

The Health Index

West Nile Virus Awareness and Behaviours In Middlesex-London

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Key Points

- Virtually all residents of Middlesex-London have heard of West Nile virus.
- Between 2001 and 2003 there was an increase in the proportion of the adult population taking measures to prevent being bitten by mosquitoes.
- In 2001 there were some differences by age group, education, and income level with respect to knowledge and personal protective behaviours. By 2003 many of these differences did not exist.
- Future efforts should focus on sustaining high levels of awareness, improving specific knowledge about West Nile virus, and identifying and removing barriers to improving adoption of personal protective measures.

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BACKGROUND

West Nile virus is spread to humans from mosquitoes that have contracted the virus, usually by biting infected birds. Many people who contract West Nile virus have no symptoms or experience only flu-like symptoms¹. About one in five of those infected develop West Nile fever^{1,2}, the symptoms of which include fever, headache, muscle aches and rash that resolve in approximately one week¹. About one out of 150 people infected develop more serious disease, including inflammation of the brain (encephalitis) or inflammation of the layers of the brain (meningitis)^{1,2}.

Identified in Africa in 1937, West Nile virus first appeared in North America in 1999 when 62 people from New York City contracted the virus, with seven subsequent deaths³. West Nile virus was first confirmed in Ontario among birds in 2001 and the first human case occurred in 2002⁴. In 2003 the Ontario Ministry of Health and Long-Term Care released a comprehensive West Nile virus surveillance and control strategy, including province-wide mosquito surveillance and public awareness campaigns.

In Middlesex County and the City of London, West Nile virus control activities include the application of mosquito larvicide to catch basins and standing water sites. At the same time, provincial and regional public awareness campaigns have been geared toward reducing personal risk by cleaning up mosquito resting and breeding sites around homes and taking protective measures such as limiting outdoor activities at prime mosquito feeding times and covering up with long clothing.

Since 2001 the Middlesex-London Health Unit (MLHU) has capitalized on its participation in the Rapid Risk Factor Surveillance System (RRFSS) to assess public awareness and behaviours related to West Nile virus concurrent to West Nile virus control activities. RRFSS is an ongoing, monthly telephone survey of the general population aged 18 years and over, conducted by the Institute of Social Research at York University on behalf of MLHU. Along with other Ontario health units, MLHU developed modules related to West Nile virus and implemented their use in RRFSS by June 2001.

adults 50 years of age and over are more likely to develop serious West Nile virus-related illness. Over one-third, 38.7% ($\pm 4.3\%$), thought that the risk was similar for all age groups, 5.0% ($\pm 1.9\%$) believed that several different age groups were at increased risk, and an additional 5.0% ($\pm 1.9\%$) replied that they did not know.

An additional element of West Nile virus knowledge is the perception of becoming seriously ill. Although most physicians believe that the risk of people becoming ill due to West Nile virus is low^{1,2}, 30.0% ($\pm 4.0\%$) of Middlesex-London residents felt that they were at risk of becoming ill.

