

# Inverted Sampling Frames to Overcome Under-Coverage of Specific Population Cohorts: Examining the Viability of Recruiting Households via Employers and Institutions

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## Abstract

The traditional landline household travel survey is facing increasing challenges in recent years. Changes in communication technology has meant decreasing response rate and greater uncertainties in sample frame coverage. This paper proposes the inverted sampling method, which recruits and surveys households through their employers, as a supplement to the traditional landline survey to address some of those challenges. A field test of the method was conducted through a 3-month period and the initial results show mixed successes. Further test of the method is planned in order to better understand the characteristics of the inverted sampling method.

Keywords: Survey Methods; Household Travel Surveys; Inverted Sampling

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## 1. Introduction

In recent years, the sample frame has received notable attention from surveyors as demographic and technological trends have upended the long-standing use of landline household lists when conducting surveys. In particular, for household travel surveys that require sample frames that consider both geographic and demographic coverage, this has been doubly problematic. It is for this reason that the landline telephone based frame has been popular; however, as the use of landlines declined with a corresponding increase in cell phone usage, the need has arisen for alternative frames or methods of surveying to compensate for the change.

General household surveys have begun incorporating the use of cell phone lists within their frame, in combination normally with the original landline lists. The application of these dual frames, however, has been limited to the United States, with minimal examples in Canada, owing to the lack of proper cell phone lists. In contrast to the U.S, survey samplers in Canada have had to mainly rely on random digit dialing to manually screen out unconnected numbers, with no easy method to pre-determine faulty dials, which can be an expensive process. Contacting individuals on cell phones has also proven to be challenging, because of the mobility of the device (i.e. not catching the respondent at a proper moment) and because of the ease of screening calls. Some surveyors have attempted to pre-warn potential contacts via text message; however, the effectiveness of the

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technique is unknown. In addition, cell phone lists do not have addresses attached, with phone numbers even with the expected area code not reliably being linked to households within the geographic area of interest.

This is particularly problematic for household-based travel surveys like the Transportation Tomorrow Survey (TTS). The TTS is the largest household travel survey in North America. Funded by the municipalities in the region and with support from the Ontario Ministry of Transportation, the TTS is conducted on 5% of the households in the Greater Golden Horseshoe (GGH) every 5 years. It has, to-date, utilized a landline-based (with associated address) sample frame since it was first conducted in 1986; however, the aforementioned demographic issues, and the need to update survey methodology with the rapid advancement of data collection technologies, led to the creation of a multi-year project (TTS 2.0) to revamp the TTS for 2021. A key pillar of this effort was changed in approach for improving respondent rates across various demographics and coverage of the overall frame. While the 2016 TTS modified its sample frame methodology to also include cell phone numbers (via random digit dialing), the effectiveness of reaching cell phone-only households via this method and the aforementioned issues when contacting via cell phone are still of concern.

## 2. Method

Because of these concerns with reaching households directly via traditional or even newer methods, an alternative approach of using an 'inverted sample frame' is formulated and presented in this paper. The approach is a callback, prior to the use of the landline sample, to an earlier method of recruiting individuals for household surveys via road-side interruption. In the 'inverted sample frame' method, individuals and households are recruited via their place of employment, institution or transportation-focused member organizations. The main driver of this approach is to deal with dropping enthusiasm from the public in answering surveys, particularly detailed ones, by delivering requests via employers which may hold more sway. Such a method could potentially be used as a supplement to a household-focused frame(s).

This approach is dependent on the ability to reach employees, students or members of companies or organizations via internal email lists, directing them to complete a web-version of the travel survey. As anti-spam laws forbid direct contact with an individual without prior communication, and it is highly unlikely that organizations would release their contact lists externally (either telephone or email), organizations willing to be a part of the sample frame need to contact their employees, students or members directly. In this situation, recruiting via email is the only method that would be feasible given time and monetary costs, as is the response method of the survey via the web. Whether the linked website collects contact information, basic demographics and home location for controlled sampling or if an oversampling method would be used with post-collection correction is open for future study for large-scale applications. For this initial feasibility test, uncontrolled sampling was used.

To explore the viability of the inverted sampling method, the paper will present a study of businesses, institutions and other organizations within the TTS study region. The study will aim to determine their willingness to distribute the TTS (both initial contacts and reminders) to their employees, students or members, and gather basic info on the individuals in their organizations (numbers and demographics where possible). Business lists will be acquired from available commercial sources (e.g. Info Canada), which compile complete lists, contacts and some basic info on businesses across Canada. Based on these results, the expected household coverage areas will be approximated via matching against O-D data from the most recent 2016 TTS.

This paper provides researchers with key insights into the viability of alternative approaches to recruiting households for the regional travel survey. It also aims to educate businesses on the TTS and provide survey researchers general data on the willingness of businesses to be involved in conducting government-backed travel surveys.

### **3. Initial Findings and Further Studies**

Initial results from the experiment with the inverted sample approach have been mixed. To date, a total of over 3000 businesses and organizations have been contacted, of which 370 agreed to participate in the study representing a 13% response rate. However, the number of employees who participated in the travel survey was low. Only 1.5% of the employees at the businesses or institutions who agreed to distribute responded to the travel survey. This indicates either businesses and institutions who initially indicated interest did not actually carry out the distribution or that the employees lacked the motivation to take part.

Follow up attempts were made to all businesses to collect feedback and information about the distribution rate in practice. Responses from the follow-up calls indicate that only half of the businesses and institutions who agreed to distribute the survey forwarded them to their employees. When asked why they did not distribute the survey, the majority of those who responded indicated that they were either busy, understaffed or uninterested. This reduces the real response rate from businesses and institutions to around 6%, indicating a low level of actual willingness and enthusiasm. This could be a result of low penetration of the initial contact e-mail and brochure meant to inform businesses of the upcoming test. When controlled for non-distributions, the response rate from employees increases to 15%, in line with typical response rates from web surveys.

One of the key characteristics of the inverted sampling method is the leveraging of the company and institutional mailing list to distribute surveys. This shifts the responsibility for distribution to the businesses and institutions, along with the burden for motivating individual respondents. These initial results show that it can be difficult to educate and convince unaffiliated businesses and institutions about the need and the importance of household travel surveys; as a result, they are not motivated and in-turn fail to motivate their employees. Combined with the limited options to incentivize businesses and institutions for a region-wide household survey, the inverted sample frame may be a challenging tool to use to improve sample coverage.

Given the initial findings from the first phase of the test, further experimentation using the inverted sampling method within a more controlled setting, such as government agencies, might provide more insight. Specifically, the response rate of employees can be examined in this isolated context, where the participation and commitment of their employer are taken out of the equation. This would provide direct evidence about the impact on response rate in situations where employers have provided additional motivation to their employees to take the survey. It would also allow for the opportunity to explore practical methods and identify best practices to increase employee participation, whether directly or indirectly through their employers. Work completed in this first phase will be used to inform this second test.

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