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Use of Admail and a geographic information system to send surveys to target populations

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Introduction: This paper briefly describes the use of Canada Post Unaddressed Admail and a geographic information system (GIS) for survey distribution to a specific target population in a large, sparsely populated geographic area, and the effectiveness of this approach.
Methods: Surveys were sent as Unaddressed Admail via Canada Post to a target population of people living within 5 km of a wind turbine in southwestern Ontario.
Results: The overall response rate from 8 wind farms (in 8 counties) was 8.1%.
Conclusion: This approach has the potential to save time and money, but low response rates are common, distribution is not precise and there is potential for selection bias. Despite these flaws, Unaddressed Admail is worth consideration for delivery of information, study-recruitment materials and surveys to rural, remote and specific target populations.

Introduction : Nous décrivons brièvement l'utilisation du service Médiaposte sans adresse de Postes Canada et d'un système d'information géographique pour la distribution de sondages à une population cible précise sur un grand territoire peu densément peuplé, ainsi que l'efficacité de cette méthode d'envoi.
Méthodes : Nous avons utilisé le service Médiaposte sans adresse de Postes Canada pour envoyer des sondages à une population cible habitant dans le sud-ouest de l'Ontario à moins de 5 kilomètres d'une éolienne.
Résultats : Le taux de réponse global pour les 8 parcs éoliens visés (dans 8 comtés différents) était de 8,1 %.
Conclusion : Bien que cette méthode puisse faire économiser temps et argent, elle n'engendre souvent qu'un faible taux de réponse, est imprécise sur le plan de la distribution et pourrait entraîner un biais de sélection. Malgré ces lacunes, le service Médiaposte sans adresse reste une option à envisager pour l'envoi de renseignements, de documents de recrutement en vue d'études et de sondages à des populations cibles précises vivant en milieu rural et éloigné.

INTRODUCTION

Unaddressed Admail has the potential for use in rural or remote communities when a specific geographically based sample in a community may be expensive or difficult to reach. In the case of a rural sample, it may be especially time-consuming and difficult to travel within a community to hand-deliver surveys.[1] Unlike studies in urban or suburban communities, where research assistants can distribute hundreds of surveys on foot over the course of a single day, rural or remote communities are not as densely built or populated and present unique challenges for survey distribution. Distribution of surveys to a handful of rural communities may take several days and include costs associated with hotels, meals and car rental. For studies with budgetary constraints, Unaddressed Admail provides a fast and low-cost alternative that does not require travel.[2] For studies examining specific populations, use of Unaddressed Admail is a more precise method to locate the population of interest than

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use of telephone survey companies that rely on 3-digit postal codes to find participants.

Canada Post Unaddressed Admail is a direct-mail service that can be used to distribute surveys to specific geographic areas. When using Admail the sender is not required to provide names and addresses of recipients. This method has been previously used for delivering surveys to rural and remote communities across Canada, and in some cases has been used in studies where researchers selected residences and communities using a geographic information system (GIS). A GIS is a geographic program used to visualize and analyze spatial data. For example, this approach was used previously for recruitment of urban residents[3] and for mailing materials related to a health-behaviour intervention,[4,5] and has largely been used as a tool to deliver surveys to rural residents, including surveys specifically targeting farmers.[6–8]

Our objective was to examine the benefits and shortcomings of using Unaddressed Admail for rural health research and to describe a GIS-based method for Unaddressed Admail distribution. We also discuss the appropriateness and efficacy of Unaddressed Admail for use by rural health practitioners. This method may be applicable to rural health practitioners or researchers attempting to deliver surveys or information to tailored rural communities in Canada, especially when communities have been selected using GIS methods.

METHODS

Survey distribution

As part of a larger public health study (unpublished data, 2015), a method was required to deliver surveys to targeted locations and a specific target population within large geographic areas. Wind turbines are a decentralized form of energy development and tend to be built in rural communities with low population density.[9,10]

The wind turbine locations from wind farms in a number of counties in southwestern Ontario were mapped[11] and data were transferred into ArcGIS 10.1, a GIS used for managing geographic information in a database, analyzing spatial data, and creating maps and visualizations.[11] It was the intent to deliver the survey to residents living within 5 km of a wind turbine, a distance selected following a review of the literature and anecdotal evidence from stakeholders who had contacted the research group. Peer-reviewed health studies have involved residents living 1.4 km,[12] 2 km[13] and 2.5 km[14] from a wind turbine, and a community-based survey reported health effects in residents living up to 5 km away.[15] Based on this evidence and a desire to be inclusive and thorough, the 5-km buffer was selected.

