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Grade: A

Residents' Experiences and Reactions to the December 2013 Ice Storm

submitted to

GGR277

by

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In December 2013, a severe ice storm occurred in Southern Ontario, causing widespread damage to Toronto's urban forest with an estimated cost of \$106 million. Coupled with the recent interest in protecting and growing the urban forest for ecosystem service provision, it is essential to understand residents' perceptions of urban trees in order to create successful and efficient urban forest programs and policies, to mitigate damage from future disturbances. A written survey will be used to understand residents' perceptions of urban trees, future plans for tree management, levels of support for municipal actions that could reduce future tree damage, and collect household-level socioeconomic demographics. The written survey will be mailed to 400 randomly selected households in each of the five selected neighbourhoods in the Greater Toronto Area. Results from the survey will be compared with demographic information to examine whether demographics affect perceptions and support for urban tree management. Differing canopy cover, ice storm severity in neighbourhoods and limitations introduced by the study area criteria may affect the survey responses. Further study is recommended to address some of this study's uncertainties and limitations.

(183 words)

Introduction

Urban trees perform numerous ecosystem services, including stormwater management, air quality improvement, temperature regulation, and increased property values (Hostetler et al. 2013). Recently the importance of the urban forest has received increased recognition, leading to a greater push to grow and protect urban forests (Conway and Bang 2014). As a result, many municipalities have implemented urban forestry programs and tree protection legislation to increase canopy cover and protect pre-existing trees from removal (Conway and Bang 2014). Since the majority of urban trees are located on private property (McPherson 1998), residents play an important role in managing and shaping the urban forest.

The objectives of this study are to: (1) investigate the perceived benefits and risks associated with urban trees, (2) explore levels of residential support for municipal actions after damaging events, and (3) determine if the two aforementioned topics vary based on household-level socioeconomic factors. The study is set in five municipalities in the Greater Toronto Area (Ontario, Canada), in order to capture information from a variety of areas and demographic groups.

Literature Review

In addition to planting trees to grow the urban forest, it is also important to maintain tree health to prevent damage from lack of maintenance, pollution and natural disturbance events (Hostetler et al. 2013). The ice storm that occurred in December 2013 in Southern Ontario is an example of a natural disturbance event. According to Armenakis and Nirupama (2014), the storm left a 30 mm layer of ice accretion on all surfaces, causing major damage to the urban forest, as well as a power outage for over a million customers in Southern Ontario lasting for more than three days.

While the benefits of urban trees have become widely known to the point where almost all residents are aware of their positive effects (Conway and Bang 2014; Hostetler et al. 2013). However few articles discuss possible disservices (Lyytimaki et al. 2008), and there has been relatively less research on the perception of risks associated with urban trees and residential support for municipal actions regarding damage mitigation. Determining which demographic groups are more likely to support municipal actions or dislike a certain aspect of tree ownership will help inform future urban forest management policies, especially given the volume of urban forest on residential properties (McPherson 1998).

Design and Methods

Through a written survey with homeowners in neighbourhoods in the Greater Toronto Area (GTA), I will examine residents' attitudes towards urban trees and their support for actions that the city should take in order to mitigate damage from future ice storms, after they have experienced a major ice storm and the consequent damages and maintenance that follows. Five neighbourhoods across the GTA will be examined to gain a sense of the variety of opinions and experiences (Figure 1). All of these neighbourhoods have high canopy cover and represent residents that experience not only the most benefits, but also the most disservices from the urban forest.

The study area was determined by overlaying household types and canopy covers over Brampton, Mississauga, Etobicoke, North York and Scarborough. Specific census tracts were identified where greater than 80% of homes were single-family homes and also had canopy cover levels that fell into the municipality's top quartile. This represents the areas that have the highest likelihood of households with a private yard containing sizeable canopy cover. From

there, potential census tracts that had minimal public land and the most even distribution of canopy cover were chosen as the five study neighbourhoods.

Previous studies (Conway and Bang 2014) with a similar focus on examining resident perceptions of urban trees have used surveys to gather data. Surveys allow the researcher to access numerous potential participants at once, and obtain a large sample population. Surveys will include a few closed questions regarding the current state of the homeowner's trees and demographics (for context), then will provide a series of open-ended, qualitative questions about tree benefits and risks, tree maintenance and removal scenarios, and questions about their support for municipal tree management actions (see Appendix A). The tree maintenance and removal scenarios were chosen because they allow the participant to express and explain their decision making process. Respondents will be able to give Likert-scale answers to express their support for municipal actions, resulting in pre-coded responses in categories for easier analysis.

Surveys will be sent to 400 randomly selected households in each census tract. For recruitment, a letter of invitation will be sent to all potential respondents detailing the research project in January 2018. Written surveys will be sent approximately a week after the invitation letter. All surveys will be given a unique ID to provide anonymity and to help track responses. Completed surveys will be entered into a dataset, and then checked to eliminate error.

Grounded theory will be used to analyse the data. Participant responses will be coded using NVIVO software to identify key themes related to residents' perceptions of urban tree benefits and risks and future tree management plans. Responses to questions associated with (1) the most important benefits and risks and (2) future tree management (3) support for municipal actions will be compared with the socio-economic demographic variables in order to determine if

respondents belonging to a certain demographic group were more likely to choose specific benefits or risks or have a certain level of support for municipal action.

