A B S T R A C T

Surveys by the Addiction Research Foundation of Ontario have produced annual estimates on smoking prevalence since 1991. This report describes the three series of telephone surveys from which these data are drawn as well as future plans to monitor tobacco use in Ontario. In addition to provision of updated descriptive results, the methodology and limitations of the data are discussed. Prevalence data for 1996 are presented from the Ontario Drug Monitor, a telephone survey of Ontario adults (n=2721). The overall prevalence of smoking in Ontario was 27% (95% confidence interval: 25% to 29%); 23% smoked daily (95% confidence interval: 21% to 25%). There is no evidence of any decline in the prevalence of smoking since 1991, and no sex differences were found in smoking prevalence. Future reports will update trend data and provide robust regional estimates.

A B R É G É

Depuis 1991, les sondages de la Fondation de la Recherche sur la Toxicomanie de l'Ontario fournissent annuellement des estimés de la prévalence du tabagisme. Ce rapport décrit trois types de sondages téléphoniques, à partir desquels ces estimés ont été produits ainsi que les stratégies futures de surveillance épidémiologique en Ontario. L'estimé de la prévalence du tabagisme pour 1996 a été établi à partir de l'ODM (Ontario Drug Monitor), un sondage téléphonique représentatif de la population adulte ontarienne (n=2721). En 1996, la prévalence du tabagisme en Ontario est de 27 % (intervalle de confiance de 95 %: 25 à 29 %) et de 23 % si l'on considère uniquement les fumeurs quotidiens (intervalle de confiance de 95 %: 21 à 25 %). Il n'y a pas de diminution évidente dans la prévalence du tabagisme depuis 1991. De plus, aucune différence significative n'a été observée dans la prévalence du tabagisme entre les hommes et les femmes. Les rapports futurs viendront actualiser ces données et fournir des estimés régionaux robustes.

Smoking in Ontario, 1991 to 1996

Susan Jane Bondy, PhD,¹ Anca Ruxandra Ialomiteanu, MA²

Information on smoking behaviour is presented from the 1996 Ontario Drug Monitor,¹ a telephone survey of 2721 Ontario adults (aged 18+) carried out by the Addiction Research Foundation (ARF). Trends in smoking from 1991 to 1996 are also presented.

Ontario is the only province with annual prevalence data for the past six years. These data have received much attention and have been used by various agencies to monitor changes in smoking behaviour in Ontario and Canada.²⁻⁴ Earlier reports of these data have seen limited circulation.^{4,5} Therefore, some attention will be given to survey methods and to describing future monitoring efforts.

METHODS

Data sources

The data presented come from three series: the Adult Drug Use Survey, Ontario Alcohol and other Drug Opinion Surveys, and the Ontario Drug Monitor.

Adult Drug Use Survey

This was an important monitoring study of current and lifetime psychoactive drug use, with data collected every two or three years from 1977 to 1994.⁶ Tobacco was included for the first time in 1991 and

again in 1994. All tobacco use data were collected by telephone interview.

Ontario Alcohol and Other Drug Opinion Surveys (OADOS)

This series included four distinct telephone surveys addressing a variety of research issues.⁷⁻¹⁰ The questionnaires were complex and included blocks of questions on beliefs and attitudes; experimental designs were built into the instruments.

Ontario Drug Monitor

The Ontario Drug Monitor (ODM)¹ is a new initiative of ARF that began in April 1996 and subsumes both of the other projects described. It should be noted that in 1994 a single sample was the vehicle for both the Adult Drug Use and OADOS surveys. The first goal of the ODM is to monitor trends in drug use, but it also allows timely pursuit of focused research questions. Data are collected continuously by telephone, with a new sample drawn each month (ordinarily January through November). The 1996 data were collected from April to December (Table I). Questions requiring large samples may remain in the survey for more than one year, and new questions may be added in any month.

Sampling design

In each survey before 1996, sampling was conducted in two stages. Private households were sampled by random digit dialling, then one adult per household was selected at random.