Survey delivery relied on Canada Post Unaddressed Admail. The Admail delivery routes of interest were selected using a map of delivery routes provided by Canada Post, which identifies the geographic area covered by each route, as well as the number of residences on each delivery route. With the use of a GIS, it was spatially determined which residences would receive the survey through contrasting of a map of the delivery routes with a map of the wind turbines. The delivery routes that contained wind turbines were selected for inclusion in the study, with the exception of delivery routes that did not contain 5 or more wind turbines. This limit was enforced to exclude delivery routes or postal codes that were expected to be under a minor influence from wind turbines and to maximize the distribution to postal routes where a larger number of residents would be living near wind turbines. Therefore, only residents living within postal codes (and corresponding delivery routes) that contained more than 5 industrial wind turbines were selected as study participants (Fig. 1). One survey per household was sent to residences located near industrial wind turbines. The survey included a question on self-assessed distance to the nearest wind turbine ("How far do you think you live from the nearest wind turbine in miles or kilometres?") and asked for the participant's address ("What is your address?") so that location could be geo-coded within the GIS. This ensured that, among residents within each delivery route, residents living within 5 km of a wind turbine could be identified.

Statistical analysis

All analyses were performed using SAS 9.22. Demographic characteristics of the sample were compared with the population of the census division for each county, via a paired *t* test, using information from the 2006 and 2011 Canadian censuses. We compared variables between the populations to determine if the respondents were significantly different from the rest of the population. We used a 2-tailed *t* test to examine the differences in sex, marital status and education level between the 2 populations.

The study protocol was reviewed and received ethics clearance through the Office of Research Ethics at the University of Waterloo.

RESULTS

Surveys were sent to 4876 residences located near industrial wind turbines. Response rates for each of the 8 wind farm communities in 8 counties were calculated. The overall response rate was 8.1% (Table 1). The lowest response rate was seen in Bruce County (6.9%) and the highest response rate was seen in Norfolk County (12.4%).

We compared the populations to determine if there was a significant difference between the groups (Table 1). The median age of the respondents was 13 years greater than the median age of the comparison population. There was a greater proportion of men in the sample (52.2%) than in the comparison population (49.2%), but this difference was not significant (p = 0.2). The sample included a significantly higher percentage of married people (79.4% v. 61.0%; $p < 0.005$) and people with postsecondary education (58.7% v. 37.1; $p < 0.005$) than the comparison population. The median total income of the sample was $7111.25 lower than that of the comparison population.

The difference between the number of overall residences and residences that accept advertisements ("Total Points of Call" v. "Consumers' Choice" lists) was not significant (p = 0.5).

