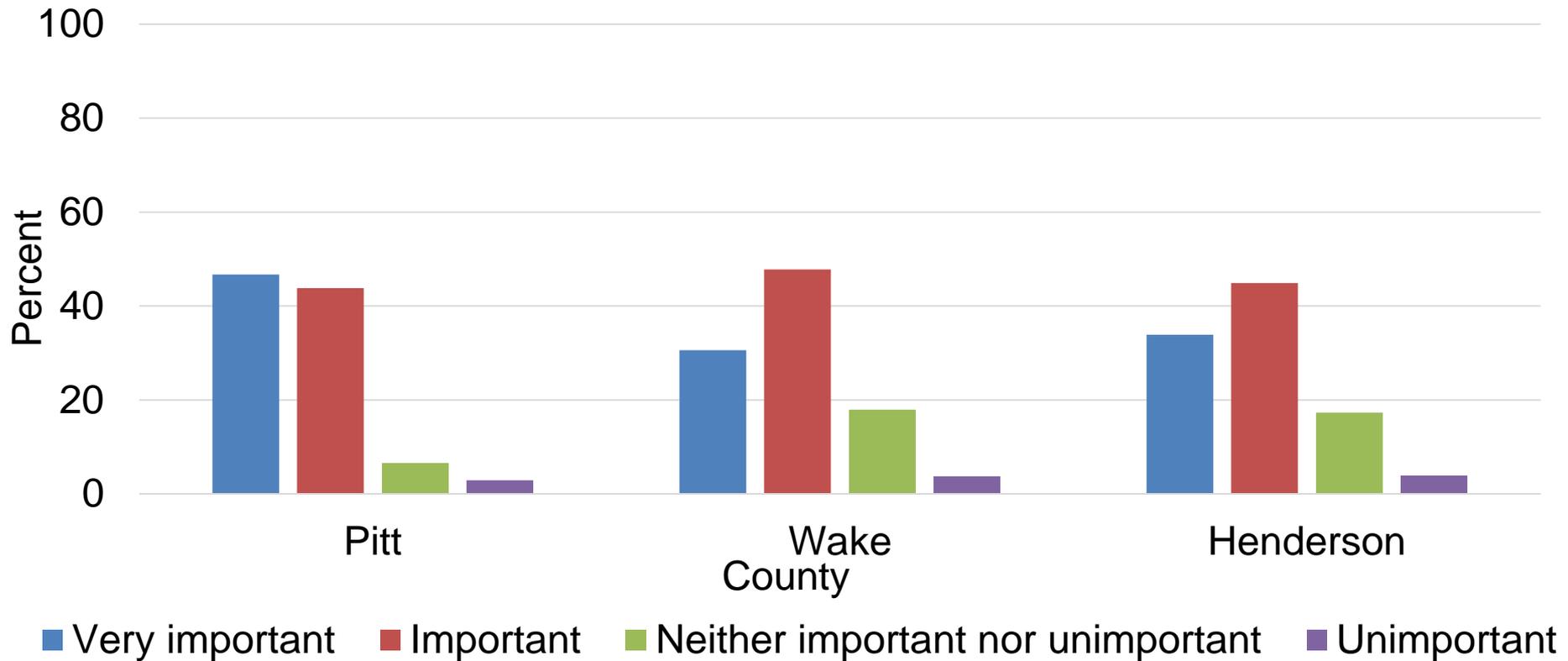
How important is mosquito control to you? (N = 408)



*Pearson chi-square = 186.769; df = 3; p = 0.000**

- There was a significant difference in the perception of the importance of mosquito control.
- Most respondents think mosquito control is important/very important.

