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A Toolkit for Affordability Driven Home Energy Efficiency Retrofits Through Local Improvement Charge Programs

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Candidate and Demographics Analysis and Recommendations

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Introduction

This document is part of a series of documents produced as part of Volta Research's CMHC funded "A Toolkit for Affordability Driven Home Energy Efficiency Retrofits Through Local Improvement Charge Programs" project, which aims to inform the way that municipalities and other entities define and create their single-family home energy efficiency LIC/PACE programs.

This document overviews identifying candidates for a proposed affordability-focused LIC demonstration project. The methodology and results presented in this document act as a case study and can be used in future LIC/PACE pilot programs to identify target demographics or potential pilot or program candidates. An extensive literature review on local improvement charge (LIC) and property-assessed clean energy (PACE) style energy efficiency programs in North America identified specific demographic characteristics as a challenge or barrier and motivation to participate in LIC/PACE programs. Data for these characteristics were analyzed for Toronto's Home Energy Loan Program (HELP) participants, along with Statistics Canada census profiles for HELP forward sortation areas (FSAs) and the Greater Toronto Area (GTA). This data was used to identify demographics and communities less likely to participate in LIC/PACE programs to target them for participation in the proposed demonstration. Recommendations were made to engage the proposed demonstration candidates based on findings from the literature review.

Challenges, Barriers, and Motivations to Program Participation

The findings of an extensive review of academic and grey literature concerning LIC/PACE programs in North America revealed the following challenges, barriers, and motivations as they relate to program participation:

Challenges & Barriers

- Demographics, including income, age, gender, household size, education level, and language, can influence the participation rate in energy efficiency programs (Brown et al., 2020; Chen et al., 2017; Das et al., 2018; Gamtessa, 2013; Sovacool et al., 2017). The following household characteristics were found to result in a lower likelihood of a retrofit investment or technology adoption (Brown et al., 2020; Gamtessa, 2013; Sovacool et al., 2017):
    - large household size
    - High-income households (as energy costs may comprise a smaller share of their monthly expenses)
    - Less than high school-level education
    - non-English speakers
    - age (some seniors have an 'unlimited access' mindset about energy use) (Doris, 2020)
- Lack of awareness and accessibility to program information, including feasibility and costs of the program, existing subsidies, regulations, and policies, may dissuade potential applicants and hinder program uptake (Adachi, 2009; Bell et al., 2011; Andrews & Poe, 2019). Asymmetric information, "poor marketing," and ineffective outreach

strategies can also hinder program participation rates (Brown et al., 2020; Cipriani et al., 2020; Gillingham et al., 2009; Ross et al., 2016).
- Getting the attention of, gaining access to customers, and having the opportunity to explain the program is a crucial challenge, and it can be more pronounced for low-to-medium income (LMI) customers, who can be even more challenging to reach due to language barriers, limited internet access, and limited established communication channels between programs administrators and LMI (Heeter et al., 2018)

Motivations

- Financial incentives, whether rebates or energy bill savings, play a key role in motivating program participation (Gamtessa, 2013; Parker et al., 2005; Gilleo et al., 2017; Perera et al., 2017)
- Social variables, including internal values and perceptions, sustainability concerns, and environmental attitudes, can influence people and motivate them to participate in energy efficiency projects (Adachi, 2009; Chen et al., 2017).
- As noted above, demographics such as age, gender, income, knowledge and experience, and social context can affect personal energy decision-making – those engaging in energy efficiency retrofits tend to be older and wealthier. In contrast, retrofits focused on improving indoor comfort are more common among elderly populations and parents of young children (Scott et al., 2000; Ferguson, 1993; Schwarz and Taylor, 1995). Knowledge and experience, or energy literacy, are also positively correlated with participation in energy efficiency programs, particularly among low-income households (Hernandez and Bird, 2010).
- Community-based groups can play an essential role in the promotion and outreach of energy efficiency programs and can help improve participation (Adachi, 2009; Andrews & Poe, 2019; Bell et al., 2011; Sanchez et al., 2018).
- Awareness of energy efficiency programs, their incentives, and benefits (through campaigns, social networks, and locally trusted sources) can encourage consumers to make initial contact and participate in the program (Craig, 2016; Gillingham & Bollinger, 2017; O'Dwyer, 2013; Stern et al., 1986).

