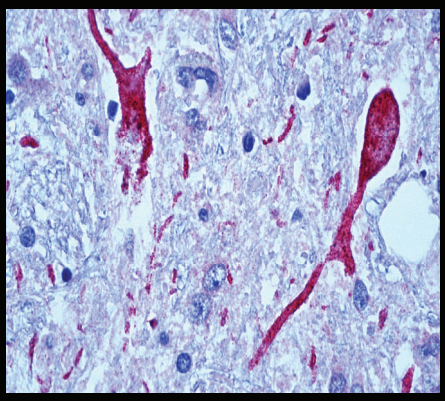

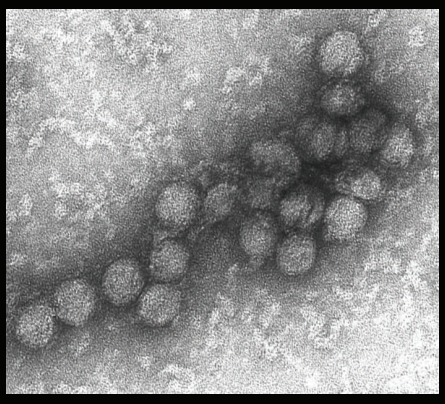

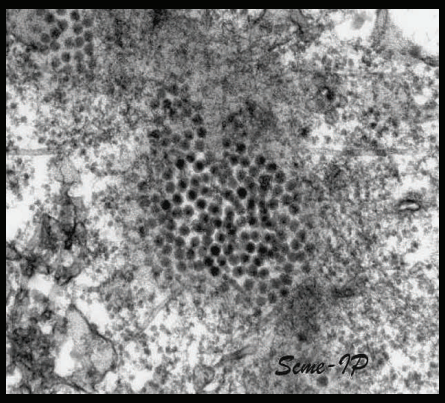

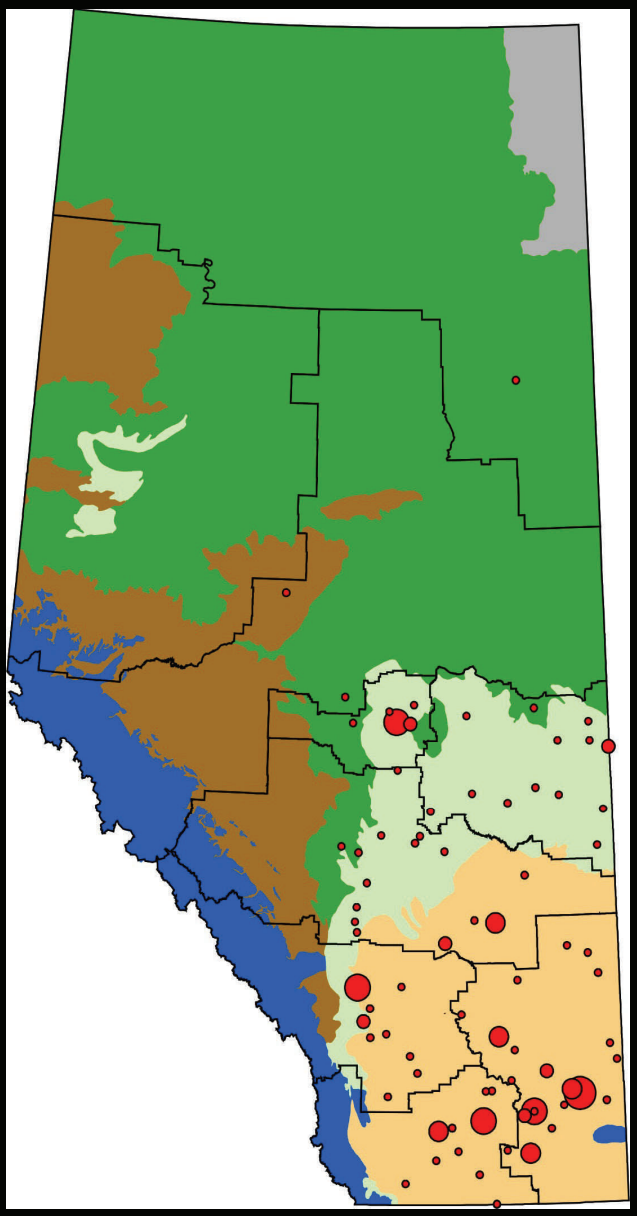

REPORT

Estimating the Infection Rate of West Nile Virus in Alberta

Alberta Health and Wellness

2005 Alberta Centennial

2005

Health Surveillance

Estimating the Infection Rate of West Nile Virus in Alberta

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Photograph 1: This image depicts dead adult mosquitoes scattered uniformly. Image courtesy of the U.S. Centers for Disease Control and Prevention Public Health Image Library (Image ID No. 6335).

Photograph 2: Brain tissue from a West Nile virus encephalitis patient. Image courtesy of the U.S. Centers for Disease Control and Prevention Public Health Image Library (Image ID No. 1845).

Photograph 3: An electron micrograph image of the West Nile virus. Image courtesy of the U.S. Centers for Disease Control and Prevention Public Health Image Library (Image ID No. 2290).

Photograph 4: Transmission electron micrograph image of the West Nile virus. Image courtesy of the U.S. Centers for Disease Control and Prevention Public Health Image Library (Image ID No. 1340).

Suggested citation:

Ivan M , Schopflocher DP, Svenson LW, Tilley P, Keays G. *Estimating the Infection Rate of West Nile Virus in Alberta*. Edmonton: Alberta Health and Wellness, 2005.

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ISBN: 0-7785-3469-3 (print)
ISBN: 0-7785-3470-7 (internet)

Acknowledgements

This report is the result of efforts of a number of individuals.

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The telephone survey was administered by Calgary Health Region-Prospective Measurement and Evaluation. The Provincial Laboratory for Public Health conducted the required screening tests for West Nile virus. The National Microbiology Laboratory, Winnipeg, conducted confirmatory tests for West Nile virus detection.

Funding was provided by Alberta Health and Wellness and Health Canada.

We would also like to gratefully acknowledge the contributions made by:

- All study respondents whose participation was crucial to the success of the study.
- All laboratories in Alberta who agreed to participate and ensured the blood collection.
- Health Surveillance staff Jill Svenson and Ada Chan for support fielding questions and ensuring that materials were sent out to respondents.
- Lavera Sebulsky, Capital Health Authority, for administrative support and budgeting.

Executive Summary

This report presents the results from the West Nile virus (WNv) Seroprevalence Study, undertaken by Alberta Health and Wellness during March through June 2004.

During 2003, there were 275 confirmed human cases of WNv in Alberta. For every clinical infection there are likely many more undetected infections in humans since the majority of WNv infections have no symptoms. The study was conducted to estimate how many Albertans had actually been infected with the virus. The study also investigated the knowledge and attitudes of Albertans about WNv and about measures used to protect against infection.

Study participants were recruited by telephone using random digital dialing. The sample was recruited equally from the Palliser Health Region (which had the highest incidence of WNv cases during the summer of 2003) and the rest of the province. The respondents were also sampled differentially according to place of residence to determine whether rural residents are at greater risk of infection.

Potential participants, 18 years and older, were asked to complete a telephone survey and donate a blood sample. The telephone interview used questions adapted from previous studies about WNv in Canada and the United States (US).

A total of 3,780 Albertans responded to the telephone survey. Of these, 2,518 also donated a blood sample. The blood samples were analyzed to determine the prevalence of WNv antibody among study participants. The results were used to estimate WNv seroprevalence in Alberta following the 2003 season.

Seroprevalence results

Overall in Alberta, the WNv seroprevalence rate was estimated to be three in 1000 residents. This suggests that more than 6,900 Albertans were infected with WNv during the 2003 season. About one in 26 infected individuals became clinical cases, and about one in 142 infected individuals developed severe illness (WNv neurological syndrome) during 2003.

The Palliser Health Region, located in the southeast of Alberta, had the highest seroprevalence rates: 46 of every 1,000 individuals living in a non urban area and eight in every 1,000 individuals living in an urban area had been exposed to WNv.

Individuals who reported they always used mosquito repellent containing DEET were somewhat less likely to be infected with WNv, although this association did not reach conventional levels of statistical significance.

Survey results

Almost all respondents heard about WNv prior to the survey, and the majority were aware that the virus had been detected in Alberta during 2003. This information was most often obtained from television or newspapers. However, a considerable proportion of seniors were not aware that they are at increased risk for severe complications of WNv infection. This suggests that a focused education campaign may be warranted.

The majority of Albertans agree with control measures initiated by communities to reduce the number of mosquitoes. This despite the uncertainty of scientific evidence on the effectiveness of mosquito control programs for reducing the risk of WNv infection. Disagreement, when present, is associated with the belief that hazardous chemicals are used or that not enough is known about the safety of these interventions.

Survey participants were more likely to use personal protective measures if they were:

- worried about contracting WNv;
- spent more time outdoors during risk hours for WNv transmission; and
- female.

In addition, respondents were more likely to use mosquito repellent containing DEET if they were more knowledgeable about WNv and were worried about contracting the virus. Participants also indicated they were more likely to engage in environmental risk reduction activities, such as removing standing water and repairing window or door screens, if they: lived in rural areas; were worried about contracting WNv; and were older.

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Introduction

During the summer of 2003, Alberta reported cases of WNv infection for the first time. Overall there were 275 confirmed human cases. For every clinical infection there are many more undetected infections in humans since the majority of WNv infections are asymptomatic and self-limiting. For this reason, a sero-survey was undertaken to complement the information gained through regular surveillance of WNv.

Enhanced surveillance was expected to:

1. Add to current knowledge of WNv epidemiology in the broad context of new emerging diseases in Canada and abroad.
2. Enhance baseline surveillance data for WNv infection prevalence in order to evaluate the evolution of this epidemic in Alberta and Canada at present and in the future.
3. Assist in evaluating the effectiveness of public communication and awareness campaign components of the 2003 WNv response plan in Alberta.
4. Identify potential risk factors at individual and community levels and assist in planning preventive strategies and focused control measures.
5. Provide a reference for future studies of ecology and epidemiology of WNv and other arthropod-borne infections in Alberta and Canada.

Epidemiology of West Nile virus infection

The virus and its ecology

WNv is an arbovirus (arthropod transmitted virus) from the *Flaviviridae* family. It belongs to the Japanese encephalitis serocomplex together with other mosquito-borne viruses: St. Louis encephalitis virus, Murray Valley encephalitis virus, the Kunjin subtype, and Japanese encephalitis virus.

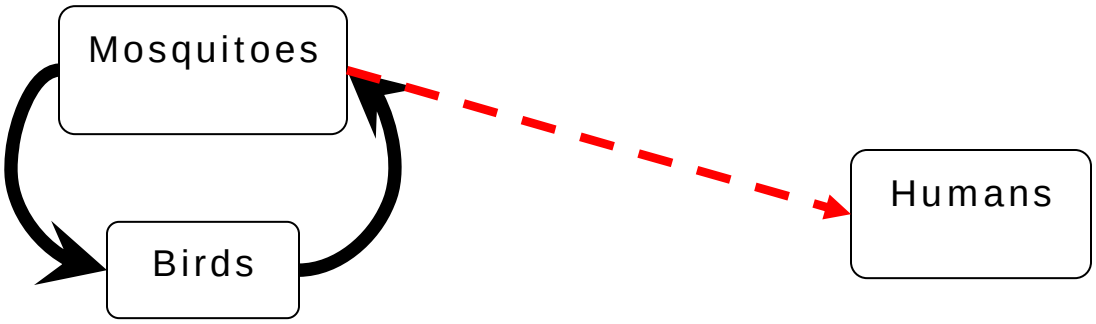
WNv was first discovered during 1937 in the blood of a woman from the West Nile province of Uganda,[1] and since then it has been involved in both sporadic human cases and major epidemics in Africa, Middle East, Europe, and Asia. WNv made its first appearance in North America during 1999.

WNv is transmitted in cycles between birds and mosquitoes, particularly the Culex species of mosquito (Figure 1). Ornitophilic mosquitoes (those feeding on birds) are the principal vectors of WNv, while many species of birds, especially migrants, act as hosts for the virus.[2] Infected birds have the ability to spread the virus into new territories, acting as introductory hosts.

For the virus to become established in a new territory, several factors are necessary: appropriate climate, abundant presence of mosquito vectors[a] and cross-species transmission to numerous indigene birds, which act as amplifying hosts. Once introduced, the virus has the ability to persist from year to year.