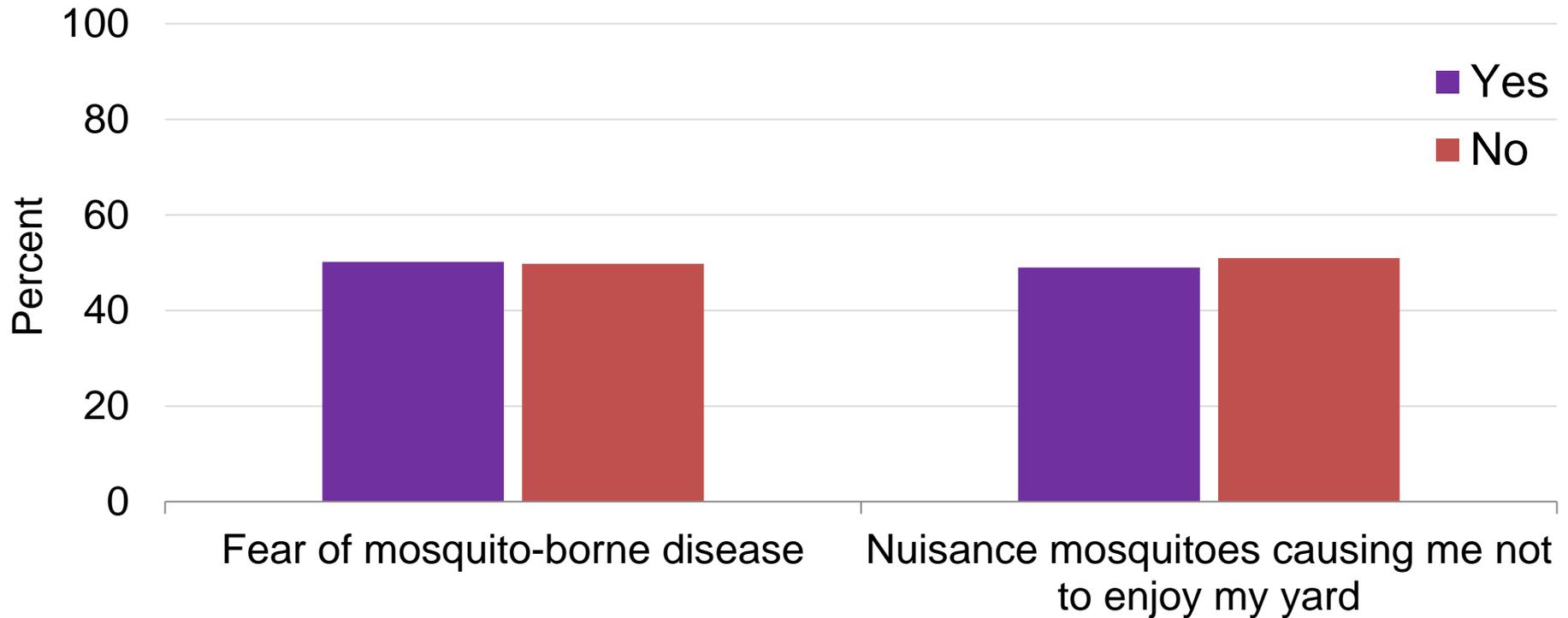
How important is mosquito control to you? (N=398)



*Pearson chi-square = 13.719; df = 6; p = 0.033**

- There was a significant difference in the perception of the importance of mosquito control between counties.
- Most respondents think mosquito control is important/very important.
- No significant difference in the perception of the importance of mosquito control between socioeconomic categories or community types.

Which choice is the most important reason why you would pay for mosquito control? (N = 408)