Methodology for Data Analysis

The following steps were taken to analyze candidates and demographics for the proposed demonstration. These steps could also be replicated for future pilots or programs.
1. The Project Team undertook an extensive literature review of LIC/PACE programs in North America (see "A Review of LIC and PACE Programs in Canada," Volta Research, 2022). The review included academic sources, grey literature, and municipal program documentation. The literature review overviews existing LIC/PACE programs in Canada, challenges and barriers experienced by similar programs in North America, participants' motivations, lessons learned and promising strategies to improve programs and increase participation, and recommendations for future programs.
2. Data from the Toronto Home Energy Loan Program for 2018 through 2021 was provided to the Project Team by the HELP Project Lead and supplemented with data pulled via

the [Home Energy Loan Program LIC Disclosure](#)[1]. Information for the LIC Disclosures was used to compile a list of property addresses for HELP participants and identify postal codes.

3. HELP participants' forward sortation areas (FSAs) were used to identify which participants fell into areas considered to be experiencing energy poverty. The Project Team used [energypoverty.ca's](#) mapping tool based on Statistics Canada demographic data. It measures energy cost burdens alongside drivers and characteristics such as housing age, type, condition and affordability, and household income levels to identify home energy burden levels in census divisions, subdivisions, and tracts across Canada.

4. The percentage of populations experiencing a high home energy cost burden was identified for each HELP FSA. A high energy cost burden is defined as more than 6% of after-tax household income allocated to home energy services (Canadian Urban Sustainability Practitioners, 2019). Households reaching this threshold or higher are said to be experiencing energy poverty.

5. Statistics Canada census profiles were then pulled for all Toronto FSAs. A separate list of FSA's for HELP program participants was also compiled. The data was sorted using Python code and exported into a CSV file for analysis.

6. The literature review findings were used to identify characteristics relevant to analyzing existing and potential program candidates. A comparison of these characteristics between HELP participants and the broader GTA population was conducted.

7. The Project Team focused on several census profile characteristics that, based on the findings of the literature, have been found to impact participation in energy efficiency-focused LIC/PACE programs:
   a. Age
   b. Dwelling-type
   c. Language
   d. Income-level
   e. Low-income / energy poverty status
   f. Tenure type (owner vs. renter)
   g. Education-level
   h. Activity in the labour force

Analysis of Findings

Using the postal code data from Toronto's Home Energy Loan Program LIC Disclosure[2], a list of FSAs was compiled for all completed HELP projects. These FSAs were entered into CUSP's Energy Poverty and Equity Explorer Mapping Tool[3]. While the available HELP LIC disclosure data does not include all HELP participants to date (the list is updated to December 9, 2020),

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[1] By-laws 1105-2013 and 1330-2013 require any LIC associated with a private residential property be publicly disclosed. All properties with a HELP LIC are listed on this website. Each address has an associated by-law which lists the site address, lot, property owners, cost of work, funding amount interest charge, admin charge, special charge (including amount owning), when the special charge is to be paid, the lifetime of the work, and the annual payment.