In Eurasia the usual epidemiologic pattern is one of isolated avian outbreaks, apparently resulting from importation of the active virus by migratory birds into an area with appropriate climatic, vector and amplifying host conditions.[3] Following its introduction in North America, the evident pattern was one of an epizootic with increased avian mortality due to lack of previous exposure and adaptation to the virus.[4]

Figure 1. WNv transmission cycle



Susceptibility to infection varies among bird species. On one end of the spectrum are species characterized by high susceptibility to infection followed by high death rates, and on the other are species which are much less susceptible to both infection and death from the virus.

Somewhere in between are species which are susceptible to infection, develop significant blood levels of virus but in whom the subsequent mortality is low. The importance of these species in the propagation of virus is still to be determined. Susceptibility to fatal infection with the virus varies markedly for adult and young birds. Younger birds are more likely to experience high death rates compared with adults.[2] Humans and other mammals are currently believed to be 'dead-end' hosts. Once infected the virus may not be able to replicate in sufficient quantity to contribute to additional infections.

In order to extend the natural cycle of WNv infection to humans the mosquitoes must act as bridge vectors, feeding first on infected birds, and then on humans. Among more than 40 species found carrying the virus, *Culex* species are the most important in transmitting the disease to humans. The *Culex* species have their peak feeding during dusk and dawn, thus the risk for infection in humans is higher during these time periods.[5]

[a] In this case, a vector is an insect that transports the virus from an infected person/animal/bird to a susceptible one. For example, the mosquito transmits WNv from infected birds to susceptible humans.

The *Culex tarsalis* mosquito, which breeds primarily in irrigated farmlands, is generally regarded as being primarily responsible for WNv transmission in western Canada. Laboratory studies have found it to be one of the most effective vectors in transmitting WNv.[6] In addition, the over-wintering mechanism present in many species, including *Culex tarsalis*, which facilitates virus survival within infected mosquitoes, may play an important role in the persistence of the virus in North America.

WNv is found in many endemic areas of Africa where is settled into epizootic cycles, with epidemic peaks when the local population of birds, horses and humans have a low prevalence of antibodies. Higher virus density is observed in areas with large populations of migratory birds localized transversally from Western Africa to Madagascar or vertically from South Africa to Europe and Russia.[7]

The distribution of WNv within a region is influenced by complex ecological factors; therefore, making predictions for a potential human epidemic is difficult. In order to assess the potential for an outbreak multiple factors must be considered:

- human population density
- vector characteristics (abundance of mosquitoes, their feeding patterns, and flight range)
- reservoir characteristics (population density of the avian host reservoir, presence of susceptible hosts)
- virus presence and characteristics (virulence)
- environmental factors (climate-rainfall and temperatures, vegetation, landscape)
- implementation of prevention and control measures (vector control programs , public education)

During the past decade, WNv gained the status of an emerging infectious disease, capturing the attention of public health professionals and the public, and involving substantial economic costs.[8] It has been involved in outbreaks in Romania (1996), Russia (1999), Israel (1998, 2000) and more recently, in North America.[7]

Human disease

Mosquitoes are the most common mode of transmission of WNv to humans. Direct human to human transmission has not been documented. Other forms of transmission have been documented and include:[9]

- organ transplantation;
- blood transfusion with approximately half of individuals who receive infected blood developing symptoms;[10]
- mother to child transmission either through trans-placental or breastfeeding; and
- occupational exposure with several cases of WNv infection reported in laboratory workers, turkey-breeders and crocodile farm workers.

Most infected individuals have no symptoms. When symptoms do appear they normally occur three to 15 days after the mosquito bite and include flu-like symptoms that last just a few days (West Nile fever). Some people may develop a more serious set of symptoms referred to as WNv neurological syndrome. Symptoms may include encephalitis, meningitis and acute flaccid paralysis (poliomyelitis-like, or Guillan-Barré-like). These symptoms are more likely to lead to hospitalization than West Nile fever. It also has an estimated seven to nine per cent case fatality rate.[11] WNv neurological syndrome might also result in a prolonged rehabilitation period, especially in older individuals.[12]

The distribution of clinical presentations (syndromes) depends on previous WNv activity in the area and consequent background immunity. It will also be influenced by the age structure of the population and the presence of surveillance activities and the effectiveness of control efforts.

In endemic areas, with a high prevalence of background immunity, WNv infection is associated with early childhood and is mostly a self-limited, non-fatal febrile disease, rarely associated with encephalitis.

In contrast, in urban areas of the temperate zones, where little or no previous virus activity has occurred (e.g. North America), aging and immunologically naïve populations are more likely to experience neuroinvasive disease. Serologic surveys indicate that infection rates are similar in every age group, and both sexes are equally susceptible but the frequency and severity of clinical illness increases with age.[13-15] About one in every 150 infected individuals will develop severe neurological disease.[16]

The risk factors associated with WNv infection in recent urban epidemics were the length of time spent outdoors and the failure to undertake personal protective measures against being bitten by mosquitoes.[16, 17]

The risk factors associated with West Nile virus infection distribution and the impact on the western hemisphere

The discovery of WNv during the summer of 1999 in the US dramatically influenced the epidemiology of arboviruses in the western hemisphere.[18] The modality of virus introduction to this new territory was not fully elucidated. The subsequent spread of the virus throughout much of the US and Canada after 1999 underscores the ability of arboviruses to become established when introduced to new areas where efficient vectors, susceptible amplifying hosts and reliable over wintering mechanisms are present.[19] The virus caused widespread mortality in some indigenous bird species.[4]

The emergence of WNv in North America prompted an immediate public health response. At present, WNv surveillance programs are in place in both the US and Canada. Data is being collected on a weekly basis during the transmission season and is reported for wild birds, sentinel chicken flocks, veterinary cases, human cases and mosquito pools.

WNv has spread continuously from east to west since its introduction in the western hemisphere. From 1999 to 2001, 149 cases of illness and 18 deaths were reported in humans in the US. During 2002, 4,100 cases and more than 280 deaths in humans were detected through surveillance systems; 2003 ended with 9,862 cases and 264 human deaths.[20] As of November 8, 2004, 2,282 cases had been reported for the year.[20] In the US, human infections are normally detected from May to December, with the majority of cases occurring in August.

In Central America and the Caribbean the epidemiology and further evolution of WNv may be influenced by the: opportunity of year round transmission; pre-existing immunity to other flaviviruses; and genetic mutations of the virus.[2] Although not many human cases have been reported from the Caribbean, virus activity has been detected in birds and horses, maintaining the potential for future human infections. This region also serves as wintering ground for migratory birds; therefore, it is likely to contribute to the maintenance of the virus in avian reservoirs.[21]

West Nile virus in Canada and Alberta

WNv was first detected in Canada in August 2001. During that year, 128 dead birds and 11 mosquito pools tested positive in Ontario. As a response to the emergence of WNv in the US, surveillance for the virus was first introduced in Canada during 2000. In Canada, the season for WNv infections lasts from May to September.

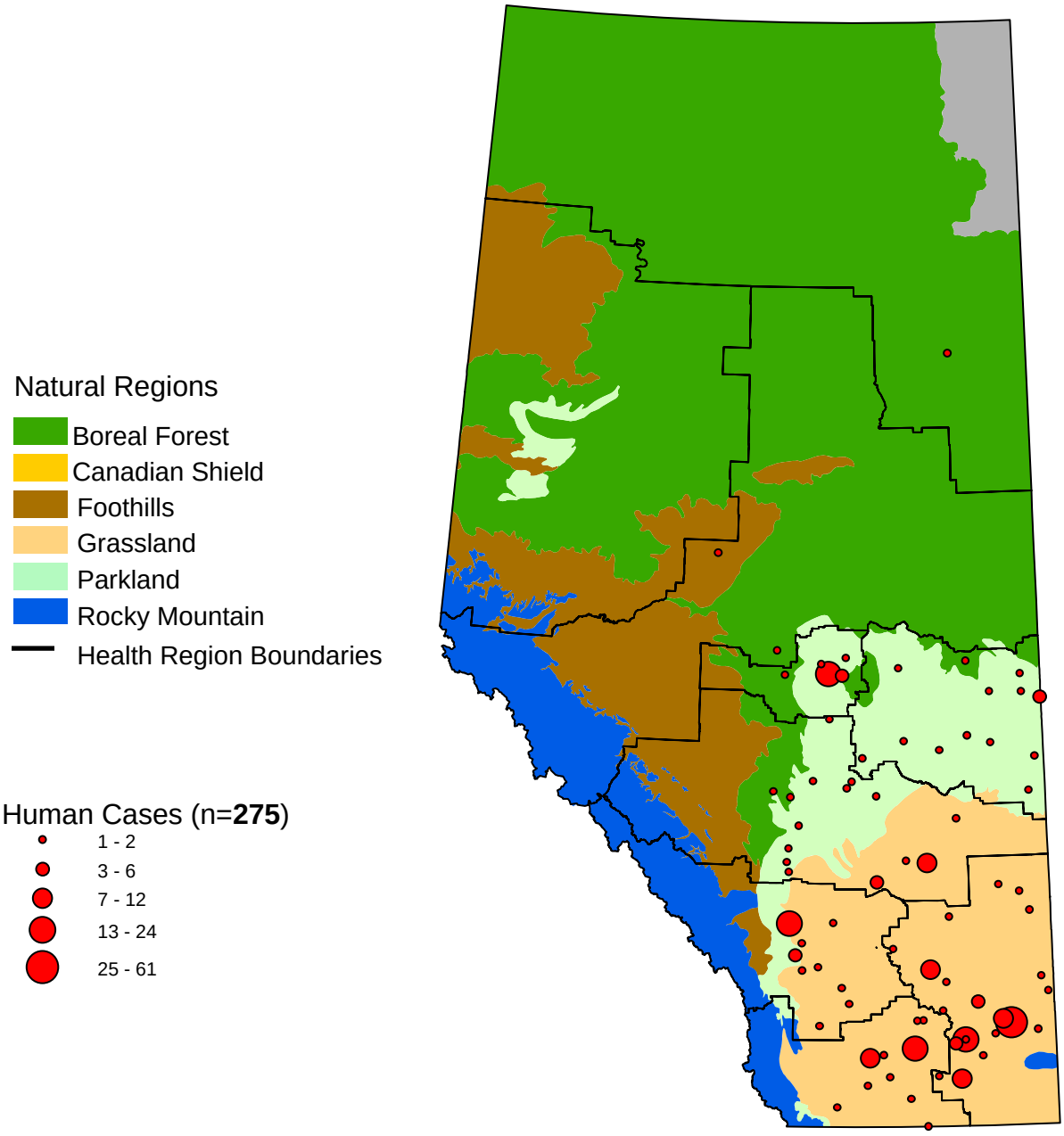
Surveillance has involved collecting and testing birds and mosquitoes, as well as enhanced passive surveillance for human and equine cases. The public health response included coordination of a multidisciplinary National Steering Committee and working groups, as well as implementing public education initiatives.

During 2002, 315 confirmed cases of human illness were reported in Ontario and Quebec. WNv activity was also recorded in dead birds only, or in combination with mosquitoes and or horses in Manitoba, Nova Scotia, Ontario, Quebec and Saskatchewan.[22]

WNv activity was reported in seven provinces during 2003: Alberta, Manitoba, New Brunswick, Nova Scotia, Ontario, Quebec, and Saskatchewan. A total of 1,388 cases were reported as of May 12, 2004. Saskatchewan registered the largest number of human cases at 935.

The arrival of WNv in Alberta was signaled by the detection of the virus in birds, mosquitoes, horses and humans. The first infected bird was confirmed on July 9, 2003 and the first human case was confirmed on August 12, 2003. In total 435 birds, 31 mosquito pools and 172 horses tested positive. The distribution of WNv was characterized by strong clustering of positive mosquitoes, birds and horses in the Parkland and Grassland natural regions of the province (Figure 2).

Figure 2. Geographical distribution of WNv in Alberta during 2003



During the 2003 season, a total of 275 confirmed clinical cases were reported in Alberta, of which 48 were the more serious West Nile neurological syndrome. Palliser Health Region, located in the southeastern part of the province, reported 131 WNv cases, the highest incidence of cases in Alberta. The region is characterized by higher temperatures and lower precipitation, which are conditions that are known to favor the development of *Culex* mosquitoes. Geographic distribution of human cases followed that of positive mosquito pools, birds and horses.