AWARENESS AND KNOWLEDGE

Snapshot 2003

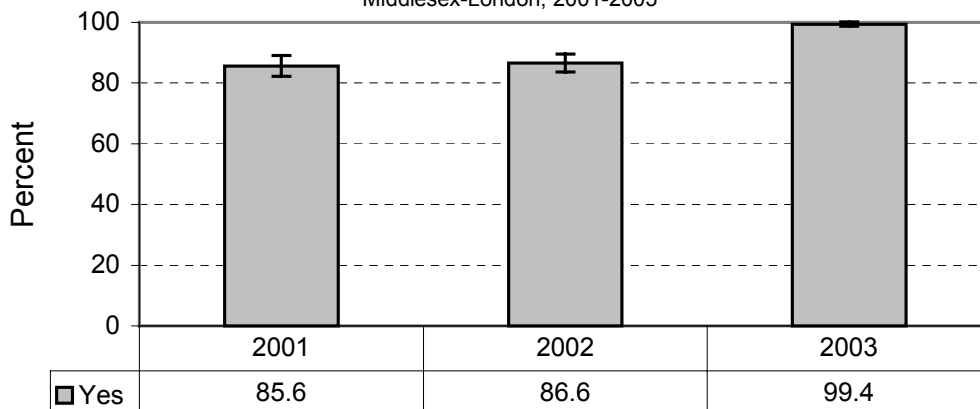
By 2003 nearly all of the adults 18 years and over residing in Middlesex-London, 99.4% ($\pm 0.7\%$), had heard of West Nile virus and 88.9% ($\pm 2.7\%$) knew that the virus is passed on to people by being bitten by an infected mosquito. However, respondents were far less knowledgeable about groups believed to be at higher risk for becoming seriously ill from West Nile virus. Only 32.3% ($\pm 4.1\%$) knew that

Trends 2001 – 2003

In general, awareness of West Nile virus in Middlesex-London has increased in the three years that information has been collected. In 2001, 85.6% ($\pm 3.4\%$) of the adult population in Middlesex-London had heard of West Nile virus; that proportion increased significantly by 2003 (99.4% $\pm 0.7\%$) (Figure 1). This increase is remarkable given the relatively short time that West Nile virus awareness programming has been in place.

Figure 1: Percentage of Adults (Aged 18+) that have heard about West Nile virus,

Middlesex-London, 2001-2003



Source: Rapid Risk Factor Surveillance System Waves 6-9 (2001), 17-21 (2002), 25-36 (2003)

Of those who had heard of West Nile virus, the proportion correctly identifying that it is passed on to humans by being bitten by infected mosquitoes* significantly increased, from 73.5% ($\pm 4.7\%$) in 2001 to over 85% in 2002 (86.3% $\pm 3.2\%$) and 2003 (88.9% $\pm 2.7\%$). In 2001 there were significant differences by age groups, education, and income levels. However, by 2003 these differences were no longer significant. This too is substantial progress. Of those in 2001 who had heard of West Nile virus:

- the proportion of 18 to 24 year olds who knew how it is transmitted to humans (85.0% $\pm 9.0\%$) was significantly greater than those 65 years and over (57.9% $\pm 15.7\%$).
- the proportion of respondents with post-secondary degrees that knew infected mosquitoes transmit the virus (79.4% $\pm 6.0\%$) was significantly greater compared to those whose highest education was less than high school (55.3% $\pm 15.8\%$).
- the proportion of residents with an annual household income over \$100,000 (93.0% $\pm 7.6\%$) was significantly greater than those with an annual household income between \$40,000 and \$70,000 (71.8% $\pm 10.5\%$) as well as those less than \$40,000 (68.1% $\pm 9.6\%$).

PROTECTIVE BEHAVIOURS

Snapshot 2003

In 2003, over one-half of the Middlesex-London adults (56.3% $\pm 5.1\%$) reported that they had made more of an effort to avoid mosquitoes since hearing about West Nile virus. Approximately two-thirds of females (67.0% $\pm 6.7\%$) reported increasing efforts

* In 2001, transmission by handling infected birds was also accepted as a correct response. As of May 2002 it was no longer included because the risk associated with handling an infected bird was deemed negligible to members of the general public.

to avoid mosquitoes; the proportion among males was significantly lower (42.9% $\pm 7.3\%$). As well, a significantly greater proportion of City of London residents reported that they had made no behaviour changes with respect to avoiding mosquitoes in spite of having heard of West Nile virus (38.8% $\pm 5.8\%$) compared to residents of Middlesex County (23.3% $\pm 8.7\%$). This was the only behaviour where a statistically significant difference between City and County residents was observed.