[2] https://www.toronto.ca/services-payments/water-environment/environmental-grants-incentives/home-energy-loan-program-help/special-charges/

[3] https://energypoverty.ca/mappingtool/

the data does show that most projects on record have been implemented in FSA's where 20% or more of the population experience high energy cost burdens (Figure 1).
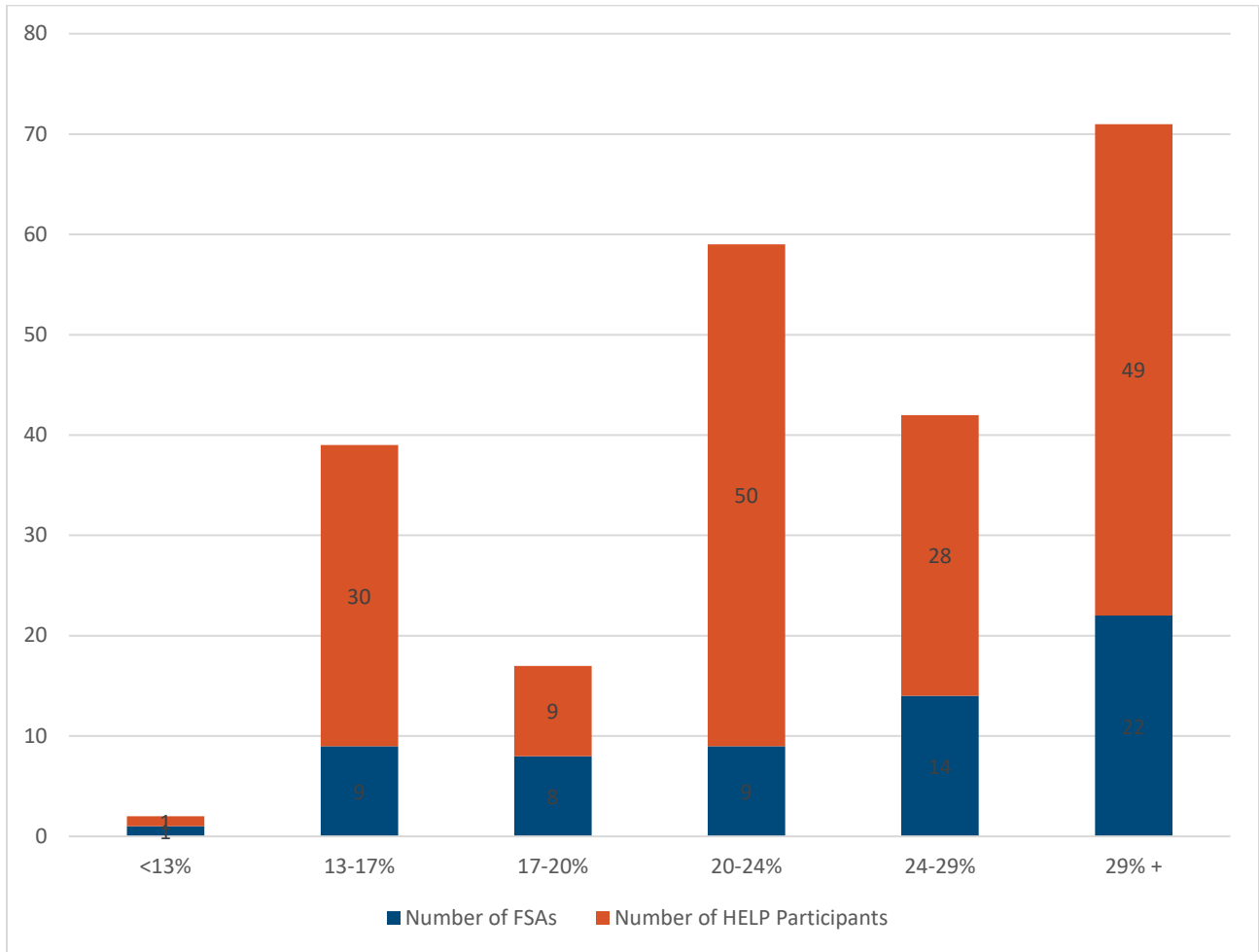

Figure 1 - Toronto HELP Participant FSAS Experiencing High Energy Cost Burdens

Households with high energy cost burdens are said to be experiencing energy poverty (Canadian Urban Sustainability Practitioners, 2019). Other indicators of energy poverty, as they relate to this project, can include (Canadian Urban Sustainability Practitioners, 2019):
   - Lack of thermal comfort,
   - Lack of ability to improve the energy performance of a home,
   - Experiencing utility disconnections or arrears, and
   - High home energy cost burdens.