The clinical presentation of cases in Alberta included both WNv fever and neuroinvasive disease. The neurological manifestations were in general similar to those previously reported in North America. Multiple neurological symptoms occurred in each patient and the neurological presentation was diverse.[23] There were no gender differences in WNv infection incidence. No cases were attributable to blood products, organ transplant or vertical transmission.

During 2004, WNv activity was detected in Alberta, Manitoba, Ontario, Quebec and Saskatchewan in mosquito pools and dead birds, but colder than average temperatures and a more humid summer resulted in few human cases. A total of 29 human cases were detected in Alberta, Manitoba, Ontario and Quebec as of November 1, 2004.[24] In Alberta two human cases were detected; one was travel related and one was considered to be locally acquired WNv neurological syndrome.[25]

West Nile virus seroprevalence

Seroprevalence is a term that refers to the proportion of the population that tests positive for a given condition at a given point in time. In the case of WNv, it is the proportion of the population testing positive for WNv antibodies. It is difficult to compare the results from different estimates of seroprevalence because methods typically differ from study to study. At one extreme serological surveys revealed endemic areas in Africa, with WNv antibodies reported in more than 60 per cent of the population.[26]

General background immunity in other regions is much lower. A post-epidemic study estimated two to four per cent in Bucharest, Romania during 1996.[14] Other studies have estimated 2.1 per cent in the Czech Republic during 1997[27] and eight per cent in Jordan during 1998.[28] In the western hemisphere, a three per cent seroprevalence rate was estimated in Queens, New York during 1999[16] and a zero to one per cent seroprevalence rate was reported in Connecticut during 2000.[29] A study of blood donors in Colorado[30] indicated a 0.2 per cent WNv infection incidence during 2003. Distribution of positives covered most major communities in Colorado, but rural areas were not very well represented.

In Ontario, in an area with the highest incidence of WNv cases during 2002, seroprevalence was estimated to be 3.1 per cent (95 per cent confidence interval: 2.2 – 4 per cent).[31]

A study conducted in Saskatchewan during the spring of 2004 revealed that more people were infected in the Five Hills Region of the province than in any other place studied in North America since the appearance of the virus in western hemisphere. Ten per cent of the adults participating in the study had evidence of infection from the 2003 season. In rural areas, the risk of infection was five times greater than in the city of Moose Jaw. People older than 60 were more likely to get infected than the rest of the population.[32]

Public perception and behaviours in North America

Since its identification in North America, there have been a series of studies conducted in order to document risk perception, behaviours, attitudes and risk factors associated with WNv infection in humans.

A study conducted in New York[16] during 1999 revealed that although 84 per cent of respondents named one or more personal protective measure against WNv, 39 per cent had not taken any of these measures. Only nine per cent of respondents consistently used repellent. The highest seroprevalence rate was found among individuals who were outdoors for more than two hours before dawn or after dusk. The study results underlined the considerable disparity between awareness and behaviour.

The study conducted in Connecticut[33] during 1999 and 2000 estimated household characteristics, behaviours and attitudes associated with WNv infection. Fifty-eight per cent of participants claimed to be a little or very worried about contracting WNv; 48 per cent were a little or very worried about getting sick from mosquito-control programs using pesticides; 79 per cent of respondents practiced one or more personal precautions to avoid exposure; and 86 per cent of households practiced one or more mosquito-source reduction activities. Practicing two or more personal precautions was associated with a higher perceived risk of infection and being female. Exercising two or more larvae source control measures was associated with households speaking English as the first language. Differences were found in individual protection measures between cultural groups and age groups.

In a study of public perceptions of WNv[34], the Harvard School of Public Health reported that 33 per cent of respondents living in a self-described "high-mosquito" area felt that it was very or somewhat likely that they or a relative would contract WNv during the next 12 months. Fully 43 per cent of respondents claimed to take no precautions against mosquito bites. In those "high-mosquito" areas where spraying occurred against mosquitoes to prevent the spread of WNv, 91 per cent of respondents approved of the spraying. Nationwide, 77 per cent of Americans reported to favor spraying as a method of preventing the spread of the virus if it appeared in their area. The study also measured public knowledge about WNv health impacts, such as associated mortality rates and treatment of the virus, finding limited knowledge. Thirteen per cent of study participants reported consulting with their veterinarians regarding potential WNv associated health risks for their pets.

A study conducted by the Connecticut Department of Public Health during 2002 assessed knowledge, attitudes and behaviours related to WNv. A high degree of knowledge of the virus was documented as well as awareness of the susceptibility of the elderly to developing severe illness due to WNv infection. Use of at least one personal protection barrier was more likely in people older than 50 years than in younger people. Respondents with confirmed WNv infection were less likely than other respondents to report using some form of personal protection. Local WNv surveillance awareness among the public was poor, and belief in the presence of WNv in the vicinity was not an established predictor for the use of personal protection barriers.[35]

A study conducted in Oakville, Ontario[31] during the spring of 2003 indicates that virtually all respondents were aware of WNv and that most (73 per cent) obtained their information about the virus from news media (television, radio and newspapers). A total of 80 per cent reported that WNv was an important or very important issue for the Halton Region and 72 per cent felt it was a somewhat or very important issue for Ontario. A total of 78 per cent of respondents were somewhat or very worried about becoming sick with WNv compared with 59 per cent who were very or somewhat worried about becoming sick from the pesticides used to kill mosquitoes. When asked what worries them more, 56 per cent reported that they were more worried about getting sick from contracting the virus, 22 per cent were more worried about pesticide use and 18 per cent were worried about both. In terms of responding to the threat of WNv during 2003, more than two-thirds of the study participants (67 per cent) would agree to the use of pesticides in order to reduce the number of mosquitoes.

Turning to risk behaviours, two-thirds of survey respondents lived on properties that had containers that held water during the summer of 2002. Further, 25 per cent of respondents reported tears in screens that covered doors or windows that opened to the outside. Nearly two thirds of respondents (65 per cent) rarely or never wore insect repellant when outdoors for 30 minutes or more. Fifty per cent rarely or never wore long-sleeved shirts and/or long pants. When asked what else they did to avoid being bitten, more than half (51 per cent) reported they did nothing. Yet, four-fifths of respondents remember receiving information in the summer of 2002 about how to avoid mosquito bites. While most area residents were aware of the risk of WNv infection as well as public health information about how to reduce the risk, area residents do not appear to have undertaken preventive measures as often as they could.

In British Columbia, where WNv arrival had been expected during 2003, a public health information campaign was followed by a telephone survey.[36] In this study, most respondents reported that information about WNv influenced them to engage in protective behaviours and the odds that these behaviours were practiced more frequently were influenced by the sources of information available, but also by the behaviours of relatives. The most prominent barrier for engaging in protective behaviours was the perception that DEET is a health and environmental hazard. A lack of knowledge was also observed regarding the increased risk for elders in contracting WNv and developing more severe symptoms. More than half of those unaware of this increased risk were from the age group 50 years or older.

Methods

Study design

This study was a cross-sectional prevalence survey and was conducted in two phases. Participants were not interviewed unless they agreed to participate in both phases of the study. In the first phase, consenting participants answered a telephone survey which asked the following about WNv in general and specifically about WNv infection:

- knowledge of
- attitudes toward
- behaviour/practices because of

In the second phase, a requisition was provided and participants donated blood samples at a participating laboratory.

Target population

Individuals residing in Alberta since July 2003 who were 18 years and older, as well as cognitively and linguistically competent were eligible to participate in the study.

Sampling design

A complex sampling design was employed. The research team decided to over-sample from the Palliser Health Region because during 2003 the region had the highest rate of confirmed WNv cases in humans. In addition, the research team wanted to determine whether risks differed between urban and non-urban environments, and since most Albertans live in urban centres, non-urban residents were over sampled.

Geographically specific banks of telephone numbers were obtained. These banks were assigned to one of two sets: the Palliser Health Region or the rest of Alberta. Within each of these two sets, banks were then allocated to one of two strata: urban or non-urban. Within the Palliser Health Region set, the urban stratum included Medicine Hat. For the non Palliser Health Region set, the urban stratum included Calgary and its suburbs (Okotoks and Strathmore), Edmonton and its suburbs (Fort Saskatchewan, Leduc, Sherwood Park, Spruce Grove, St. Albert and Stony Plain,) and the major regional urban centres of Fort McMurray, Grande Prairie, Lethbridge and Red Deer. All other banks were allocated to the non-urban strata.

The research team allocated 50 per cent of the sample to the Palliser Health Region and 50 per cent to the rest of the province. Based upon estimates of the number of urban and rural residents, the team allocated 60 per cent of the Palliser Health Region sample and 53.33 per cent of the non Palliser Health Region sample to the urban strata.

There were a number of uncertainties in this design. These included: the refusal rate for participation and the rate of completed blood donations among participants. It was also unclear whether these rates would differ across strata. The survey therefore proceeded by maintaining a balanced sample, but without a firm quota.

Surveying was discontinued after a sample of 3,780 Albertans had been assembled. Budget was an important consideration, but the decision to discontinue was made only after an assessment of the blood donation rate among survey participants suggested that approximately 2,500 blood samples would eventually be collected and the blood donation rate did not differ markedly across strata.

Finally, it should be noted that this sampling strategy excluded certain categories of Alberta residents, specifically those living in a household without a telephone, many of those living in long term care facilities and those residing in correctional facilities.

Telephone survey

The survey questionnaire (Appendix A) included questions adapted from previous studies conducted in Canada and the US. It consisted primarily of close-ended questions that investigated knowledge about WNv, the attitudes toward the virus and the use of measures to protect against infection.

Surveys were conducted by an experienced interview team from the Prospective Measurement and Evaluation department of the Calgary Health Region who used a computer assisted telephone interview system to facilitate the recording of information. An orientation session and WNv information package was provided for all interviewers.

The interviewers followed a strict protocol. It included a list of standard responses to frequently asked questions (Appendix B). The protocol was pilot tested by the interview team and refined prior to the initiation of the study. During the study, interviewers were monitored for adherence to the protocol.

Each selected telephone number was called a minimum of nine times including calls in three different time slots (weekday, evening and weekend) before it was abandoned. Contacted individuals who declined to participate were not called again. Table 1 presents the participation rates.

Table 1. Participation rates

Phase I participation rate			
	Rest of province	**Palliser Health Region**	**Total**
Agreed to participate	1,891	1,889	**3,780**
Declined to participate	4,541	3,511	**8,052**
Total	6,432	5,400	**11,832**
Rate	29%	35%	**32%**

These rates are lower than those typically obtained in telephone surveys that address health concerns. However, participation involved agreeing not only to answering the telephone survey, but also agreeing to provide a blood sample at a participating laboratory. A study, comparable in this respect, has previously reported a response rate of 25 per cent.[34]

Blood collection

Survey respondents received an information package about the blood collection procedures in the mail. It included: an information letter (Appendix C), a requisition form (Appendix E), a list of patient collection sites in the region and a WNv educational brochure. Participants were asked to take the requisition form to a designated participating laboratory to provide a blood sample. Samples were forwarded to the Alberta Provincial Laboratory for Public Health (ProvLab) for analysis.

Reminders were mailed to survey participants at two weeks intervals after the survey date in order to increase participation. Survey respondents who did not provide a blood sample received as many as two reminders. Two weeks after the survey date and before any reminder had been mailed, 40 per cent of survey respondents had provided a blood sample. After follow-up, the response rate increased to 67 per cent. Table 2 presents the participation rate for this phase of the study.