Public education campaigns promote a variety of personal protective measures aimed at reducing the likelihood of being bitten by mosquitoes. In 2003 these behaviours were adopted in varying degrees among residents of Middlesex-London:

- 52.6% ($\pm 4.4\%$) regularly avoided mosquito resting areas outside their homes, such as shaded and wooded areas, and potential mosquito breeding grounds, including ditches and ponds with stagnant water. A significantly greater proportion of females (60.6% $\pm 5.8\%$) did so compared to males (43.0% $\pm 6.4\%$).
- 31.0% ($\pm 4.0\%$) regularly limited their outdoor activities in the early evening, night time and early morning hours when mosquitoes were likely to bite. Again, the proportion of females (41.2% $\pm 5.8\%$) was significantly greater than males (18.9% $\pm 5.1\%$).
- 32.7% ($\pm 4.1\%$) regularly wore protective clothing while outdoors, including long-sleeved shirts, pants and socks. The proportion among residents whose highest level of education was less than high school (56.0% $\pm 13.8\%$) was significantly greater than high school graduates (29.3% $\pm 6.6\%$) and those with post secondary degrees (30.3% $\pm 5.7\%$).

- 16.6% ($\pm 3.3\%$) regularly used insect repellent with DEET[†]; 13.4% ($\pm 3.0\%$) used DEET repellent half the time or less.

In spite of these efforts and nearly universal familiarity of West Nile virus, between one-quarter and two-thirds of the adult population had made no changes in their behaviours and practices in order to avoid mosquitoes. The proportion was lowest with respect to never making an effort to avoid mosquito resting and breeding areas ($26.9\% \pm 3.9\%$). However, nearly one-half never limited their outdoor activities in the early evening, over night and early morning hours ($48.4\% \pm 4.4\%$) or wear protective clothing while outdoors ($45.7\% \pm 4.4\%$) to avoid being bitten by mosquitoes. Close to 70% of the Middlesex-London residents never used DEET insect repellent ($69.1\% \pm 4.1\%$). A significantly greater proportion of males than females reported never taking any of these personal protective measures, with the exception of using insect repellents containing DEET, where there was no gender-based difference.

Protective measures around the home aimed at reducing exposure to mosquitoes appeared to be better adopted than were personal protective behaviours. Over 80% ($83.1\% \pm 3.3\%$) of Middlesex-London residents kept mosquitoes out of their homes by either keeping windows shut or ensuring that screens were in good repair to prevent mosquitoes from coming in through windows. Only $5.4\% (\pm 2.0\%)$ of households had containers that collected water outside of their homes, such as bird baths and water barrels, where the water was allowed to stand for more than seven days. The majority of households reduced potential mosquito breeding sites either by having no water containers outside their homes ($77.0\% \pm 3.7\%$) or by ensuring that containers with standing water were

emptied at least every seven days ($17.6 \pm 3.3\%$).

A comprehensive mosquito larvicide program aimed at reducing the number of mosquitoes in potential mosquito breeding sites such as catch basins and standing surface water was launched in Middlesex-London in 2003. RRFSS data from 2003 indicated that $71.9\% (\pm 4.0\%)$ of residents of Middlesex County and the City of London were supportive of the use of pesticides in order to reduce mosquito resting and breeding sites and help control the spread of West Nile Virus to people. Only $6.3\% (\pm 2.1\%)$ were unsure whether they supported or opposed the use of pesticides to reduce potential mosquito resting and breeding sites.

Trends 2001 – 2003

Depending on the protective behaviour under consideration, there were some significant differences by gender, age groups, and household income level. However, there were no differences between Middlesex County residents and those in the City of London for the elements that could be compared 2001 through 2003.