High home energy cost burdens can occur among both owners (22.4%) and renters (16.1%) and both low-income and non-low-income households (Canadian Urban Sustainability Practitioners, 2019). Those living in homes built before 1960 are also more likely to be experiencing high energy cost burdens or energy poverty (Canadian Urban Sustainability Practitioners, 2019).

For the following analysis, the project team focused on the HELP FSAs where 29%+ of the population experiences high energy burdens, comparing the characteristics identified in Step 7 of the methodology to those of the greater Toronto area

Using the Statistics Canada Census Profiles for the high energy burden HELP FSAs and FSAs for the greater Toronto area, the Project Team noted the following differences when comparing the following characteristics:

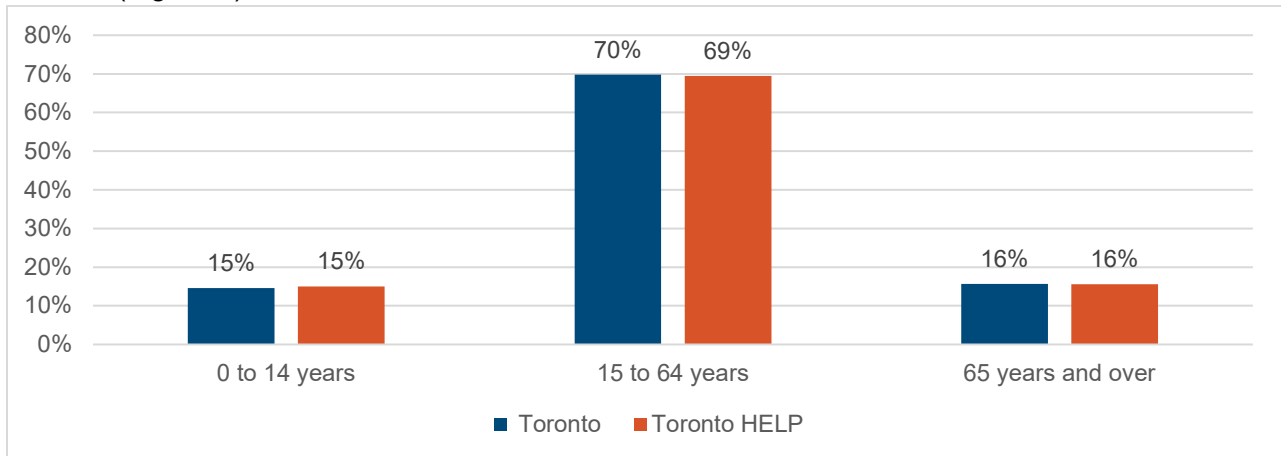Age: The population composition by age is similar in higher energy burden FSA's and greater Toronto (Figure 2).