Table 2. Phase II participation rate

Phase II participation rate	
Laboratory requisitions mailed	3,780
Blood samples received at Provincial Lab	2,518
Response rate	**67%**

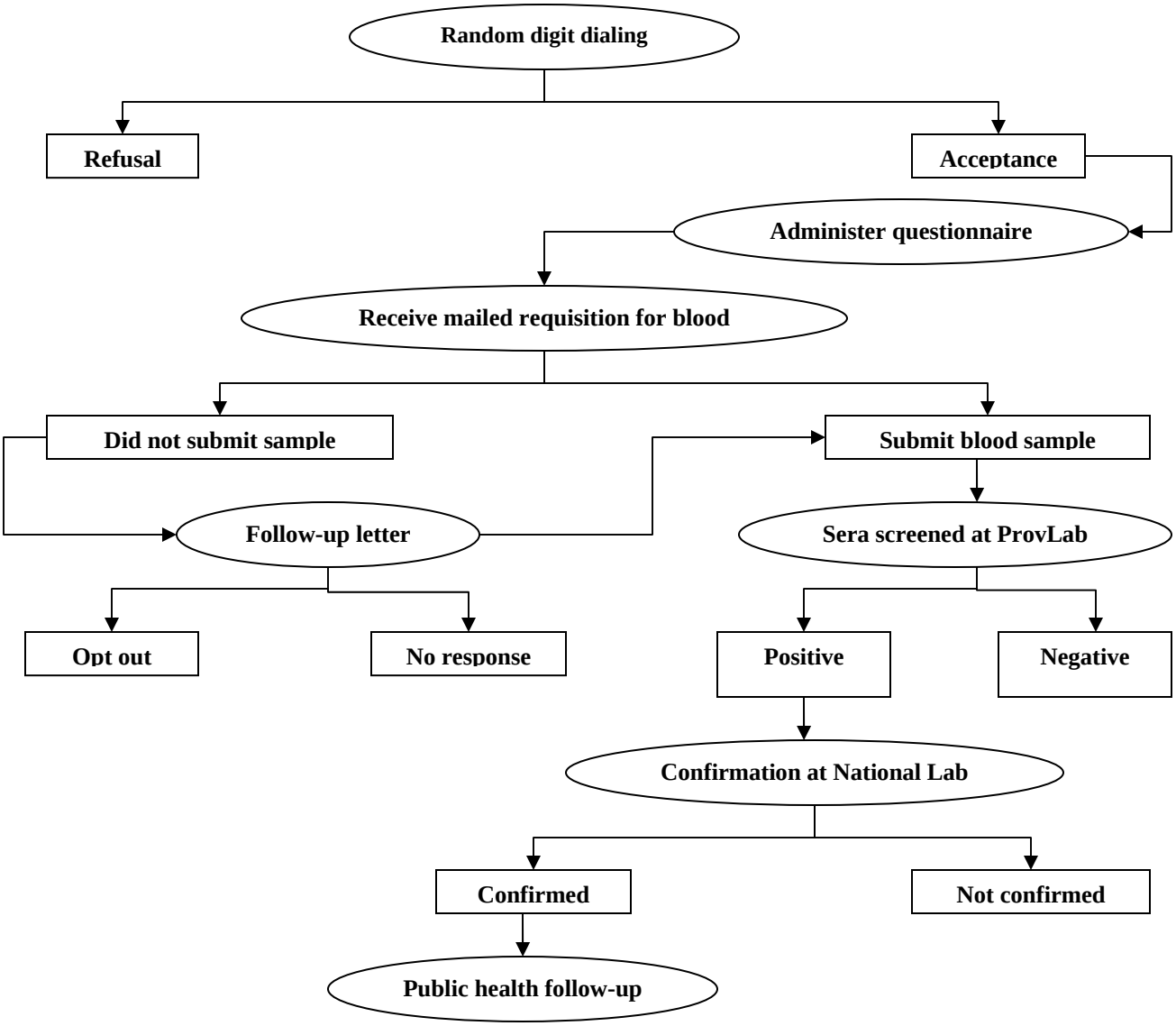
Laboratory tests

The ProvLab screened the blood specimens for IgG WNv antibodies. Reactive samples were forwarded to the National Microbiology Laboratory in Winnipeg, Manitoba for confirmation with a plaque reduction neutralization test (PRNT). The positive results from serological investigation were followed up by regional public health officials after the completion of the project (Appendix D).

Summary

Figure 3 presents a visual summary of the study flow.

Figure 3. Study flowchart



Data analysis

A unique identifier was assigned to each participant. This identifier was used to merge laboratory results and survey data for further analysis.

To allow accurate inferences to the provincial population, weights were derived to reflect the differential probability of being selected for participation. In addition to population estimates derived from the Alberta Health Care Insurance Plan Registry for each stratum and each region, the weighting process included corrections for household size and the number of telephone lines to the household. Weights were also post stratified by age and sex.

Sets of alternate weights were derived by repeating these procedures on 200 bootstrap samples. These bootstrap weights were used to derive standard error estimates for survey based estimates.

Data were analyzed using SPSS® statistical software version 11.0.

Results

Demographic characteristics of survey participants

From the 3,780 survey respondents, 1,889 were from Palliser Health Region. Among these 59.9 per cent were from urban areas and 40.1 per cent were from non-urban areas. Among those outside of Palliser Health Region, 53.4 per cent of the 1,891 respondents were from urban areas; the remaining 46.6 per cent were non urban residents.

It should be noted that some demographic categories were under-sampled, while others were over-sampled when compared with their distribution in Alberta's 2003 population. Specifically, those aged 18 to 24 were under-sampled (8.1 per cent) compared to the Alberta population (13.7 per cent) and females were over-sampled (63.3 per cent) compared to the Alberta population (50 per cent). The post stratification of weights takes these differences into account for analytic purposes.

Survey: descriptive results

The research team presents descriptive results for variables from the telephone survey below. Point estimates were derived using weighted data and standard errors were calculated from the successive application of bootstrap weights. Provincial estimates are always given. Separate estimates by strata are presented only when differences between strata were statistically significant.

Table 3 presents additional unweighted demographic information about the participants.

Table 3. Demographic characteristics of the survey sample

		Palliser Health Region (n=1,819)				Rest of the province (n=1,891)			
		Urban (n=1,132)		Non-Urban (n=757)		Urban (n=1,010)		Non-Urban (n=881)	
		Count	Col %	Count	Col %	Count	Col %	Count	Col %
Sex	Male	383	33.8%	265	35.0%	413	40.9%	325	36.9%
	Female	749	66.2%	491	64.9%	597	59.1%	556	63.1%
	N.R.			1	.1%				
Age	18 - 24 years	84	7.4%	68	9.0%	109	10.8%	46	5.2%
	25 - 34 years	168	14.8%	134	17.7%	176	17.4%	127	14.4%
	35 - 44 years	267	23.6%	179	23.6%	236	23.4%	215	24.4%
	45 - 54 years	265	23.4%	191	25.2%	240	23.8%	191	21.7%
	55 - 64 years	177	15.6%	92	12.2%	145	14.4%	151	17.1%
	65 and over	170	15.0%	93	12.3%	102	10.1%	150	17.0%
	NR	1	.1%			2	.2%	1	.1%
Education	Elementary, Junior high or less	63	5.6%	45	5.9%	32	3.2%	71	8.1%
	Senior high - incomplete	108	9.5%	77	10.2%	45	4.5%	82	9.3%
	Senior high - complete	280	24.7%	228	30.1%	207	20.5%	227	25.8%
	College or technical school - incomplete	100	8.8%	53	7.0%	68	6.7%	41	4.7%
	College or technical school - complete	350	30.9%	217	28.7%	286	28.3%	264	30.0%
	University - incomplete	44	3.9%	29	3.8%	65	6.4%	31	3.5%
	University - complete	159	14.0%	83	11.0%	256	25.3%	131	14.9%
	Graduate degree	24	2.1%	16	2.1%	47	4.7%	22	2.5%
	NR	4	.4%	9	1.2%	4	.4%	12	1.3%
Do you live within 5 km of a city?	Yes	1,099	97.1%	590	77.9%	975	96.5%	594	67.4%
	No	33	2.9%	167	22.1%	35	3.5%	286	32.5%
	NR							1	.1%

West Nile virus knowledge

Virtually all respondents (99.3 per cent ± 0.3) have heard about WNv prior to the survey. Most (90.2 per cent ± 0.1) were aware that WNv has been identified in mosquitoes in Alberta. In the Palliser Health Region the percentage was greater (97 per cent ± 0.5). There were no differences between urban and non-urban residents.

Most respondents were aware that WNv had been identified in humans in Alberta during the 2003 season. In Palliser Health Region, the percentage was greater than in the rest of the province (95 per cent ± 0.7 vs. 80 per cent ± 1.3). Again there were no differences between urban and non-urban residents. Table 4 presents responses to questions about modes of transmission of WNv.

Table 4. Knowledge of modes of WNv transmission

Can a person become infected with WNv by:	Yes (Per cent ± standard deviation)	No (Per cent ± standard deviation)	Don't know (Per cent ± standard deviation)
Mosquito bites	97.6%± 0.5	0.5% ±0.2	2% ±0.4
Blood transfusions	46.9% ±1.4	17.6% ±1.1	35.5% ±1.3
Sexual contact with an infected person	6.2% ±0.7	50.6% ±0.4	43.3% ±1.4
Organ transplant	26.3% ± 1.3	21.9% ±1.1	51.8% ±1.8
Being in the same room with an infected person	1.7% ±0.3	83.4% ±1	15% ±1
Contact with dead birds	62.4% ±1.4	13.6% ±1	24% ±1.2
Shaking hands with someone infected with WNv	2.1% ±0.4	80.6% ±1.1	17.3% ±1.1

While almost all respondents correctly recognized mosquito bites as a mode of WNv transmission, a considerable proportion don't know or do not recognize organ transplant or blood transfusion as possible modes of transmission for the virus. A majority believed incorrectly that contact with dead birds could be responsible for WNv transmission to humans.

Other findings included:

- Most respondents (75.3 per cent ± 1.3) recognized that seniors (aged 65 and over) are more likely to develop severe complications when infected with WNv. However, among respondents within the seniors group (65 and over), fewer (60 per cent ± 4.2) are aware that their age group is at increased risk.
- A large minority of respondents (43.4 per cent ± 1.5) incorrectly believe that young children are also more likely to develop severe complications.

Sources of information

Table 5 presents the sources of information about WNv provided by participants.

Table 5. Most mentioned sources of information

Where did you hear about WNv?	Per cent in Palliser Health Region	Per cent in the rest of the province	Per cent in Alberta
Television	80.1 ±1.1	86.6 ±1	86.4 ±0.9
Radio	48.5 ±1.5	46.2 ±1.5	46.3 ±1.4
Newspaper	68 ±1.3	65.6 ±1.3	65.7 ±1.3
Friends	21.9 ±1.2	12.5 ±0.9	12.8 ±0.9
Pamphlets	4.8 ±0.6	4.4 ±0.6	4.4 ±0.5
Doctors	6.6 ±0.8	4.7 ±0.6	4.7 ±0.6
Internet	3.6 ±0.6	5 ±0.6	5 ±0.6
Other	21.6±1.2	16.1±1	16.6±1

While television, radio and newspaper were mentioned by most participants, lower proportions mentioned pamphlets, doctors and the Internet as sources of information. Television was mentioned as the first source of information by 48.6 per cent (±1.3) of respondents, while the newspaper was named by 30.8 per cent (±1.3). Other sources of information mentioned were: the workplace, magazines, veterinarians and communication with a person infected by WNv. Notably, in the Palliser Health Region, almost twice as many participants mentioned friends as a source of information than in the rest of the province (21.9 per cent to 12.5 per cent).

Table 6 presents information about the sources of information participants thought most reliable.

Table 6. Most reliable sources of information

What sources of information do you and your family rely on for information and updates about **WNv?**	Percentage urban areas	Percentage non-urban areas	Percentage Alberta
Television	70.5 ±1.6	68.9 ±1.9	70 ±1.2
Newspaper	53.2 ±1.8	47.8 ±1.9	51.6 ±1.4
Radio	25.4 ±1.6	33.6 ±1.8	27.8 ±1.2
Friends	2 ± 0.5	2.8 ±0.7	2.2 ±0.4
Pamphlets	2.5 ±0.6	4.2 ±0.7	3 ±0.5
Doctors	6 ±0.8	7 ±0.9	6.3 ±0.7
Internet	9.9 ±1.1	8.3 ±1	9.4 ±0.8
Others	9.2±1.1	10.9±1.1	9.7±0.9

Most relied primarily on television, newspapers and radio for information and updates about WNv, which are passive sources of information as opposed to active sources (the Internet, consultation with doctors, etc.). Television was chosen as the most reliable source of information by 44 per cent (±1.3) of participants while newspapers were chosen by 29.5 per cent (±1.3) and radio by 6.7 per cent (±0.7).

The largest differences in ratings of reliability between urban and non-urban residents were for radio, which was perceived as more reliable by non-urban participants, and newspapers, which was perceived as more reliable by urban participants.

Other sources mentioned as reliable by a small proportion of participants included: the workplace, public health authorities, magazines and veterinarians.

Attitudes toward West Nile virus and control measures

Table 7 presents information about the proportion of people worried about the possibility of being infected by WNv.