In 2001, only $37.0\% (\pm 4.7\%)$ of adults avoided potential mosquito resting sites such as shaded and wooded areas or stagnant water where mosquitoes were likely to breed. This proportion increased significantly in 2002 to $55.9\% (\pm 4.4\%)$ and was maintained in 2003 ($52.6\% \pm 4.4\%$). In 2001, more females ($45.2\% \pm 6.9\%$) than males ($29.2\% \pm 6.3\%$) reported regularly avoiding potential mosquito resting and breeding areas. Further, the proportions of 18 to 24 year olds ($22.4\% \pm 9.4\%$) and 25 to 44 year olds ($33.8\% \pm 8.0\%$) who regularly avoided these areas were both significantly lower than those 65 years of age and over ($59.1\% \pm 14.5\%$). Finally, in 2001 a greater proportion of those with household incomes less than \$40,000 reported that they regularly avoided shaded and wet areas around their homes ($44.5\% \pm 9.3\%$)

[†] Chemical name: N,N-diethyl-meta-toluamide

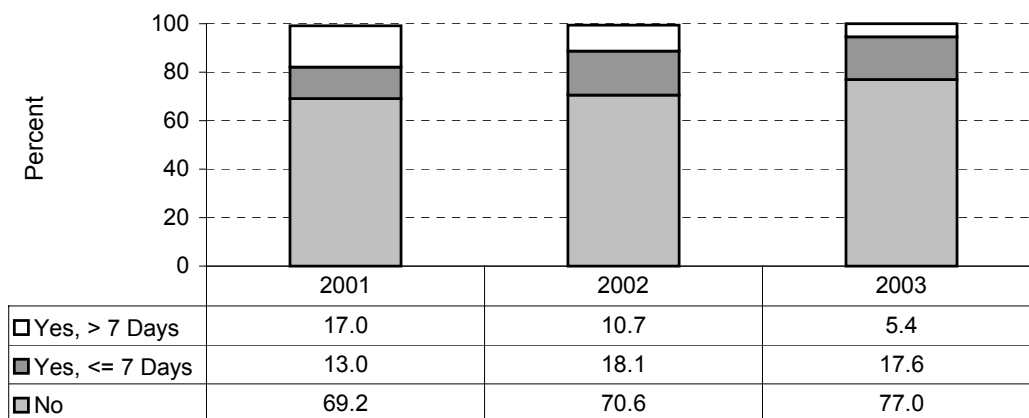
compared to those with an annual household income between \$70,000 and \$100,000 (22.9% ± 11.9%); respondents with household incomes over \$100,000 could not be considered due to low counts. By 2003, the proportion of females (60.6% ± 5.8%) regularly avoiding areas where mosquitoes were likely to rest and breed was still significantly greater than males (43.0% ± 6.4%), but differences by age group and household income level were no longer significant.

Between 2001 and 2003, the proportion of Middlesex-London residents regularly limiting their outdoor activities in the early evening, night time and early morning hours when mosquitoes are likely to bite increased significantly from 22.2% (± 4.1%) to 31.0% (± 4.0%) by 2003. At the same time, the proportion reporting that they never limited activities significantly increased from 47.1% (± 4.9%) in 2001 to 56.5% (± 4.3%) in 2002, but decreased again in 2003 to 48.4% (± 4.4%). In 2001, a significantly greater proportion of those over the age of 65 years indicated that they regularly limited their outdoor activities during prime mosquito feeding times (40.0% ± 14.3%) compared to 18 to 24 year olds (10.5% ± 6.9%), but by

2003 there were no statistically significant differences by age group.

The most substantial improvement observed between 2001 and 2003 was in the proportion of Middlesex-London households that reduced potential mosquito breeding and resting sites outside their homes, such as in bird baths and water barrels. Figure 2 shows that there was a minor increase in the proportion of households that had no containers outside collecting water, from 69.2% (± 4.6%) in 2001 and 70.6% (± 4.1%) in 2002 to 77.0% (± 3.7%) 2003, but this increase was not statistically significant. However, the proportion of households in 2003 that allowed water in containers outside their homes to stand for more than 7 days (5.4 ± 2.0%) was significantly lower than the proportion of households in either 2002 (10.7% ± 2.7%) or 2001 (17.0 ± 3.7%). In both 2001 and 2003 there were no significant differences between genders, age groups, education and household income levels with respect to this protective behaviour.