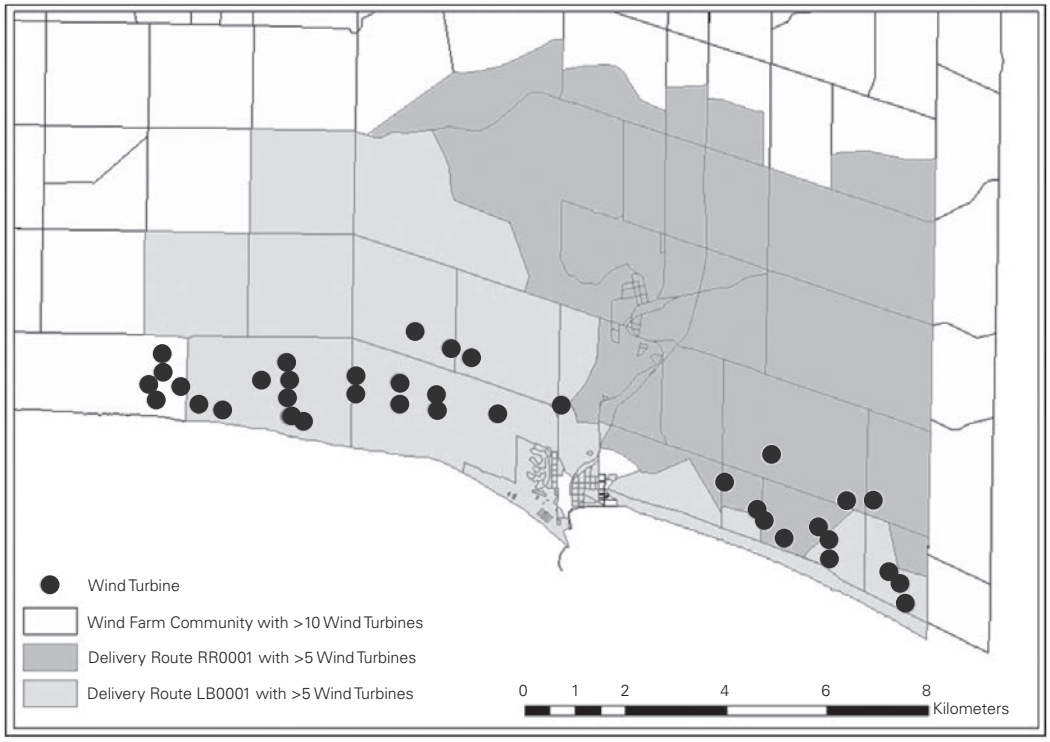

Fig. 1. The locations of wind turbines and Canada Post delivery routes (within a 6-digit postal code) in Port Burwell, Ont.

Table 1: Demographic characteristics of the study sample and the comparison population

Characteristic	Sample*	Comparison population†	p value
Median age, yr	56	43	—
Male sex, %	52.2	49.2	0.2
Married, %	79.4	61.0	< 0.005
Median total income, $‡	60 000.00	67 111.25	—
Postsecondary education, %	58.7	37.1	< 0.005

*The sample included 396 survey respondents, of 4876 households that received the survey.
†The comparison population was the population of the census subdivision (1 021 257 residents).
‡Total income for the sample was calculated by using the midpoint of a range. The total income is the sum of the total incomes received by all household members from all sources, before taxes, in the past 12 months. The total income for the comparison population is the sum of the total incomes of all members of that family. Total income refers to the total money income received from various sources during calendar year 2005 by persons aged ≥ 15 years.

DISCUSSION

The objective of this paper was to examine the benefits and shortcomings of survey distribution using Unaddressed Admail to target rural communities across Canada, which is a simple approach that requires minimal time and funding yet has some limitations. Unaddressed Admail has the potential for use in rural or remote communities. This approach is relevant to rural health researchers yet does not appear to be widely used or well-documented in the Canadian health literature. Unaddressed Admail can be used to disseminate recruitment postings, health interventions and surveys to a large number of people over a large geographic area. Despite the shortcomings of this approach, in some cases it is the only financially suitable option available to researchers.

Unaddressed Admail may be particularly effective when used for the dissemination of information or finding nonrepresentative study samples. In cases where targeted distribution is required, landowner lists[2] or mailing lists may not be available to researchers, and the census distribution to targeted postal routes is the only available option. In cases where researchers have geographically identified communities of interest using GIS, the Unaddressed Admail method is also preferable, since the distribution routes are available as a GIS map, making route selection relatively easy. Further, in using GIS and spatial distribution methods from the outset, researchers can request information about respondents' addresses and use spatial-analysis techniques, including dose–response analysis of health effects. A dose–response relation implies that an exposure results in an outcome of interest, and spatial data (e.g., measures of distance) can be used to estimate dose (unpublished data, 2015).

Limitations of Unaddressed Admail

Our study pointed to 3 main shortcomings of Unaddressed Admail, although some researchers may find that the practicality of the approach outweighs these concerns.

First, our study had a low response rate, and this was a consistent trend in each of the 8 counties, with an overall response rate of 8.1%. Other studies that have used Unaddressed Admail have obtained response rates ranging from 1%[3,16,17] to 27.5%.[18] It has been suggested that these should not be considered true response rates, which cannot be calculated owing to a lack of data about how delivery was executed. The delivery routes will include households or residents that are not potential participants of interest, and if the denominator is estimated as the number of surveys that the researchers submitted to Canada Post, this value will include surveys that were knowingly delivered to homes that did not qualify for study inclusion.[16,17]

In another study involving the rural Ontario communities where our survey was delivered, an overall response rate of 17.1% resulted, which is greater than our response rate but still modest.[2] Given that the Unaddressed Admail approach generally results in low response rates, it is important for researchers to consider the possibility that the rate may be too low for research findings to be statistically significant or accepted for publication in peer-reviewed journals.