Table 7. Worried about West Nile virus

How worried are you about getting WNv?	Percentage Palliser Health Region	Percentage rest of the province	Percentage Alberta
Very or a little worried	67 ±1.2	48.6 ±1.5	49.2 ±1.4
Not worried at all	33±1.2	51.4±1.5	50.8±1.4

Although the level of worry was high, more people were worried about WNv in the Palliser Health Region than in the rest of the province. There were no differences between the urban and non-urban strata. In addition, females were more worried than males (57.6% ±1.5 vs. 41.3% ±2.5).

In Alberta, the aim of mosquito control interventions initiated by communities is to reduce the number of mosquitoes and may include draining standing water and using larvicides. Most participants (81.5 per cent ± 1.1) agreed with the use of these control measures. Reasons for not agreeing included: protection of the environment (7.9 per cent ± 0.7), the use of unsafe/hazardous chemicals (6.2 per cent ± 0.7) and not having enough information about the risks associated with mosquito control measures (5.1 per cent ± 0.6).

Behaviours related to West Nile virus prevention

The research team asked participants to indicate which personal protective measures they practiced and how often. The participants' responses are shown below in Table 8.

Table 8. Personal protective measures

Thinking back to last summer, at times when you might be bitten by a mosquito, how often did you do the following things?	Always	Most of the time	Sometimes	Rarely	Never
Restrict your outdoor activity	1.4 ±0.3	5.1±0.6	14.1±0.9	20.3±1.1	59.1±1.4
Avoid places where mosquitoes were a problem	6.5 ±0.7	20.1±1.1	21.6±1.2	17±1.1	34.7±1.3
Wear a long-sleeved shirt and pants	9.7±0.7	19.8±1.2	38±1.4	16.2±1.1	16.2±1.1
Wear light-colored clothing	7.8±0.8	25.6±1.4	44.5±1.4	10.9±0.9	11.1±0.9
Avoid the times when mosquitoes were most active	4.8±0.5	214±1.2	26±1.2	17.1±0.9	30.7±1.3
Wear mosquito repellent	13.7±0.9	23.2±1.2	29.9±1.2	17.1±0.9	18±1.1

The majority of respondents rarely or never restricted their outdoor activities. About half rarely or never avoided places where mosquitoes were a problem or the times when mosquitoes were most active during their outdoors activities.

The majority of participants indicated sporadic or no use of mosquito repellent. The most mentioned reasons for not using repellent at all were: did not bother (6.3 per cent ± 0.7), concern about the use of chemicals (4.5 per cent ± 0.6), did not see mosquitoes (4.6 per cent ± 0.6). Other reasons included: allergy, perceived low risk of contracting WNv, too much trouble and the unpleasant smell of the repellents. No respondents were concerned over an interaction between repellent and sunscreen.

Other findings included:

- When asked if the repellent they used contained DEET, the majority (73.4 per cent ± 1.4) answered yes, while 18.6 per cent (±1.3) indicated that they did not know and 7.1 per cent (±0.9) indicated that it did not.
- Most participants (86 per cent ±0.1) were aware of the need to use personal protective measures even when a mosquito reduction program was in place within their community.

Table 9 shows environmental risk reduction activities in which participants engaged.

Table 9. Environmental risk reduction activities

Last summer did you or anyone in your household do any of the following things to reduce the number of mosquitoes around your house?	Yes	No	Did not apply /don't know
Put screens on windows or doors that previously had none	13.4±0.9	37.7±1.3	48.9±1.3
Repaired screens that had tears or holes in them	30.9±1.3	28.5±1.3	40.6±1.2
Checked and cleaned all rain gutters as required	37.9±1.5	43.9±1.5	18.3±1.2
Emptied or replaced pools of standing water regularly	44.2±1.4	18.6±1.1	37.2±1.3

Survey: predictive results

The research team used multiple linear regressions to examine predictors of:

- engaging in personal protective measures;
- the use of a mosquito repellent containing DEET; and
- engaging in environmental risk reduction activities.

The dependent measure for engaging in personal protective measures was a composite formed by assigning a number to each category (4 for 'Always' decreasing to 0 for 'Never') and summing across the six activities listed in Table 8. Similarly, a composite for environmental risk reduction activities was formed by summing across the four activities listed in Table 9.

Each analysis employed the following independent variables:

- Demographic characteristics such as age, gender and education.
- Place of residence: urban or non-urban, Palliser Health Region or the rest of the province.
- A composite for knowledge of WNv formed by scoring the WNv knowledge questions listed in Table 2 and the item asking whether the virus had been detected in humans in Alberta and totalling the number answered correctly.
- Time spent outdoors such as time during high and low risk periods for WNv transmission.
- Attitudes related to WNv such as whether participants were worried about the possibility of WNv infection or not.

All analyses were conducted on weighted data. Standard errors for regression coefficients were generated by bootstrap, and these were used in tests of significance of the individual coefficients.

Table 10 presents the results of the analysis of the personal protective measures composite.

Table 10. Predictors for personal protective measures

	Unstandardized coefficients		Standardized coefficient	t	Sig
	B	Bootstrap generated Standard Error	β		
Constant	5.451				
Rural-Urban	0.229	0.322	0.026	0.71118	n.s.
Palliser Health Region vs. the rest of the province	-0.243	0.238	-0.027	-1.02101	n.s.
Age	0.248	0.145	0.070	1.710345	n.s.
Education	-0.015	0.027	-0.023	-0.55556	n.s.
Sex	1.465	0.327	0.173	4.480122	p<0.01
Knowledge composite	-0.046	0.121	-0.015	-0.38017	n.s.
Yes, in Alberta people	0.505	0.493	0.033	1.024341	n.s.
Time in high risk times	0.035	0.018	0.175	1.944444	p<0.05
Time in low risk times	-0.048	0.018	-0.235	-2.66667	p<0.01
Worried/not	2.484	.350	.269	7.097143	p<0.01

Participants were more likely to engage in personal protective measures if they:

- were worried about contracting WNv;
- spent more time outdoors during risk hours for virus transmission; or
- were female.

They were less likely to use protective measures if they spent more time outdoors during low risk times.

Table 11 shows the results of the analysis of the use of a mosquito repellant containing DEET.

Table 11. Predictors for the use of repellent containing DEET

	Unstandardized Coefficients		Standardized Coefficient	t	Sig.
	B	Bootstrap Generated Standard Error	β		
Constant	0.296				
Rural-Urban	0.030	0.037	0.027	0.81	n.s.
Palliser Health Region vs. the rest of the province	-0.029	0.030	-0.011	-0.97	n.s.
Age	-0.001	0.018	-0.004	-0.06	n.s.
Education	-0.004	0.005	-0.060	-0.80	n.s.
Sex	0.024	0.038	0.024	0.63	n.s.
Knowledge composite	0.028	0.014	0.081	2.00	p<0.05
Yes, in Alberta people	0.047	0.056	0.036	0.84	n.s.
Time in high risk times	0.001	0.002	0.049	0.50	n.s.
Time in low risk times	-0.001	0.002	-0.025	-0.50	n.s.
Worried/not	0.101	0.044	0.102	2.30	p<0.05

Participants who were more knowledgeable about WNv were more likely to report using a repellant containing DEET as were participants who expressed more worry at the risk of being infected.

Table 12 shows the results of the analysis of the environmental risk reduction composite.

Table12. Predictors for engaging in environmental risk reduction activities

	Unstandardized Coefficients		Standardized Coefficient	t	Sig.
	B	Bootstrap Generated Standard Error	β		
Constant	0.690				
Rural-Urban	0.223	0.090	0.093	2.48	p<0.05
Palliser Health Region vs. the rest of the province	-0.017	0.062	-0.003	-0.27	n.s.
Age	0.066	0.038	0.080	1.74	p<0.05 one tailed
Education	-0.007	0.007	-0.044	-1.00	n.s.
Sex	0.140	0.090	0.064	1.56	n.s.
Knowledge composite	-0.025	0.031	-0.033	-0.81	n.s.
Yes, in Alberta people	-0.092	0.118	-0.033	-0.78	n.s.
Time in high risk times	0.001	0.004	0.016	0.25	n.s.
Time in low risk times	-0.002	0.005	-0.025	-0.40	n.s.
Worried/not	0.396	0.091	0.182	4.35	p<0.01

Respondents were more likely to engage in environmental risk reduction activities if they were: older; lived in a non-urban area; and were more worried about contracting WNv.

Demographic characteristics of the seroprevalence sample

A total of 2,518 blood samples were received at the ProvLab. A total of 52.4 per cent of the samples came from the Palliser Health Region and 47.6 per cent came from the rest of the province. Of the participants that supplied a blood sample, 56.2 per cent were urban residents and 43.8 per cent were non-urban residents.

Table 13 presents the composition of the seroprevalence sample.

Table 13. Demographic characteristics of the seroprevalence sample

		Palliser Health Region (n=1,320)				Province (n=1,198)			
		Urban (n=786)		Non-Urban (n=534)		Urban (n=630)		Non-Urban (n=568)	
		Count	Col %	Count	Col %	Count	Col %	Count	Col %
Sex	Male	266	33.8%	176	33.0%	254	40.3%	195	34.3%
	Female	520	66.2%	357	66.9%	376	59.7%	373	65.7%
	NR			1	.2%				
Age	18 - 24 years	25	3.2%	24	4.5%	34	5.4%	10	1.8%
	25 - 34 years	72	9.2%	65	12.2%	79	12.6%	48	8.5%
	35 - 44 years	169	21.5%	126	23.6%	145	23.1%	120	21.1%
	45 - 54 years	203	25.9%	153	28.7%	156	24.8%	143	25.2%
	55 - 64 years	158	20.1%	84	15.7%	124	19.7%	119	21.0%
	65 and older	158	20.1%	82	15.4%	90	14.3%	128	22.5%
Education	Elementary, junior high or less	52	6.6%	27	5.1%	24	3.8%	57	10.0%
	Senior high - incomplete	73	9.3%	62	11.6%	24	3.8%	48	8.5%
	Senior high - complete	186	23.7%	140	26.2%	105	16.7%	124	21.8%
	College or technical school - incomplete	57	7.3%	34	6.4%	37	5.9%	27	4.8%
	College or technical school - complete	236	30.0%	166	31.1%	192	30.5%	170	29.9%
	University - incomplete	34	4.3%	20	3.7%	42	6.7%	24	4.2%
	University - complete	126	16.0%	64	12.0%	170	27.0%	96	16.9%
	Graduate degree	19	2.4%	13	2.4%	33	5.2%	13	2.3%
	NR	3	.4%	8	1.4%	3	.5%	9	1.6%
Do you live within 5 km of a city?	Yes	764	97.2%	411	77.0%	611	97.0%	367	64.6%
	No	22	2.8%	123	23.0%	19	3.0%	200	35.2%
	NR							1	.2%

Seroprevalence estimate

From 2,518 blood samples received at the ProvLab, 2,506 samples were included in the analyses, the rest being excluded due to arriving too late. All sera were screened using WNv IgG test made by Focus Technologies. All positive and borderline results from this screening were sent to the National Microbiology Laboratory (n=109).

The National Microbiology Laboratory ran the CDC WNv IgG ELISA on all 109 samples. Forty-three samples were detected as positives and further confirmed with plaque reduction neutralization titres (PRNT), which is considered the gold standard method for WNv detection. The confirmatory analysis produced 35 samples considered truly positive.

Table 14 presents the weighted seroprevalence estimates and bootstrap generated confidence intervals.

Table 14. Seroprevalence estimates

Region	Seroprevalence (Point estimate and 95% CI)
Palliser Health Region – non-urban	4.561% (2.791, 6.772)
Palliser Health Region – urban	0.768% (0.277, 1.411)
The rest of the province – non-urban	0.840% (0.198, 1.819)
The rest of the province – urban	0
Alberta (total)	**0.305% (0.121, 0.584)**

Extrapolating these estimates to the 2003 Alberta midyear population 18 years and older (2,313,752), the research team estimate about 6,941 Albertans (95% CI: 2,777- 13,420) were infected with WNv during the 2003 season.

During 2003, 266 cases of WNv clinical infection were detected in Alberta in the adult population (18 years and older). The research team estimate 3.8% (95%CI: 2%, 10%) of infected individuals became clinical disease cases, or 1 in 26. Of these, 48 cases developed severe illness (WNv neurological syndrome). The team estimate 0.7% (95%CI: 0.4%, 2%) of infected individuals developed severe illness, or 1 in 142.