The 1996 survey used the same two-stage design, but geographical stratification was added, drawing roughly equal samples from each of six regions comparable to Ministry of Health planning areas:

1. Social Evaluation and Research Department, Addiction Research Foundation; and Department of Public Health Sciences, University of Toronto
2. Research Division, Addiction Research Foundation

Correspondence and reprint requests to: Susan Bondy, Addiction Research Foundation of Ontario, 33 Russell Street, Toronto, Ontario M5S 2S1, Tel: (416) 595-6893, Fax: (416) 595-6899, e-mail: sbondy@arf.org

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North (North East and North West planning areas), Southwestern Ontario, Central West, Central East (excluding Metropolitan Toronto), and Metropolitan Toronto.

Sample sizes and response rates appear in Table I. Response rates are conservatively estimated, assuming that the proportion of eligible households among telephone numbers never reached is the same as the proportion among contacted telephone numbers.¹¹⁻¹⁴ Similar procedures were used to minimize selection bias. Calls were made on a quota schedule including weekdays, evenings, and weekends, and a minimum of 14 attempts were made to reach each number.

The telephone portion of the 1991 Adult Drug Use Survey was conducted by Gallup Canada, the rest by the Institute for Social Research at York University.

Survey definitions

Smoking status categories correspond as closely as possible to those used by Health Canada.¹⁵ A current smoker smokes cigarettes daily or occasionally, or has quit for less than one month. Non-daily or occasional smokers have smoked at least 100 cigarettes in their lifetime and have smoked in the past month, but do not smoke daily or average less than a cigarette per day. Former smokers have smoked at least 100 cigarettes, but none in the past 30 days. Lifetime nonsmokers have never smoked, or have smoked less than 100 cigarettes in their lifetime.

Statistical methods

Percentages are based on data weighted to account for the sampling design. For 1991 to 1995, sample weights adjusted for the number of adults and telephone numbers per household. Earlier work has shown that design effects in these surveys are small.¹⁶ Therefore, standard errors were calculated assuming a simple random sample. Accounting for design effect would rarely change the confidence intervals reported here to the nearest integer. For 1996, sample weights accounted for the number of adults in the household and region. Standard errors for this complex survey sample were calculated using SUDAAN software.¹⁷

TABLE I
Summary of Sample Size and Response Rate in Six ARF Telephone Surveys

Survey and Year	Dates of Interview	Total Sample	Response Rate, %
Adult Drug Use Survey, 1991	Feb. 20 to Mar. 18	1047	67
OADOS 1992	June 24 to Aug. 20	1058	63
OADOS 1993	Apr. 19 to May 24	1034	65
OADOS 1994	Mar. 1 to May 5	2022	63
OADOS 1995	Mar. 28 to May 9	994	63
Ontario Drug Monitor, 1996	Apr. 8 to Dec. 23	2721	64

TABLE II
Smoking Status by Age Groups of Interest and Sex (Weighted Percentage and 95% Confidence Interval) Ontario Adults (18+), Ontario Drug Monitor, 1996¹