In cases where response rates are low and sampling was purposive and regional, study findings have low generalizability,[18] and researchers using this method should note this in research findings. Researchers can plan to do a modest number of site visits to select research communities to perform door-to-door nonresponse surveys, which has been done in other studies using Unaddressed Admail to assess nonresponse bias.[8,19] A more appropriate application of Unaddressed Admail might be for research studies using purposeful sampling techniques. For example, Unaddressed Admail can be used in studies using snowball or chain sampling to recruit the first round of participants or for reaching participants for case studies.

A second limitation is coarseness of spatial distribution. Researchers must select geographic areas based on the routes created by Canada Post and not based on the spatial pattern of interest. In this study, residents living within 5 km of a wind turbine were of interest, but residents living farther away received the survey. To combat this, participants in this study were asked to provide information about their specific geographic location by estimating distance from a wind turbine and by providing their address (which was used to objectively measure distance from a wind turbine).

Asking participants to provide geographic information enabled researchers to exclude respondents who lived beyond the 5-km buffer; however, it is important to note that the address and assessment of distance are self-reported. These data can also be used to roughly examine whether there were discrepancies in the spatial distribution of respondents. Quantifying any spatial discrepancies would require access to GIS maps that indicate the number of households in an area and comparison with a map of the respondents, and a dose–response analysis of the study variables.

A third limitation is selection bias. This results from the nature of the Unaddressed Admail service

in that items are delivered only to residences that do not opt out of receiving advertisements. Members of the target population who have opted out of advertisements may not have received the survey; however, the difference between the number of overall residences and residences who accept advertisements ("Total Points of Call" v. "Consumers' Choice" lists) was not found to be significant. Furthermore, follow-up surveys have found that nonrespondents have thrown out surveys specifically because they were delivered as part of their "junk mail" and did not have the potential participant's name or address on the front of the envelope.[8,19]

Selection bias can also be a shortcoming of studies that use Unaddressed Admail, given that response rates are low. Researchers who have used Unaddressed Admail and encountered low response rates have tried to assess nonresponse bias with follow-up surveys and found no significant difference between respondents and nonrespondents in terms of demographics or study variables of interest.[8,19] In the current study, we compared the demographic characteristics of the study sample with census division data for the 8 counties (i.e., the comparison population). Significant differences were found (i.e., marital status and postsecondary education); however, in the current study, comparisons between census division data and the study sample are of limited value owing to the low response rate and the subsequent potential for sampling error. Furthermore, these differences in marital status and education are likely a better indicator of a small sample than a systematic sampling bias. In a study that distributed a survey through Unaddressed Admail to farmers in western Canada, respondents were more educated than the overall community.[16,17] This shortcoming is not specific to Unaddressed Admail distribution — survey respondents do not necessarily match the community, regardless of the method of data collection.[20] However, response rates with Unaddressed Admail are consistently low and could therefore be inferred to be consistently unrepresentative of the population. It is also worth considering that only 1 survey or item is delivered to each home; if a research study aims to reach more than 1 member per household, multiple surveys may be sent to each household in each package, or surveys may include contact information for potential participants to contact the researcher for additional copies.

Despite a low response rate in our study, Unaddressed Admail was an efficient method to deliver surveys to targeted locations covering a large geographic area. For research projects with a limited budget, it is one of the only options available. The low response rate of our study is likely the result of the specific research topic, given that many similar studies have had much higher response rates with similar methods. This method has been used modestly in public health and social sciences research, and details of this method and its strengths and weaknesses are not well-established in the literature.

CONCLUSION

Unaddressed Admail is worth considering for rural health research if door-to-door delivery is not feasible and if the population of interest is being selected using specific geographic criteria. There are many applications for Unaddressed Admail services in rural health research, for study recruitment, survey distribution or dissemination of information, and this approach is worthy of consideration by rural health practitioners.

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