The research team used logistic regression to examine the association between being seropositive (outcome variable) and various categories of responses from the telephone surveys. All analyses were conducted on weighted data. Confidence Intervals for odds ratios were generated by bootstrap, and were used in tests of significance of the individual ratios. The results are presented in Table 15.

Table15. Logistic Regression

Variables	β	df	Odds Ratio	95% Confidence Interval for Odds Ratio (Bootstrap Generated)		Statistical Significance
'Always use DEET'	1.933	1	6.91	0.2	30.2	
Location (relative to the 'rest of Alberta')		2				
Palliser Health Region - urban	0.867	1	2.38	1.1	>8000	$p < 0.05$
Palliser Health Region - rural	3.960	1	52.46	15.9	>8000	$p < 0.05$
Male	0.906	1	2.47	0.1	20.7	
Age (relative to <35)		2				
Age 35-54	2.111	1	8.26	0.4	55.5	
Age 55+	0.709	1	2.03	0.4	13.2	
Hours outdoors during high risk times	-1.928	1	0.15	0.1	3.7	
Did not report hours outside	-1.707	1	0.18	0.1	1.5	
Constant	-9.027	1	0.0			

Respondents were more likely to test positive for WNv infection if living in the Palliser Health Region as compared to the rest of the province and even more likely if living in rural areas of the Palliser Health Region. There is a tendency for those reporting that always used mosquito repellent containing DEET to be less likely to test positive for WNv infection, although this association did not reach conventional levels of statistical significance.

Discussion

WNv made its first appearance in Alberta during the summer of 2003 with 275 confirmed cases reported. Given the lack of information on the epidemiology of the virus, it was important to assess the infection rate (seroprevalence), people's knowledge, information sources and personal protective behaviours. This information was needed to understand the epidemiology of WNv and determine what prevention messages were needed and how public health messages should be delivered.

The present study represents the largest assessment of WNv infection in Canada to date. Also, the present study did not limit its scope to examining only an area with a high number of reported cases.

The assessment of infection was done in such a way to ensure an accurate estimate for the Palliser Health Region (urban and non-urban) and the rest of Alberta (urban and non-urban). Other studies[31, 32] focused solely on geographic areas that had the highest reported number of cases. These studies were able to fully estimate the infection rate, but were unable to do relative comparisons between high risk areas and others, nor could they look at urban and non-urban differences, which the present findings demonstrated were important.

Individuals who participated in the survey were told they would be contacted by their regional health authority should the confirmatory testing indicate they were infected. This was unique to this project. The chief medical officer of health for each region with positive cases was provided a list of cases as well as key messages (Appendix D) that highlighted the importance of personal protective behaviours.

Survey results

Public awareness of WNv was found to be high and was consistent with studies conducted in the northeastern US, Ontario, Saskatchewan and British Columbia.[16, 29, 31, 32] Despite recognition of the virus as an important public health issue and knowledge of preventive measures, few individuals consistently took precautions. This highlights the need to continue public messaging about the risks associated with WNv infection and the importance of personal protective practices to reduce the risk of infection.

The level of concern about WNv appears to be associated with the level of virus activity. Two thirds of residents of the Palliser Health Region indicated they were very or a little worried compared to just less than half in the rest of the province. These levels of concern were lower than reported by Elliot *et al*.[31] who found 78 per cent of Oakville residents were worried about contracting WNv. Individuals who expressed worry about contracting the virus were also more likely to engage in personal preventive practices.

Understanding primary information sources helps to plan public awareness campaigns by prioritizing the media used to raise understanding about WNv risks. Information sources most often cited were the television, radio, and newspapers. These are primarily passive information resources. More active sources, such as the Internet or asking a health care provider, were less likely to be used. Television was viewed by 44 per cent of respondents as the most reliable source of information. This highlights the need to fully utilize this medium as part of public health messaging as a primary means of communicating information about WNv, its distribution, risks and prevention strategies.

Seroprevalence results

Alberta's overall seroprevalence was 0.3 per cent with the rural areas of the Palliser Health Region having the highest at 4.6 per cent. This rate is lower than the 10 per cent found in the Five Hills Region of Saskatchewan.[32] Studies conducted in Oakville, Ontario and Manitoba estimated seroprevalence to be 3.1 and 3.2 per cent respectively. All three studies (Oakville, Saskatchewan and Ontario) only examined areas with high numbers of reported cases and did not examine the seroprevalence in other areas. They were unable to assess differences in seroprevalence, knowledge of WNv and use of personal protective measures in areas with fewer reported cases.

Within Alberta, the stratified sample examining urban and non-urban areas of the Palliser Health Region and urban and non-urban areas of Alberta allowed for a more accurate assessment of the penetration of WNv infection within the province. The rate for Palliser Health Region is consistent with the Oakville and Manitoba studies as well as those from the northeastern US and Europe.[31, 32, 37, 38]

The present estimate of seroprevalence will form the baseline rate for future comparisons. WNv is a relatively new infection within North America in general and Alberta in particular. As a result, its natural history is not fully understood. Repeated estimates of seroprevalence will be needed as part of an enhanced public health surveillance program to establish the full significance of this pathogen and its impact.

Conclusions

Survey results

Almost all respondents have heard about WNv prior to the survey, and a majority were aware that the virus had been detected in Alberta during 2003. Most knew that mosquitoes are the principal mode of transmission for WNv infection. Unfortunately, a considerable proportion of seniors were unaware that they belonged to the age group with the highest risk of severe complications from the virus. This suggests that a focused education campaign for groups at risk may be warranted.

Passive sources of information (broadcast media) are likely to be the most effective tools for public health messaging.

A majority of Albertans agreed with control measures initiated by communities to reduce the number of mosquitoes. Disagreement, when present is generated by the belief that hazardous chemicals are used or by the belief that not enough is known about the safety of these interventions.

Respondents were more likely to engage in personal protective measures if they: were worried about contracting WNv, spent more time outdoors during risk hours for transmission of the virus; and were female. They were more likely to use mosquito repellent containing DEET if they were more knowledgeable about WNv and were worried about contracting the virus. As well, respondents were more likely to engage in environmental risk reduction activities if they: lived in rural areas; were worried about contracting WNv; and were older.

Seroprevalence results

Participants were more likely to test positive for WNv infection if they lived in the Palliser Health Region, where the majority of WNv clinical cases were reported during 2003, as compared to rest of the province. The seroprevalence rate was highest in non-urban areas in this region.

During 2003, approximately 1 in 26 infected individuals became clinical cases, and approximately 1 in 142 infected cases suffered from WNv neurological syndrome. This is comparable to rates reported in other studies.[16]

There was a tendency toward lower seroprevalence rates among those reporting they always used mosquito repellent containing DEET, although this association did not reach conventional levels of statistical significance.

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Appendices

Appendix A. Questionnaire

Appendix B. Frequently asked questions

Appendix C. Sample letters

Appendix D. Follow-up information for those testing positive

Appendix E. Laboratory requisition form

Appendix A. Questionnaire

INT14: FIRST INTRODUCTORY SCREEN

Hello, my Name is <insert own name> and I am calling on behalf of Alberta Health and Wellness. We are conducting a study aimed to increase our understanding of West Nile Virus and to help plan the province's program of West Nile virus prevention. The study involves a 15 minute survey that can be completed over the phone and also requires study participants to give a small blood sample for West Nile virus testing. We need to speak to someone in your household who is - 18 years of age or older - has been living in Alberta since July 1st, 2003 (last summer) or earlier - and has had the most recently past birthday? Is that you, or is there more than one person 18 years of age or older? IF NEEDED: More than 2?

INT17: RECRUITMENT AND WAIVER WITH SUBJECT

Participation in this study involves two parts. The first part involves completing a phone survey with Albertans who are also willing to give a blood sample for West Nile Virus testing. If you are interested in participating, I will ask for your name and mailing address. A requisition for blood testing and a list of blood collection sites in the province will be mailed to your house some time this week. The requisition must be taken with you to the blood collection site where a small vial of blood will be drawn and sent to the ProvLab for testing. Because of the size of the study, respondents would only be contacted if their blood sample came back positive for West Nile Virus and this contact would be handled by the medical officer of health for your health region. If you are willing and able to provide the blood sample, then we can proceed right now with a short phone survey about West Nile virus. Do you have any questions about the study as I have described it so far? TRY TO ANSWER QUESTIONS FROM F.A.Q. AND THEN: Are you willing to participate in both parts of the study?

CONSE: CONSENT

Before I start with the actual survey questions, I want to remind you that your help is voluntary and all your responses are strictly confidential. SAY SLOWLY: You are free to stop the interview at any time. If there are any questions you feel uncomfortable answering, please tell me and I will move on to the next one. May I continue now?

HEAR

The first part of the survey deals with your knowledge about West Nile Virus. Before today, have you ever heard of West Nile Virus?

Yes		
No	**skip to**	**LSUM**
DO NOT READ: Don't Know	**skip to**	**LSUM**
DO NOT READ: Refused		

WHERE

Where did you hear about it?

DO NOT READ OPTIONS, CHECK ALL THAT APPLY

- Newspaper
- TV
- Radio
- Friends
- Pamphlets
- Doctors/health care professionals
- Internet
- Other: Please specify
- DO NOT READ: Don't Know
- DO NOT READ: Refused

SOUR

What sources would/do you and your family rely on for information and updates on West Nile Virus?

DO NOT READ OPTIONS CHECK ALL THAT APPLY

- Newspaper
- TV
- Radio
- Friends
- Pamphlets
- Doctors/health care professionals
- Internet
- Other: Please specify
- DO NOT READ: Don't Know
- DO NOT READ: Refused

MOSQ

To your knowledge, has West Nile Virus been identified in mosquitoes in Alberta?

- Yes
- No
- Don't know
- DO NOT READ: Refused

PEOP

To your knowledge, have there been people infected with West Nile Virus identified in Alberta?

- Yes
- No
- Don't know
- DO NOT READ: Refused

WORRI

How worried are you about getting West Nile? Are you....
READ SCALE

Very worried
A little worried
Not worried at all
Don't know
DO NOT READ: Refused

LIST

I am going to read you a list of possible ways people can get a disease. As I read each one, please tell me whether or not you think a person can become infected with West Nile virus that way:

Mosquito bites?
Blood transfusions?
Sexual contact with someone who has WNV?
Organ transplants?
Being in the same room with someone who has WNV?
Contact with dead birds?
Shaking hands with someone who has WNV?

Yes
No
Don't know
DO NOT READ: Refused

AGE

To the best of your knowledge, which age group is more likely to develop severe complications when infected with West Nile virus?

OPTIONAL READ: Severe complications may require hospitalization and in rare circumstances can lead to prolonged health problems or can be fatal. Examples include brain or spinal cord membrane inflammation...

CONTINUE TO READ IF REQUIRED: Meningitis is an inflammation of the membrane around the brain and spinal cord. Encephalitis is an inflammation of the brain. Meningoencephalitis is an inflammation of the brain and the membrane surrounding it.

PICK ALL THAT APPLY

YOUNG CHILDREN - Under the age of 5 years
CHILDREN - Between the ages of 6 and 12
TEENAGERS - Between the ages of 13 and 17
ADULTS - Between 18 and 64
SENIORS - 65 years of age or older
DON'T KNOW
Do Not Read: Refused

LSUM

Thinking back to last summer, at times when you might be bitten by a mosquito, how often did you do the following things?

Restrict your outdoor activities
Avoid the places where the mosquitoes were a problem?
Wear long sleeves and pants?
Wear light colored clothing?
Avoid the times of day when mosquitoes were most active? (If required: Mosquitoes are most active at dusk and dawn)
Wear mosquito repellent?

Always
Most of the time
Sometimes
Rarely
Never
DO NOT READ: Don't know
DO NOT READ: Refused

NORE

If you did not use repellents, why not?
CHECK ALL THAT APPLY, DO NOT READ

Concerned about the use of chemicals
Perceived low risk of getting West Nile virus
Did not see mosquitoes
Concern over interaction with sunscreen
Too much trouble
Cost too much
Didn't bother
Other (please specify)
Don't know
Refused

DEET

Did the mosquito repellent you use most often contain DEET?

OPTIONAL READ: DEET is the most effective ingredient used to repel pests like mosquitoes or ticks. DEET does not kill mosquitoes; it just makes them unable to locate people and to feed on them.