Age	Both Sexes							
	18 and older	Age Groups of Earlier Reports	Age Groups of Earlier Reports	Age Groups of Earlier Reports	Age Groups used by Public Health Units	Age Groups used by Public Health Units	Age Groups used by Public Health Units	Age Groups used by Public Health Units
		18 to 34	35 to 54	55 plus	20 to 64	20 to 44	45 to 64	65 +
Current smoker (Daily smoker)	27 ± 2 (23 ± 2)	30 ± 4 (24 ± 3)	29 ± 3 (26 ± 3)	18 ± 4 (17 ± 3)	29 ± 2 (25 ± 2)	32 ± 3 (26 ± 3)	23 ± 4 (21 ± 3)	14 ± 4 (14 ± 4)
Former Smoker	26 ± 2	14 ± 3	30 ± 3	40 ± 5	25 ± 2	19 ± 3	36 ± 4	41 ± 6
Never 100 cigs.	47 ± 2	56 ± 4	41 ± 4	41 ± 5	46 ± 3	49 ± 3	41 ± 4	45 ± 6
Total % (N unweighted)	100 (2721)	100 (848)	100 (1123)	100 (698)	100 (2207)	100 (1460)	100 (747)	100 (406)
Age	Male							
	18 and older	Age Groups of Earlier Reports	Age Groups of Earlier Reports	Age Groups of Earlier Reports	Age Groups used by Public Health Units	Age Groups used by Public Health Units	Age Groups used by Public Health Units	Age Groups used by Public Health Units
		18 to 34	35 to 54	55 plus	20 to 64	20 to 44	45 to 64	65 +
Current smoker (Daily smoker)	28 ± 3 (24 ± 3)	31 ± 5 (24 ± 5)	31 ± 5 (28 ± 4)	16 ± 5 (16 ± 5)	30 ± 3 (25 ± 3)	34 ± 4 (28 ± 4)	23 ± 5 (21 ± 5)	13 ± 7 (12 ± 7)
Former Smoker	30 ± 3	14 ± 4	34 ± 5	53 ± 7	28 ± 3	20 ± 3	44 ± 5	57 ± 9
Never 100 cigs.	42 ± 3	55 ± 6	35 ± 5	30 ± 7	42 ± 4	46 ± 5	33 ± 6	30 ± 9
Total % (N unweighted)	100 (1206)	100 (409)	100 (513)	100 (268)	100 (1016)	100 (670)	100 (346)	100 (145)
Age	Female							
	18 and older	Age Groups of Earlier Reports	Age Groups of Earlier Reports	Age Groups of Earlier Reports	Age Groups used by Public Health Units	Age Groups used by Public Health Units	Age Groups used by Public Health Units	Age Groups used by Public Health Units
		18 to 34	35 to 54	55 plus	20 to 64	20 to 44	45 to 64	65 +
Current smoker (Daily smoker)	26 ± 3 (22 ± 3)	29 ± 5 (24 ± 5)	27 ± 4 (25 ± 4)	20 ± 5 (18 ± 4)	28 ± 3 (24 ± 3)	30 ± 3 (25 ± 4)	23 ± 5 (21 ± 4)	15 ± 5 (15 ± 5)
Former Smoker	23 ± 3	14 ± 3	26 ± 4	30 ± 5	22 ± 3	19 ± 3	29 ± 5	29 ± 7
Never 100 cigs.	52 ± 3	57 ± 5	47 ± 5	50 ± 6	50 ± 4	51 ± 4	48 ± 6	56 ± 7
Total % (N unweighted)	100 (1515)	100 (439)	100 (610)	100 (430)	100 (1191)	100 (790)	100 (401)	100 (261)

Estimates with high sampling variability are not presented. For all descriptive uses of ODM data, it is recommended that estimates with relative standard error (RSE) larger than 0.175 be suppressed. The RSE for any proportion (p) is calculated as follows:¹⁸

$$\text{where } p \leq 0.05 \quad \text{RSE} = \frac{\text{SE}(p)}{-\ln(p)}$$

$$\text{where } p > 0.05 \quad \text{RSE} = \frac{\text{SE}(1-p)}{-\ln(1-p)}$$

RESULTS

Smoking in 1996

Table II presents smoking status by the age categories used in earlier ARF reports¹⁰ and those commonly used in public health units.

Approximately 27% of adult Ontarians were current smokers in 1996, and 23% smoked daily (Table II). The prevalence was highest in young adults (18 to 34) and declined with age thereafter. Roughly 14% of seniors (65 and older) smoked.

A similar percentage of men (28%) and women (26%) were current smokers

TABLE III
Smoking Status by Region, by Age Groups of Interest (Weighted Percentage and 95% Confidence Interval) Ontario Adults (18+), Ontario Drug Monitor, 1996¹