Positionality

In terms of my positionality in relation to my research, I may be considered an insider since I live in the GTA, and was present during the December 2013 ice storm, and experienced negative effects of the storm. I may also be considered an outsider because I am not a homeowner, do not reside in a single-family, detached home, and do not have to manage the trees in the back or front yard. Although my identity as a young, Asian female researcher might affect how people engage with me in face-to-face research, because I am not interacting with people in person, I do not anticipate that these aspects of my identity will affect the research. On the other hand, the surveys will be sent on University of Toronto stationary which could lead to people taking the survey more seriously than if it was sent in a plain envelope. Finally, I realize that my knowledge of this topic might lead me to write questions and scenarios that include too much academic jargon for the average respondent. To address this concern, I will ensure that the questions in the study are easy to understand and accessible to those who are not as well-versed in the field of urban forestry by asking other peers to edit and complete samples of the survey.

Ethical Considerations

Out of the three core principles of ethics in social research, respect for persons is the most relevant principle for my proposed research project. Informed, ongoing consent is the most important concern that I will be addressing. I will ensure that all potential respondents are fully aware of the goals and the information they will be providing before they agree to participate in the study. The initial invitation letter will provide a summary of the research, as well as the investigator and include contact information so that I can be accessible, and able to answer any

questions that residents have. Any participants that wish to withdraw can do so at any time, and all electronic and physical copies of their personal information and responses will be destroyed. Furthermore, the participants' personal information will only be used for correspondence purposes; past the data entry stage, each respondent will be given a unique numerical code that will be used in any references to a specific resident. Finally, all physical and electronic data containing personal information will be kept in a room with limited card access, and destroyed 5 years after the research has been completed.

The questions that I plan to ask in my survey will not cover any sensitive topics, so concern for welfare and justice should not be an issue in my project. If there are any questions that touch on a sensitive topic, or one that the resident prefers not to answer (i.e. a demographic question), they may skip the question.

Limitations

Any significant relationships that may be found between household socio-demographics and survey responses may not be indicative of meaningful relationships, as some demographic groups may be small and thus overrepresented in the analysis. Therefore it is unclear whether these are significant patterns or the result of several individual's opinions. As well, the criteria for selecting study area may have skewed the respondent demographics, since residents that live in detached homes in neighbourhoods with high canopy cover are likely to be wealthier than the average resident in the municipality.

As these surveys are done remotely, it is possible that there will be a low response rate and therefore the results may not be representative of the target population of homeowners in the GTA. Since I chose to send written surveys, I will not be able to obtain any additional information outside of the survey responses; follow-up questions and more in-depth

investigations are not possible. Finally, the responses that we receive in the survey only represent the opinions of those who are willing to participate in this study. This is of particular concern as it relates to those who do not feel they have the time to complete the study which might reflect on the time they have available to manage their urban forests. Some of these limitations may be addressed by sending a second mailing of surveys to increase the response rate, and planning a follow-up project which includes a more interactive research method (i.e. interviews) to gather more information that may not have been given in the survey.

References

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Appendix A: Sample Survey

Please answer the following questions. All responses will be kept confidential and anonymous.

The person in the household responsible for managing the trees should complete this survey, if possible.

1. List **three benefits** associated with urban trees that you consider to be most important (i.e. shade), and explain why.

2. List **three risks** associated with urban trees that you consider to be most important (i.e. falling limbs), and explain why.

3. If a storm caused damage to **majority** of the trees on your property and the affected trees were either **killed**, or **require extensive pruning**, (a) how would you choose to manage your trees after the event **to reduce future damage** (i.e. prune, remove and/or replace)? (b) Would you perform the maintenance by yourself, or hire professionals? Why?

4. If a storm caused damage to a **few** trees on your property and the affected trees only suffered **minor damage**, (a) how would you choose to manage your trees after the event **to reduce future damage** (i.e. prune, remove and/or replace)? (b) Would you perform the maintenance by yourself, or hire professionals? Why?

5. Please indicate your level of support for the tree management scenarios below.

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
The municipality should plant fewer or smaller street trees to reduce future damage.					
The municipality should continue with their current tree management plan; no changes are necessary.					
The municipality should plant more trees, regardless of future damage.					

Please provide the following demographic information:

1. What is your age? _____
2. What is your gender? _____
3. How long have you lived at your current address?
___ 0-5 years
___ 5-10 years
___ 10-20 years
___ 20+ years
4. Where is your place of birth?
___ Greater Toronto Area
___ Ontario, but not the Greater Toronto Area
___ Canada, but not Ontario
___ Outside of Canada, if so, where? _____
5. What is your annual household income?
___ \$0 to \$25 000
___ \$25 000 to \$50 000
___ \$50 000 to \$75 000
___ \$75 000 to \$100 000
___ \$100 000+

Thank you for completing the survey!
Please mail the completed survey to the provided address using the prepaid envelope.
If you have any questions, please email viv.yip@mail.utoronto.ca.