Yes	**skip to**	REDUC
No	**skip to**	NODE
Don't know	**skip to**	REDUC
DO NOT READ: Refused	**skip to**	REDUC

NODE

If you did not use DEET repellents, why not?

CHECK ALL THAT APPLY, DO NOT READ

- Concerned about chemical use
- Perceived low risk of getting West Nile Virus
- Did not see mosquitoes
- Concern over interaction with sunscreen
- Too much trouble
- Cost too much
- Didn't bother
- Other (please specify)
- Don't know
- Refused

REDUC

Last summer did you or anyone in your household do any of the following things to reduce the number of mosquitoes around your house?

- Put screens on windows or doors that previously had none?
- Repaired screens that had tears or holes in them?
- Checked and cleaned all rain gutters as required?
- Regularly emptied or replaced pools of standing water? Examples of standing water include: birdbaths, tires, children's pools or fountains that don't work.
  - Yes
  - No
  - Does not apply
  - DO NOT READ: Don't know
  - DO NOT READ: Refused

WORK

Did you work last summer? (Skips work day questions if they did not work at all)

On a typical workday last summer (July to September), how much time did you spend outdoors during the following time periods?

Early morning (4 am to 8 am)
Day time (8 am to 5 pm)
Evening (5 pm to 9 pm)
Nighttime (9 pm to 4 am)

NONW

On a typical day when you were **NOT working** last summer (July to September), how much time did you spend outdoors during the following time periods?

Early morning (4 am to 8 am)
Day time (8 am to 5 pm)
Evening (5 pm to 9 pm)
Nighttime (9 pm to 4 am)

AGREE

In Alberta, mosquito control intervention initiated by communities may include draining standing water and using chemicals to keep mosquitoes from hatching. These chemicals are called larvicides. Would you agree to the use of mosquito control programs in your area to reduce the number of mosquitoes?

Yes	**skip to**	PROG
No	**skip to**	WHYNO
DO NOT READ: Don't know	**skip to**	WHYNO
DO NOT READ: Refused	**skip to**	PROG

WHYNO

What are some of the reasons you would not agree (or don't know if you would agree) to the use of mosquito control programs in your area? (Read brackets if they said they did not know if they would agree to the use)

DO NOT READ CHOICES - CHECK ALL THAT APPLY

No insects/pest problems
Child's health
Adult's health
Pet/livestock health
Environmental protection
Unsafe/hazardous
Too expensive
Not enough information about risks
Other: Please specify
DO NOT READ: Don't Know
DO NOT READ: Refused

PROG

In your opinion, **if** there is a mosquito control program in your area this summer, would it be important to protect yourself from being bitten by mosquitoes by doing things like wearing repellent, light-coloured clothing, pants and long-sleeved shirts or by avoiding times when mosquitoes are most active?

Yes
No
DO NOT READ: Don't know
DO NOT READ: Refused

LIVE

Do you live within 5 km of a major urban area?
READ IF NECESSARY: Greater Calgary area (Airdrie, Calgary, Chestermere, Cochrane, Okotoks and Strathmore) Greater Edmonton area (Fort Saskatchewan, Leduc, Sherwood Park, Spruce Grove, St Albert and Stony Plain) Fort McMurray, Grande Prairie, Lethbridge, Medicine Hat or Red Deer

Yes
No
DO NOT READ: Don't know
DO NOT READ: Refused

DEMO

The following questions are for grouping our results and will not be used to identify you in anyway.

SEXQ

ONLY IF YOU ARE NOT SURE: It may seem obvious, but we have to ask everyone, are you male or female?

Male
Female
DO NOT READ: Don't know
DO NOT READ: Refused

AGEGR

Which of the following age groups best describes you?

18 - 24 years
25 - 34 years
35 - 44 years
45 - 54 years
55 - 64 years
Over 65
DO NOT READ: Don't know
DO NOT READ: Refused

EDUC

What is the highest level of education you have completed?

Elementary, junior high or less
Senior high - incomplete
Senior high - complete
College or technical school - incomplete
College or technical school - complete
University - incomplete
University - complete
Graduate degree
DO NOT READ: Don't know
DO NOT READ: Refused

HEALT

In general, would you say your health is...?

READ CHOICES

Excellent
Very good
Good
Fair
Poor
DO NOT READ: Don't know
DO NOT READ: Refused

INT99

Thank you for completing the survey. We will be sending you forms that you will need when you go to the lab to have your blood tested. Do you have any other questions? Thank you very much for your participation. Have a good day/evening. Goodbye.

<End Survey>

Appendix B. Frequently asked questions

What is the purpose of the survey?

The Government of Alberta through Alberta Health and Wellness has the mandate to determine how many Albertans have been infected with West Nile virus since it spread to our province during the spring and summer of 2003. This information will help the province plan its educational prevention programs as well as understand the impact the virus has had thus far. Most people with West Nile virus do not even know they have it because the symptoms are so mild, so the only way to know who has been infected is through testing a small sample of blood from each person. All of the western provinces are now involved in some sort of study like this one to determine who has been exposed to the virus. This study not only asks you to provide a small vial of blood but also asks questions about how you have heard about West Nile virus, what you know about it and things you can do to prevent yourself from getting it. The research team for Alberta Health and Wellness has selected random households in the province to participate in this study so that at the end of the study, a representative view of Alberta will be obtained. The information will be used by the province, and health regions to plan their campaigns and also their medical response to this upcoming season of West Nile virus.

Is the information confidential?

Yes. Throughout the study, your personal information such as your name, address and phone number will be kept strictly confidential and is only used for the purposes of mailing necessary documents to you. At no time will this information be made public and any reports of this data will remove all personal identifiers. Individuals will not be identifiable from the reports.

Will my phone number be kept in a list?

Until the completion of this project, all of the records will be stored on a confidential list on a secured computer. You may be called later in the study to make sure you received the lab requisitions and make sure you were able to get to the lab to give your blood sample. This contact information will also be used by the medical officer of health for your health region if your blood sample does test positive for West Nile virus.

Will I be phoned back in the future?

You may be phoned during the study to ensure that you were able to get to a lab to give your blood sample. This phone call would typically take place a few weeks after the phone survey. You will also be called if your blood sample tests positive for West Nile virus. Because West Nile virus testing can take several weeks or even months to confirm positive cases, this call would probably not come for several months after the phone survey.

In the case of testing positive for West Nile virus, this call would be from the medical officer of health for your health region. Because of the size of this study, it is only possible for us to call the Albertans who have tested positive for West Nile virus.

How will this information be used?

The survey data will be analyzed by research team at Alberta Health and Wellness to help the province plan its educational strategies around preventing West Nile virus. Results from the blood tests will be used to see where West Nile virus has spread in the province. Medical officers for each health region in the province will use this information to plan their medical response to the upcoming mosquito season and also address education and prevention strategies.

How did you get my phone number?

In order to include all residents of Alberta, phone numbers were randomly generated using computer methods. The research team use complex methods to ensure that all parts of the province are included in this study and your household is invited to participate.

Who are the people who are doing this study?

This study is being coordinated by the Health Surveillance Branch of Alberta Health and Wellness from Edmonton. All the regional health authorities are represented by their medical officers of health who are part of a provincial working group to address the issues of West Nile virus in the province. Other experts on West Nile virus have also been invited to participate in this working group and have provided their input into the design, analysis and interpretation of results.

Can I talk to the research team?

The main contact person you may call is:

Larry Svenson
Team Lead, Epidemiologic Surveillance
Alberta Health and Wellness
Phone: (780) 422-4767

Anybody calling long distance can call the government toll-free RITE number 310-0000 and then enter his ten digit phone number.

Who is paying for the survey?

The survey is funded by the Government of Alberta and administered by Alberta Health and Wellness.

Can I quit part way through this?

You can refuse to answer any question and you can stop at any time. However, in order to ensure the accuracy of our survey, it is best if all of the questions are answered. If you run out of time, or need to leave the phone, we can call you back at a later time.

Do I get paid for doing this?

You are doing an important service by answering our questions and agreeing to go to a lab and give a small sample of blood for West Nile virus testing. We really appreciate the time you are giving us. However, we are not paying people for answering these questions or giving blood. Your participation will be instrumental in how the province understands and plans for the upcoming West Nile virus season.

Can I participate in the study if I know I have had West Nile virus?

Yes, you can take part in the study. To get a reliable estimate of West Nile virus infection in Alberta, we need to include all Albertans, even those who know they have had it.

Can I participate even if I am on medication?

There are no exclusion criteria for people taking medication. But if you are concerned about the effects it may have on your own health, please consult your physician before agreeing to participate.

Can I participate even if I have another major health issue or disease?

There are no exclusion criteria for people who have health issues or illness. But if you are concerned about the effects if may have on your own health, then please consult your physician before agreeing to participate.

Will I be quarantined if I am found to be positive?

Being positive means that you have been exposed to West Nile virus in the past and your body developed an immune response to the virus. It does not mean that you are sick or that you can transmit the disease to other people. Therefore, no public health measures like quarantine are necessary.

Will I be treated if I find out I have West Nile virus?

Being positive means that you have been exposed to West Nile virus in the past and your body responded to it. It doesn't mean that you are sick. No treatment is needed in this case. If you test positive, you will be contacted by a physician or public health nurse from your health region to discuss your results.

Who can I call if I find a dead animal or bird?

If you find a fresh dead crow, you can drop it off at any Fish and Wildlife office throughout the province. To find the office closest to you, call toll-free 310-0000. When dealing with any 'found dead' wildlife, always wear gloves, pick up the carcass using a bag inverted over your hand, or use a stick to move the dead animal into a container. Do not handle dead wildlife directly with your hands.

What is Alberta Health and Wellness?

Alberta Health and Wellness is the provincial government department responsible for encouraging and supporting healthy living, ensuring quality health services and providing leadership to the health care system.

Is there a phone number to get general information about West Nile virus?

For information about West Nile virus please visit the Health and Wellness website at www.health.gov.ab.ca or call 310-4455.

What will happen to my blood after it is tested?

All the samples will be labeled with a confidential study ID number and stored by the ProvLab for the duration of the study period. This may be for a several months to allow all confirmatory testing to be done.

What are the risks of giving a blood sample for testing?

Having a blood sample drawn does not put you at risk of disease. All needles are sterile, used only once and discarded. Blood is drawn by trained professionals. In some cases, occasional bruising at the needle site may occur.

How much blood will be taken?

Only a very small quantity will be taken **-** 10cc or 10 ml. This is the equivalent to a standard blood collection tube you may have had drawn as part of a regular physical checkup.

Will my blood be used (or tested) for anything else?

Your blood will not be tested for anything besides West Nile virus and as part of this study.

Appendix C. Sample letters

10025 Jasper Avenue
Box 1360
Edmonton, Alberta
Canada T5J 2N3

Dear <respondent's name>

Thank you for agreeing to participate in this important provincial study of West Nile virus. We greatly appreciate the time that you have already spent answering the phone survey. This information will be used to plan further public education campaigns about West Nile virus. As we explained, this study is made up of two parts. The second part involves collecting blood samples to determine how many Albertans have been infected with West Nile virus. We thank you for consenting to provide a blood sample.

We have enclosed a personalized Laboratory Requisition that you MUST TAKE WITH YOU when you go to have your blood sample taken. We have also included a list of laboratories that can take your sample. Please pick the laboratory that is most convenient. There are no other special instructions.

We do request that you provide this sample as soon as possible so that the results of this phase of the study can inform West Nile virus control procedures for the 2004 summer season.

After you have provided your blood sample, we will only contact you again if you have been infected with West Nile virus. It may take several weeks for positive specimens to be identified and confirmed, but if you have been infected you will be contacted by the office of the medical officer of health from your regional health authority.

If you have not provided a blood sample within three weeks, we will contact you as a reminder.

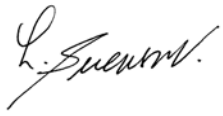
If at any time, you have questions or concerns about this study or your participation in it, please contact:

Larry Svenson
Team Lead, Epidemiologic Surveillance
Alberta Health and Wellness
In Edmonton: (780) 422-4767
Toll-free: 310-0000 and then 780-422-4767

Michaela Ivan
Study Coordinator
Alberta Health and Wellness
In Edmonton: (780) 427-4518
Toll-free: 310-0000 and then 780-427-4518

Thank you once again for your willingness to participate in this study. Your contribution will be invaluable.