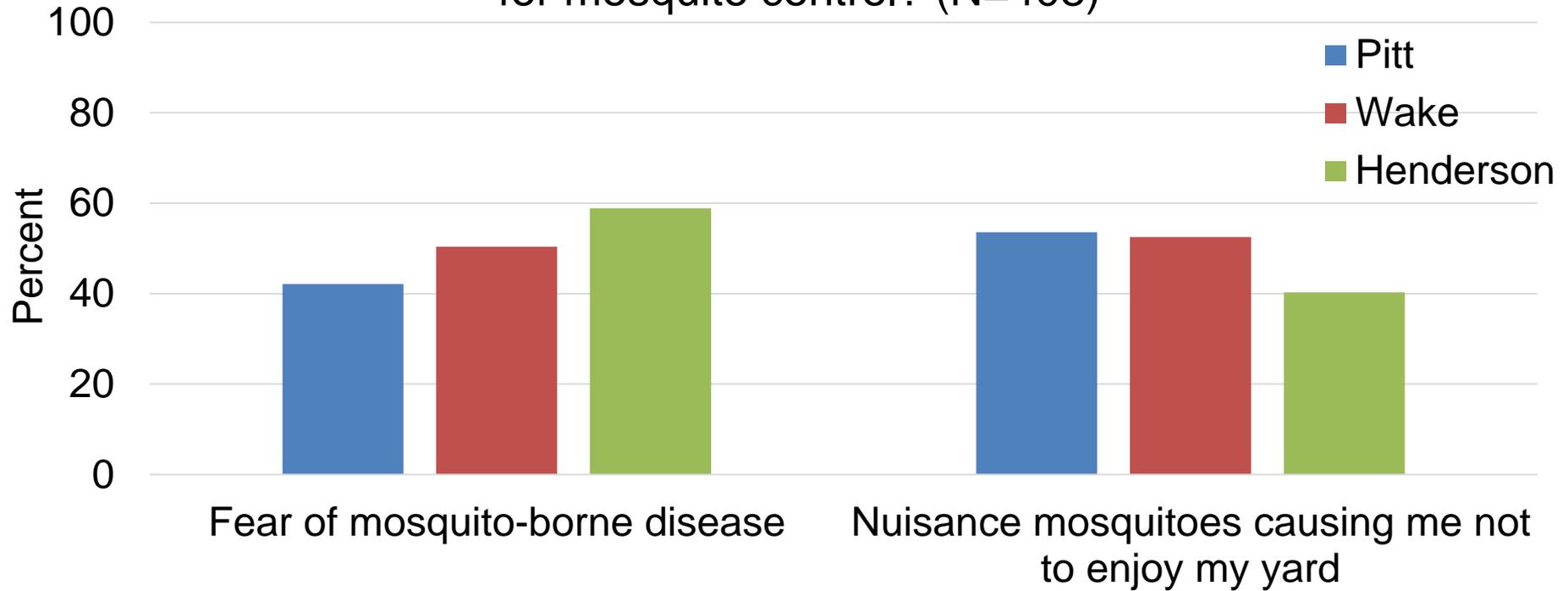


Fear: Pearson chi-square = 0.010; df = 1; p = 0.921

Nuisance: Pearson chi-square = 0.157; df = 1; p = 0.692

- Respondents could choose both choices here.
- The percentage of those who chose 'fear' was not significantly different from those who did not.
- The percentage of those who chose 'nuisance' was not significantly different from those who did not.

Which choice is the most important reason why you would pay for mosquito control? (N=408)