Figure 2: Percentage of households with objects/areas outside homes that collect water Middlesex-London, 2001-2003



Source: Rapid Risk Factor Surveillance System Waves 6-9 (2001), 17-21 (2002), 25-36 (2003)

SUMMARY AND IMPLICATIONS

By 2003, awareness of West Nile virus in the City of London and Middlesex County was nearly universal. Comparison of information from 2001, 2002 and 2003 indicated that improvements have also been made in the proportion of the adult population taking measures to avoid being bitten by mosquitoes. While this progress is commendable, efforts should not be relaxed. High awareness levels need to be sustained, which may be challenging in the face of the increasing number of competing public health concerns.

These analyses suggest that there are continued gains to be made with respect to translating awareness and knowledge into the adoption of protective behaviours. In order to achieve this it may be necessary to first explore reasons why protective behaviours are not accepted and to gear education campaigns toward these issues. For example, one personal protective measure where RRFSS analyses suggested poor adoption was the use of insect repellants containing DEET. Guidelines for the use of DEET insect repellants suggest different concentrations for different age groups; poor understanding of how to properly use the product may be contributing to low use by Middlesex-London residents. Alternatively, respondents may have concerns about the potential toxicity of DEET, reducing the likelihood of regular use. Identifying barriers for adoption of this and other personal protective measures and developing strategies to overcome these barriers are necessary aspects of continuing the overall improvements observed between 2001 and 2003.

There are also gains to be made in terms of improving specific knowledge about West Nile virus, such as awareness of high-risk groups and appropriate perception of personal risk for developing serious West Nile virus-related illness. Future efforts in

this area will need to provide accurate information so that residents understand why West Nile virus prevention is important without becoming overly apprehensive about becoming seriously ill.

Considering the relatively short amount of time since West Nile virus was first identified in North America and public awareness campaigns began in Ontario and Middlesex-London, considerable progress has been made in terms of awareness and adoption of personal protective behaviours. By sustaining these efforts and further enhancing public education strategies, this progress should continue into 2004 and the coming years. Ongoing, semi-annual monitoring through RRFSS will play an important role, providing information that can be used to both evaluate and enhance existing public awareness programs.

METHODS

Data Source

Information about West Nile virus knowledge and protective behaviours in Middlesex-London was derived from the Rapid Risk Factor Surveillance System (RRFSS), an ongoing population health telephone survey of adults 18 years of age and over. Data are collected for the MLHU by the Institute of Social Research at York University. Each month approximately 100 households, randomly selected from all households with telephones in London and Middlesex County, are surveyed. Respondents are systematically selected from each household by identifying the individual 18 years of age or over whose birthday is next. Every effort is undertaken to complete the interview with the identified respondent. On average, five calls to each household are required in order to complete the interview.

In the MLHU service area, information about West Nile virus knowledge and behaviours was collected between June and October in

2001 and between May and October in 2002 and 2003. The unweighted or household sample consisted of 1,420 respondents across all three years of RRFSS data used, representing a total of 14 waves of data collection (Table 1). Per RRFSS standards, responses were weighted to approximate a random sample of adults where applicable.

While every effort is taken to ensure consistency among RRFSS questions, many have been modified since the introduction of the West Nile virus module in order to accommodate the up-to-the-minute and evolving nature of the survey. As a

result, comparison among 2001, 2002 and 2003 is limited to those questions that were unchanged over all three years.

Presentation of Information

All percentages were provided with 95% confidence intervals. Differences between groups were considered significant if confidence intervals did not overlap. Bar charts included error bars illustrating 95% confidence intervals.

Table 1: RRFSS West Nile virus modules, 2001 – 2003, Middlesex-London

Year	Waves of Data Included	Dates	# Households Sampled (Unweighted Sample)
2001	6 – 9	June 12 – October 09	405
2002	17 – 21	May 11 – October 09	506
2003	25 – 36	May 09 – October 10	509

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