Sincerely,



Larry Svenson
Team Lead, Epidemiologic Surveillance
Health Surveillance Branch

10025 Jasper Avenue
Box 1360
Edmonton, Alberta
Canada T5J 2N3

Date

Dear “respondent name”

I would like to thank you for your participation in the Alberta Health and Wellness West Nile virus study. Your contribution will allow us to assess the extent of the infection in Alberta and will be used to guide our public health response to West Nile virus in the future.

Enclosed please find a brochure that explains what West Nile virus is and how to reduce your risk of being infected.

If you have any further questions or concerns about West Nile virus, this study or your participation in it, please contact:

Larry Svenson
Team Lead, Epidemiologic Surveillance
Alberta Health and Wellness
In Edmonton: (780) 422-4767
Toll-free: 310-0000 and then 780-422-4767

Michaela Ivan
Study Coordinator
Alberta Health and Wellness
In Edmonton: (780) 427-4518
Toll-free: 310-0000 and then 780-427-4518

Thank you for contributing your time to help us address this important public health issue.

Sincerely,

Larry Svenson
Team Lead, Epidemiologic Surveillance
Health Surveillance Branch

Appendix D. Follow-up information for those testing positive

West Nile Virus Seroprevalence Follow-Up
Key Messages

- Acknowledge study participation
- Communicate that the respondent tested positive
- What does it mean to test positive
- Possible misconceptions about testing positive
- The need to continue using protective measures to avoid mosquitoes bites
- Answer any other related questions from respondent

Thank you very much for participating in West Nile virus Seroprevalence Survey. The time that you have spent answering the phone survey and submitting a blood sample is greatly appreciated.

We are now able to communicate the results of study. According to our records, the blood sample that you have submitted as part of this study tested positive for West Nile virus.

Testing positive means that you have been exposed to West Nile virus in the past and your body developed an immune response to the virus. Most likely, you came in contact with the virus through a mosquito bite before or during the 2003 summer season. Testing positive does not mean you are sick or that you can transmit the disease to other people. No treatment is needed in this case.

Although you have evidence of exposure to West Nile virus, we do not presently know whether this provides protection against illness if you are exposed to the virus in the future, or how long any protection might last. Therefore, it is very important that you continue to take action in protecting yourself against mosquito bites in the future.

You can take simple precautions to avoid mosquito bites by:

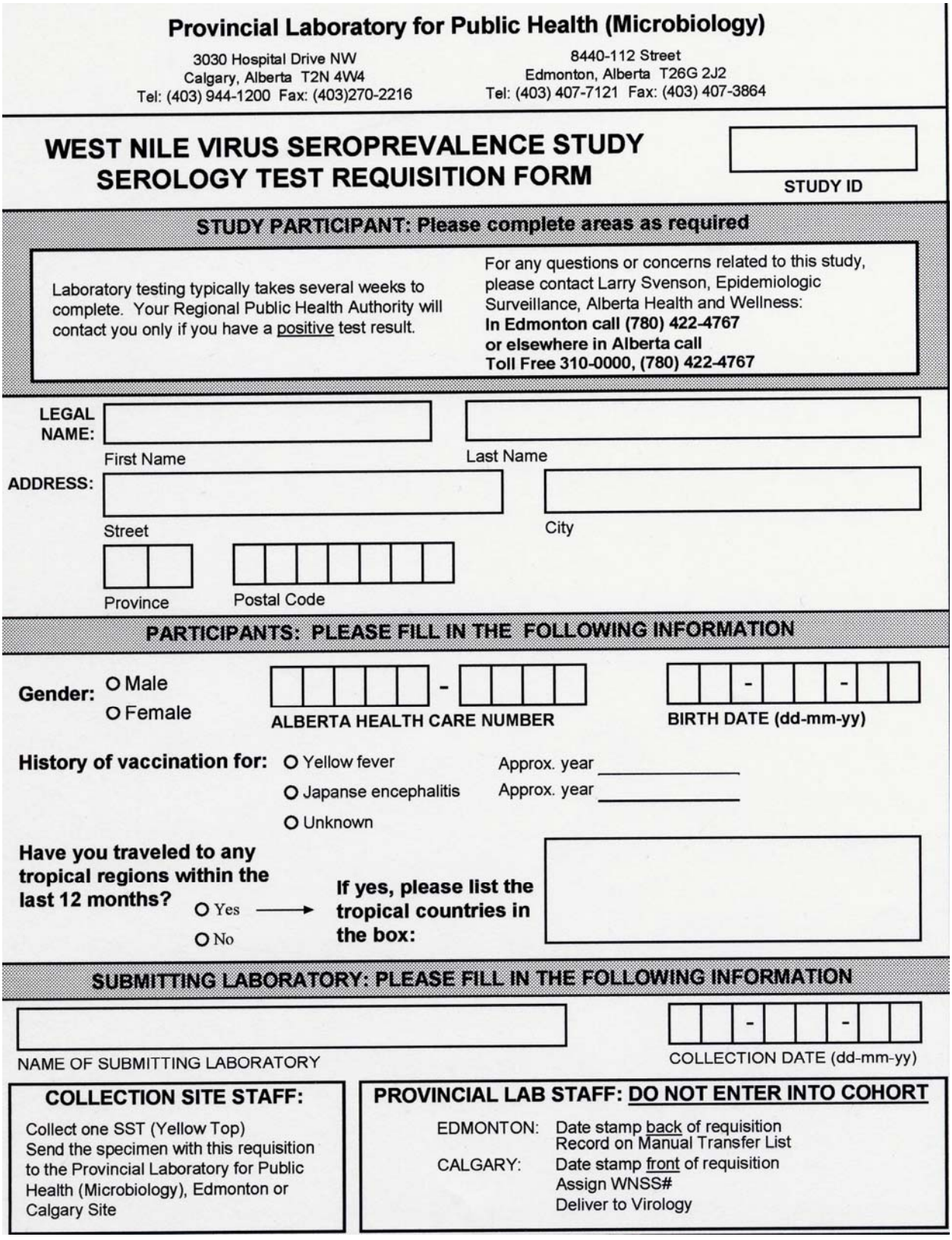
- Using a mosquito repellent containing DEET or other approved ingredients on exposed skin; apply it on clothing as well, as mosquitoes can bite through fabric.
- Avoiding outdoor activities at dusk and dawn where possible.
- Wearing long -sleeved shirts and pants during peak mosquito times as well as light-coloured clothing.

It is also important to take measures around your home:

- Make sure there is no standing water in your yard where mosquitoes can lay their eggs.
- Keep mosquitoes out of house by using window and door screens, etc.

For further information about West Nile virus, visit www.fightthebite.info

Appendix E. Laboratory requisition form



Provincial Laboratory for Public Health (Microbiology)

3030 Hospital Drive NW
Calgary, Alberta T2N 4W4
Tel: (403) 944-1200 Fax: (403)270-2216

8440-112 Street
Edmonton, Alberta T26G 2J2
Tel: (403) 407-7121 Fax: (403) 407-3864

WEST NILE VIRUS SEROPREVALENCE STUDY
SEROLOGY TEST REQUISITION FORM

STUDY ID

STUDY PARTICIPANT: Please complete areas as required

Laboratory testing typically takes several weeks to complete. Your Regional Public Health Authority will contact you only if you have a positive test result.

For any questions or concerns related to this study, please contact Larry Svenson, Epidemiologic Surveillance, Alberta Health and Wellness:
In Edmonton call (780) 422-4767
or elsewhere in Alberta call
Toll Free 310-0000, (780) 422-4767

LEGAL NAME: First Name Last Name

ADDRESS: Street City

Province Postal Code

PARTICIPANTS: PLEASE FILL IN THE FOLLOWING INFORMATION

Gender: O Male O Female

ALBERTA HEALTH CARE NUMBER

BIRTH DATE (dd-mm-yy)

History of vaccination for: O Yellow fever Approx. year _____
O Japanse encephalitis Approx. year _____
O Unknown

Have you traveled to any tropical regions within the last 12 months? O Yes → O No

If yes, please list the tropical countries in the box:

SUBMITTING LABORATORY: PLEASE FILL IN THE FOLLOWING INFORMATION

NAME OF SUBMITTING LABORATORY

COLLECTION DATE (dd-mm-yy)

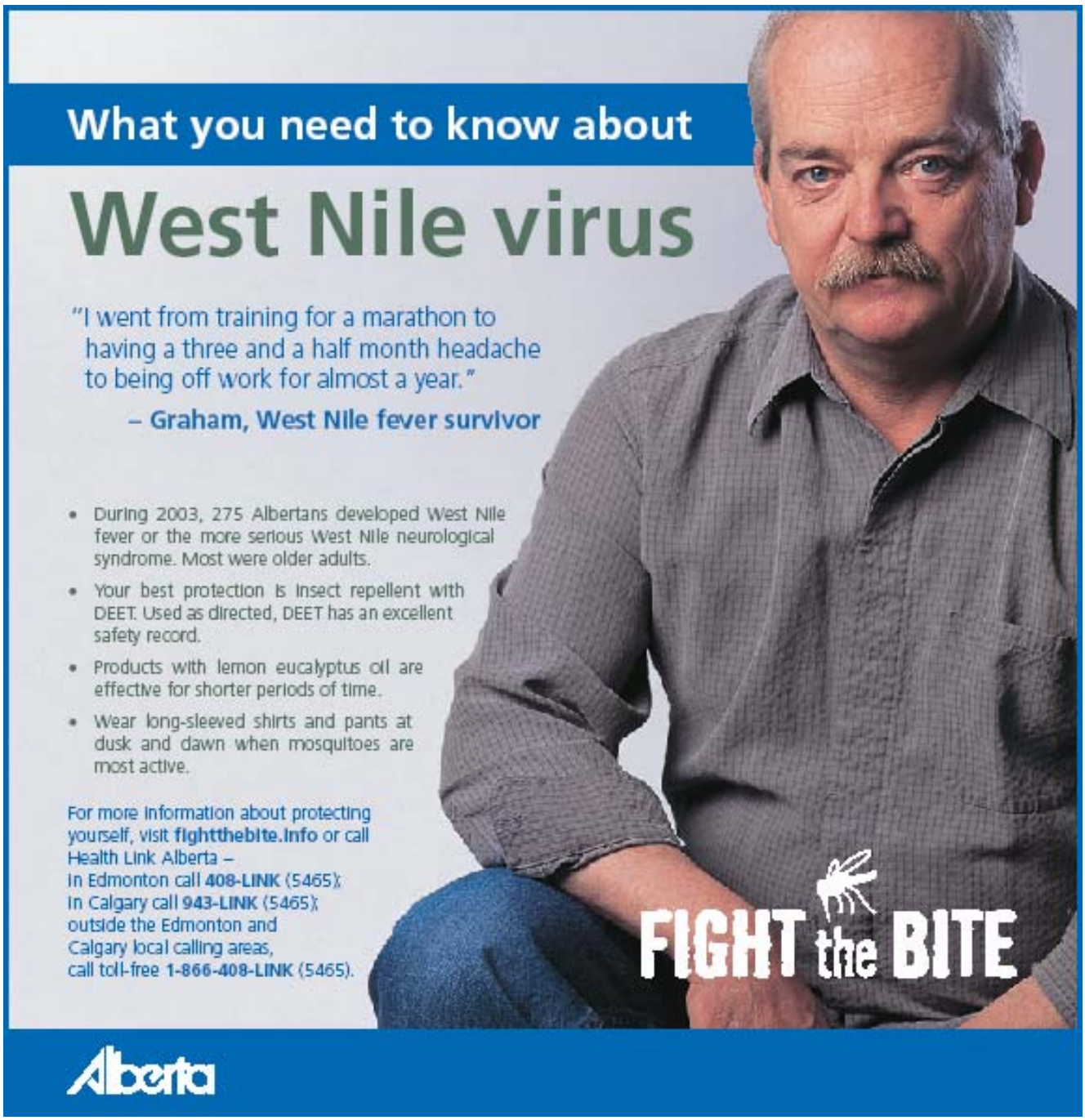
COLLECTION SITE STAFF:

Collect one SST (Yellow Top)
Send the specimen with this requisition to the Provincial Laboratory for Public Health (Microbiology), Edmonton or Calgary Site

PROVINCIAL LAB STAFF: DO NOT ENTER INTO COHORT

EDMONTON: Date stamp back of requisition
Record on Manual Transfer List

CALGARY: Date stamp front of requisition
Assign WNSS#
Deliver to Virology



2005 advertisement targeting older Albertans