Region	Smoking Definition	Age Group			
		18 and older	20 to 64	20 to 44	45 to 64
Ontario	Current	27 ± 2	29 ± 2	32 ± 3	23 ± 3
	Daily (N unweighted)	23 ± 2 (2721)	25 ± 2 (2207)	26 ± 3 (1460)	21 ± 3 (747)
Metro Toronto	Current	24 ± 5	27 ± 5	31 ± 7	15 ± 7
	Daily (N unweighted)	19 ± 4 (430)	21 ± 5 (360)	23 ± 6 (255)	14 ± 7 (105)
Central East (excluding Toronto)	Current	26 ± 4	28 ± 5	32 ± 6	21 ± 8
	Daily (N unweighted)	22 ± 4 (459)	24 ± 5 (350)	26 ± 6 (231)	21 ± 8 (119)
Central West Region	Current	28 ± 5	28 ± 5	30 ± 6	26 ± 8
	Daily (N unweighted)	25 ± 4 (448)	24 ± 5 (371)	26 ± 6 (251)	22 ± 8 (120)
Southwestern Ontario	Current	26 ± 4	28 ± 5	31 ± 6	23 ± 7
	Daily (N unweighted)	24 ± 4 (461)	25 ± 5 (374)	28 ± 6 (240)	20 ± 7 (134)
Eastern Ontario	Current	28 ± 4	30 ± 5	33 ± 6	25 ± 8
	Daily (N unweighted)	24 ± 4 (481)	27 ± 5 (396)	28 ± 6 (262)	23 ± 8 (134)
North (North West and North East Regions)	Current	31 ± 4	37 ± 5	38 ± 7	34 ± 8
	Daily (N unweighted)	28 ± 4 (442)	32 ± 5 (356)	33 ± 7 (221)	31 ± 8 (135)

($p=0.240$). Similarly, no sex differences were found among 20 to 44 year olds ($p=0.903$), 45 to 64 year olds ($p=0.157$) or those over age 64 ($p=0.642$). Female non-smokers were more likely to have never smoked than male nonsmokers ($p<0.001$).

Table III presents prevalence by region and age. Region-specific estimates are not shown for 18 and 19 year olds or people over 64 because of high sampling variability. Overall, no statistically significant differences were found between region for all ages (chi square=5.57, $df=5$; $p=0.34$) or among 20 to 44 year olds (chi square=5.52, $df=5$, $p=0.36$). Among 45 to 64 year olds, the percentage of current smokers was somewhat higher in Northern Ontario than in other regions. Again, this was not statistically significant (chi square=9.52, $df=5$, $p=0.09$). Possible urban versus rural differences were also tested on the basis of postal codes (rural postal codes are identified by a zero in the second position). There were no such differences in smoking prevalence either province-wide or within any of the five regions with rural areas (data not shown).

Trends in smoking, 1991 to 1996

Prevalence estimates for 1991 through 1996 are given in Table IV. Current smoker estimates varied from 23% in 1993, to 29% in 1991 and 1995. There is no general upward or downward trend over all six years.

DISCUSSION

Timely information on smoking behaviour is necessary to inform and evaluate public policy and prevention efforts. Annual data, particularly with modest sample sizes, are subject to random error, and several years of data are needed to estimate trends. As the number of years of data increases, so will our ability to determine whether year to year differences reflect genuine behaviour changes or random fluctuations.

The tremendous decrease in smoking prevalence in Canada from 1965 to 1990 has been described elsewhere.¹⁹ By the end of the 1980s, roughly one third of the Canadian population was smoking, and rates for men and women had converged.¹⁹ The data presented here show no net

TABLE IV
Trend in the Prevalence of Smoking in the Adult Population of Ontario, 1991 To 1995, by Sex (Weighted Percentage and 95% Confidence Interval) Adults (18+), Addiction Research Foundation Surveys