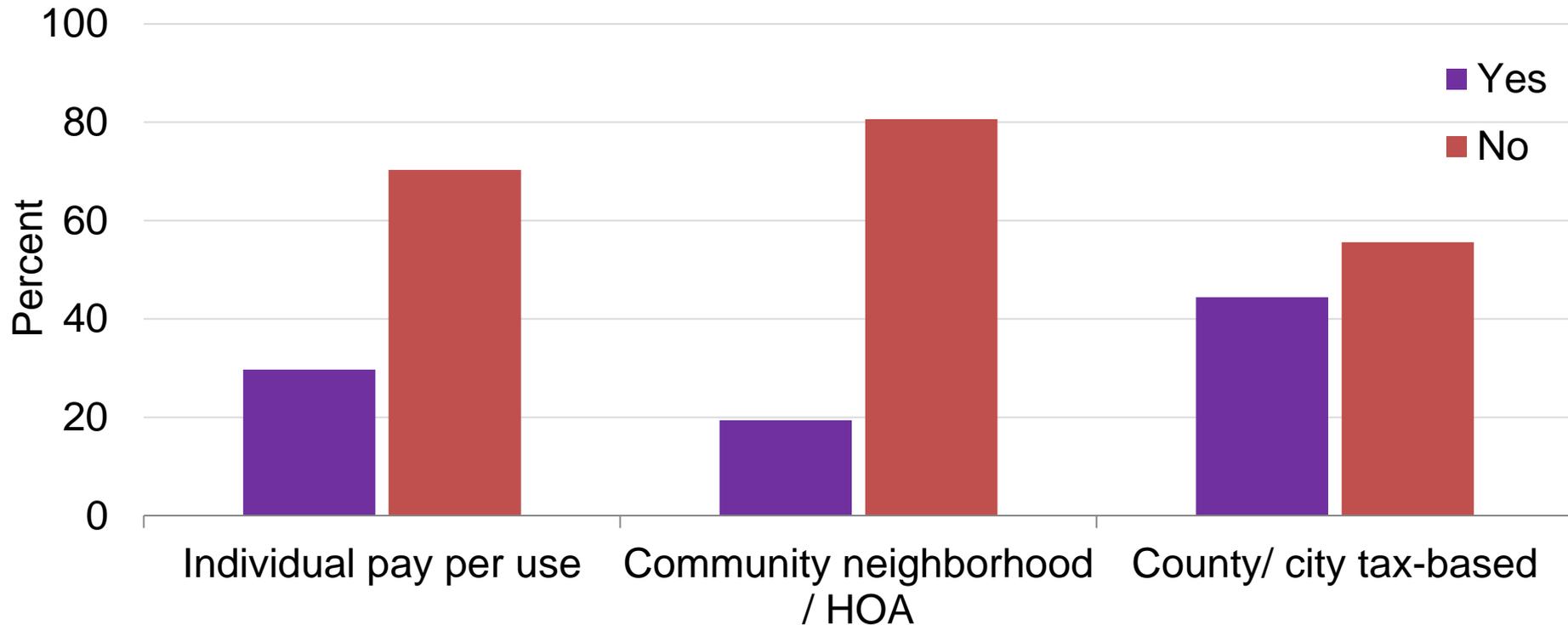


*Fear: Pearson chi-square = 7.555; df = 2; p = 0.023**

Nuisance: Pearson chi-square = 5.757; df = 2; p = 0.056

- Respondents could choose both choices here.
- The percentage choosing 'fear' was significantly different among counties.
 - Henderson County chose fear of disease more frequently. They are the only county with significant endemic disease (La Crosse encephalitis).
- The percentage choosing 'nuisance' was not significantly different between counties.
- No significant difference between socioeconomic categories or community types.

If you are willing to pay for mosquito surveillance and control, should it be: (N = 408)



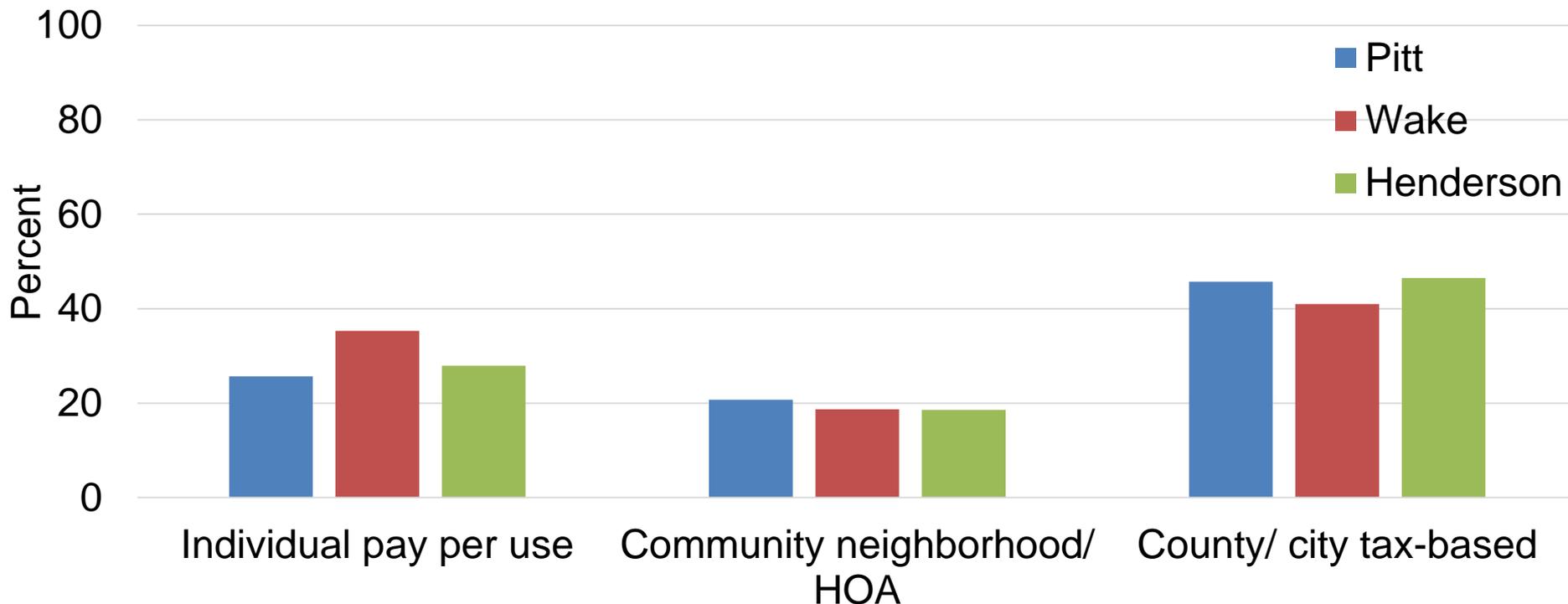
*Individual: Pearson chi-square = 67.539; df = 1; p = 0.000**

*Community: Pearson chi-square = 153.186; df = 1; p = 0.000**

*County/City Tax: Pearson chi-square = 5.186; df = 1; p = 0.023**

- Respondents could choose all three choices here.
- There is a significant difference in choosing and not choosing any of the payment methods for mosquito control.
- Most preferred tax-based payment.

If you are willing to pay for mosquito surveillance and control, should it be: (N=408)



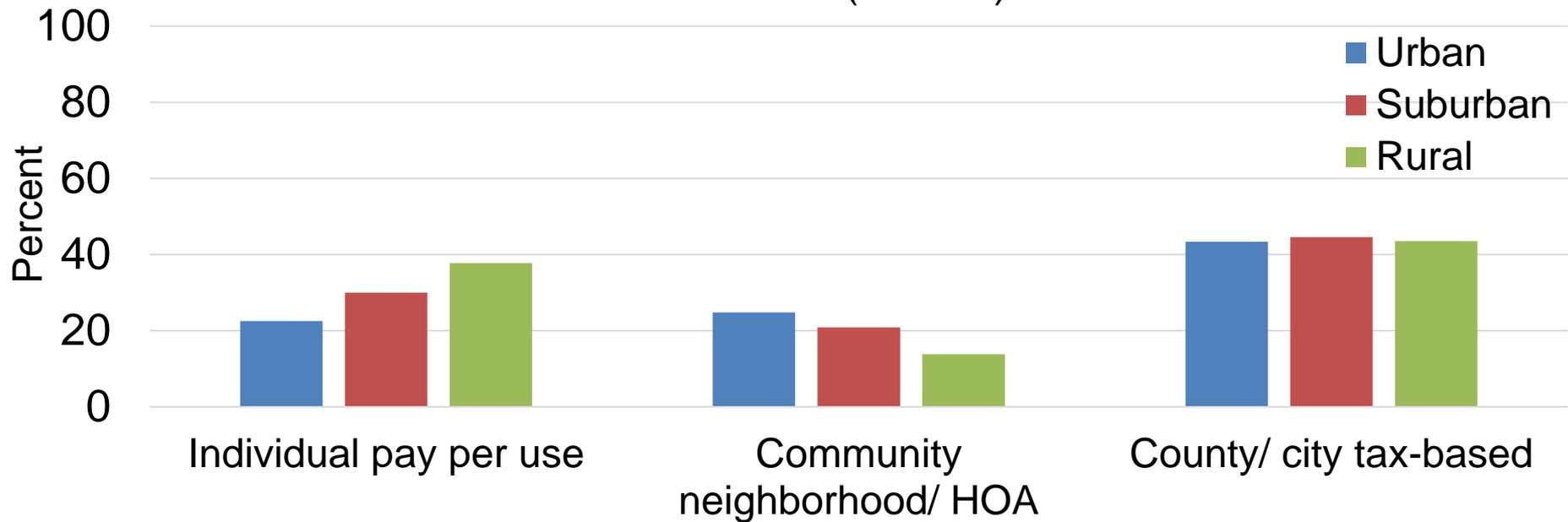
Individual: Pearson chi-square = 3.318; df = 2; p = 0.190

Community: Pearson chi-square = 0.250; df = 2; p = 0.883

County/City Tax: Pearson chi-square = 0.979; df = 2; p = 0.613

- Respondents could choose all three choices here.
- There is no significant difference in choosing and not choosing any of the payment methods for mosquito control between counties.
- Most preferred tax-based payment.

If you are willing to pay for mosquito surveillance and control, should it be: (N=408)



*Individual: Pearson chi-square = 7.309; df = 2; p = 0.026**

Community: Pearson chi-square = 5.300; df = 2; p = 0.071

County/City Tax: Pearson chi-square = 0.049; df = 2; p = 0.976

- Respondents could choose all three choices here.
- Percentage choosing 'individual' was significantly different among community types.
- Rural communities were more willing to pay individually.
- Percentage choosing 'community' or 'county/city tax' was not significantly different among community types.
- Most preferred tax-based payment.
- No significant difference between socioeconomic status categories.

Selected Comments from Respondents

- Mosquito control is important, but not with spray that is harmful.
- Perhaps it is more important than I realize.
- I would like to have an opt-out option since I am a beekeeper.
- What if the community is poor? [how could they afford community-based mosquito control]
- We pay enough property tax to include this service.
- Education of folks is also key.

Summary

- Mosquito control is important to communities across NC (for nuisance mosquitoes and prevention of disease).
- Many think that the current tax base should be better managed to pay for mosquito control in their communities.
- Most respondents are interested in having more information about mosquito control programs, insecticide applications, and mosquito related issues in NC.

Acknowledgements

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- We thank the many homeowners that responded to our survey.