	Ontario Adult Drug Use Survey, 1991	OADOS 1992	Survey and Year OADOS 1993	OADOS 1994	OADOS 1995	Ontario Drug Monitor 1996
% Current Smoker						
Age 18 +						
Total	29 ± 3	26 ± 3	23 ± 3	25 ± 2	29 ± 3	27 ± 2
Male	30 ± 4	30 ± 4	28 ± 4	27 ± 3	30 ± 4	28 ± 3
Female	29 ± 4	23 ± 4	19 ± 3	24 ± 3	27 ± 4	26 ± 3
Ages 20-44						
Total	31 ± 4	30 ± 4	27 ± 3	30 ± 3	29 ± 4	32 ± 3
Male	30 ± 5	35 ± 5	31 ± 5	31 ± 4	30 ± 5	34 ± 4
Female	32 ± 5	25 ± 5	23 ± 5	29 ± 4	29 ± 5	30 ± 3
Ages 45-64						
Total	31 ± 6	21 ± 5	20 ± 5	19 ± 3	26 ± 5	23 ± 4
Male	35 ± 9	21 ± 8	25 ± 8	21 ± 5	30 ± 8	23 ± 5
Female	28 ± 8	21 ± 7	15 ± 6	17 ± 5	22 ± 7	23 ± 5
% Daily Smoker						
Age 18 +						
Total	29 ± 3	25 ± 3	22 ± 3	24 ± 2	27 ± 3	23 ± 2
Male	30 ± 4	29 ± 4	26 ± 4	25 ± 3	29 ± 4	24 ± 3
Female	28 ± 4	22 ± 3	19 ± 3	23 ± 3	25 ± 4	22 ± 3
Ages 20-44						
Total	31 ± 4	28 ± 4	25 ± 4	27 ± 3	32 ± 4	26 ± 3
Male	30 ± 5	34 ± 5	28 ± 5	28 ± 4	32 ± 5	28 ± 4
Female	32 ± 5	23 ± 5	23 ± 5	26 ± 3	31 ± 5	25 ± 4
Ages 45-64						
Total	31 ± 6	20 ± 5	19 ± 5	18 ± 3	28 ± 5	21 ± 4
Male	34 ± 9	21 ± 8	24 ± 8	20 ± 5	32 ± 8	21 ± 5
Female	28 ± 8	20 ± 7	14 ± 6	17 ± 5	23 ± 7	21 ± 4

change in the prevalence of smoking in Ontario since 1991. This study also found no sex differences in smoking status, although age-related differences were found.

The apparent reversal of a downward trend after the 1993 survey has been noted elsewhere^{2,4,5} and has been linked to the marked reduction in the price of cigarettes in early 1994, attributable first to smuggling then to a tax decrease. The trend data presented here are insufficient alone to demonstrate this effect conclusively. Data from a variety of sources taken together provide stronger evidence that the tax decrease did result in increased smoking.^{2,4}

These data suggest that the prevalence of smoking is higher in Northern Ontario, but the sample size is insufficient to clearly demonstrate or refute this. Regional differences will be studied in the future using data from more than one calendar year.

Methodologic issues

Coverage and representativeness

The aim of these surveys is to obtain representative samples of Ontario adults. However, no information is provided about people under age 18, those in institutions or who are homeless, or those without a telephone. Response rates varied from 67% to 63%, which are slightly lower than those typically obtained by Statistics Canada in Ontario. Ontario typically has the lowest response rate by province in national surveys. For example, in Canada's Alcohol and Drug Survey (CADS),²⁰ the response rate was 76% nationally, 67% in Ontario and 60% in Metropolitan Toronto.

Comparison between the survey samples (1991 and 1996) and Ontario census data^{1,6} showed very similar age and sex distributions. However, the survey samples tended to include more people who had attained higher levels of education and who had never been married than expected by chance. The most likely effect of incomplete coverage is underestimation of true smoking rates.

Limitations of the sample size

When compared with major health surveys, these surveys are modest in size. For

cycles with roughly 1000 respondents (1992, 1993 and 1995), percentages based on the whole sample may be estimated reliably to within roughly three percentage points. However, estimates within subpopulations of interest (such as by sex, smoking status, or region) are subject to high variability and should be interpreted with caution. It should also be noted that the suppression rules used are less conservative than those used by Statistics Canada.

Comparability of measures over time

With the exception of the Adult Drug Use Survey (1991 and 1994) and the Ontario Drug Monitor (1996 forward), these surveys were not exclusively designed to study trends. There are subtle differences in wording for tobacco use questions, and it is unclear whether these differences affect prevalence estimates. Similar question variability is also seen across national health surveys. The 1991 ARF survey discussed earlier and another telephone survey with slightly different wording²¹ produced nearly identical estimates at 29% and 30% respectively. Both estimates are lower than that of the 1990 Ontario Health Survey,²² at 33% (estimates for ages 18 and older from public use data tape), but this may be because of different data collection methods (telephone versus household sampling and written questionnaire).

In 1996, two more important changes were made to the questionnaire. First, response options for the core question "At the present time do you smoke cigarettes?" were changed from "yes" or "no" to "daily", "occasionally" or "not at all" to correspond with major national surveys. This may have caused slightly higher estimates of the prevalence of non-daily smoking.

The second change was to define lifetime smoking status on the basis of a minimum of 100 cigarettes. This provides a reliable definition of lifetime abstinence, and has been recommended by Health Canada.¹⁵ Before 1996, these surveys were not a good vehicle for distinguishing between lifetime abstainers and former smokers, or for studying movement between current and former smoker categories.

Although the content of the ODM varies from month to month, core ques-

tions for smoking status will not change. These also appear at the beginning of each interview and so are not affected by the variable portions of the interview.

To ensure comparability across years, all estimates were re-derived to approximate Health Canada definitions.¹⁵ Therefore, some estimates have changed from earlier reports, by less than 2%. Before 1995, it was not known whether someone had smoked in the previous 30 days (typically only the previous year). For the 1996 data, applying or not applying the 30 day rule changed the estimated prevalence of smoking by less than 1%.

Future monitoring

Monitoring the use of tobacco (and other drugs) is a priority area of the Addiction Research Foundation, and data from the Ontario Drug Monitor will be released annually. Information beyond prevalence of smoking will vary from year to year. Over time, this vehicle will allow for more complex statistical analyses, such as assessment of seasonal variation, and provide more precise estimates on subgroups and smaller geographical areas by combining more than one year's data.

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L E T T E R S C O R R E S P O N D A N C E

Canadian Immunization Cuts Will Cause Child Deaths

Sometimes it is important to remember that some of the things we take for granted in Canada can mean the difference between life and death in other countries. Immunization, which most Canadian children receive almost automatically, is one of those things.

As a medical doctor, I have had the opportunity to evaluate the impact of immunization programs on the population of my country, Senegal. This has led me to believe that the termination of Canada's International Immunization Program, as recently announced by the Canadian International Development Agency (CIDA), would be regrettable.

Children in developing countries are often victims of a vicious circle of malnutrition and infectious disease. Some of them suffer more elaborate forms of injustice, such as trafficking of organs, prostitution, sexual abuse, corruption, and the trauma and displacements caused by armed conflict. These problems are not all equally simple to resolve, but we would be shamefully guilty if we did not at least continue

those battles already being waged — principally in maternal and child health, malnutrition, and vaccination.

Infectious disease kills 2 million children under the age of five each year. I am not referring to exotic ailments — rather, to measles, mumps, diphtheria, neonatal tetanus, and tuberculosis. In spite of this terrible toll, global vaccination programs (which Canada has supported until now) currently save over 3 million lives per year. This progress has come at minimal financial cost. The Canadian contribution to these programs has been about \$6 million per year, which is less than 0.3% of the Canadian aid budget.

CIDA should be proud of having financed the Canadian International Immunization Program. According to an evaluation by the Canadian Public Health Association, the program's projects have not only efficiently accomplished immunization goals but have also trained local providers of primary health care.

Can we really afford more foreign aid? In fact, for developed countries, financing the eradication of polio, neonatal tetanus, and measles could be considered an investment rather than aid. After the eradication

of these diseases, it will no longer be necessary to fund costly domestic immunization programs year after year. The eradication of smallpox in 1978 represented a saving of millions of dollars each year in the US alone.

It is estimated that polio, which continues to cripple over 80,000 children annually, could be eradicated for ever for \$180 million per year over five years. This is significantly less than the \$380 million that the US currently spends each year to immunize American children against polio. Such an expenditure would be unnecessary if polio were eradicated. Canada and other Western countries waste comparable amounts each year. It is not surprising that the US has recently increased spending on international immunization programs.

Cancelling Canada's International Immunization Program is a bad idea. The world needs more programs like this one. I cannot watch it go without voicing a note of protest.

*Ismaila Thiam, MD
Department of Nutrition
University of Montreal*