Figure 2 - Population by Age

Dwelling-type: Dwelling types in the HELP FSAs compared to the GTA are similar, with a slightly higher prevalence of single-detached houses, row houses, and apartments/flats in a duplex (Figure 3).
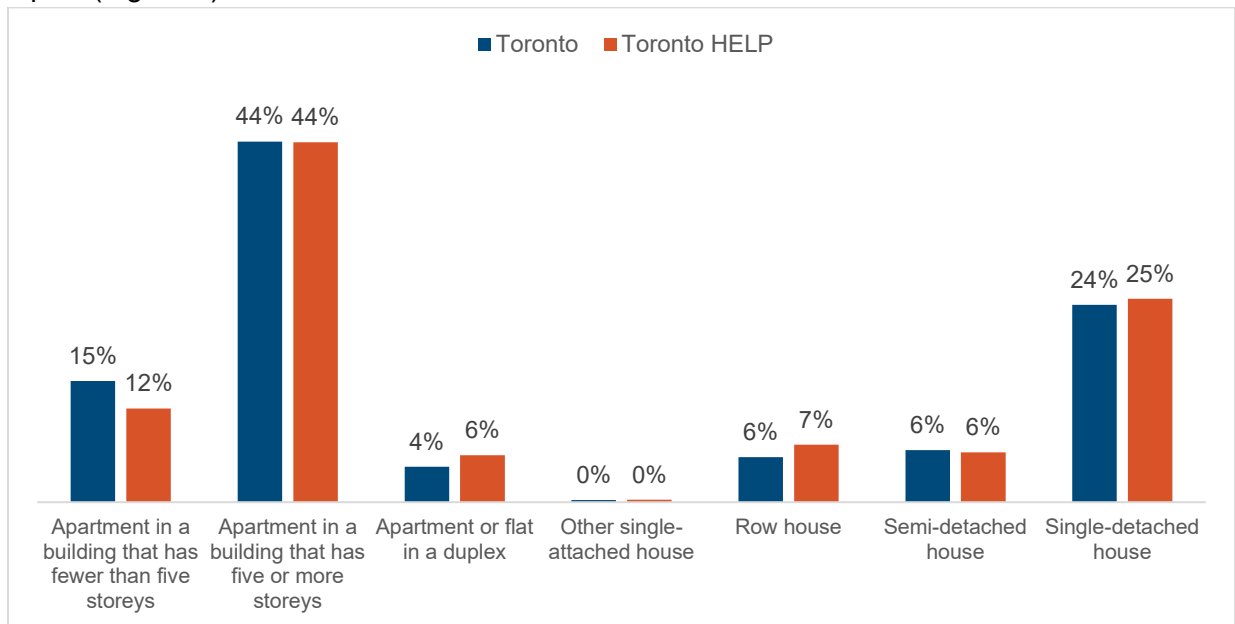

Figure 3 – Toronto and HELP FSA Dwelling Types

Language: Languages other than English are far more prevalent in HELP's high energy burden FSAs than in the GTA (Figure 4). The five most prevalent languages besides English are Cantonese, Mandarin, Tagalog, Tamil, and Portuguese (Figure 5).
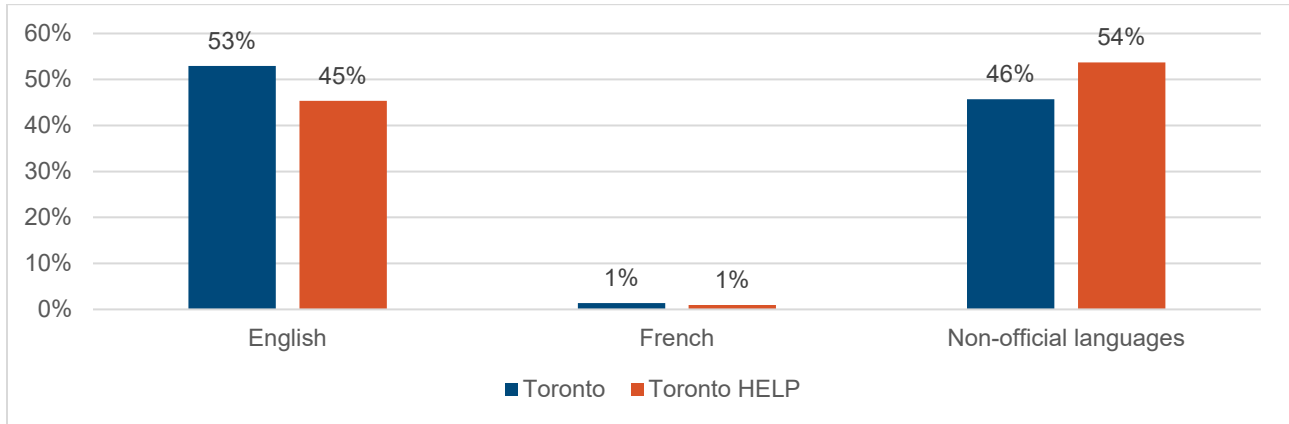

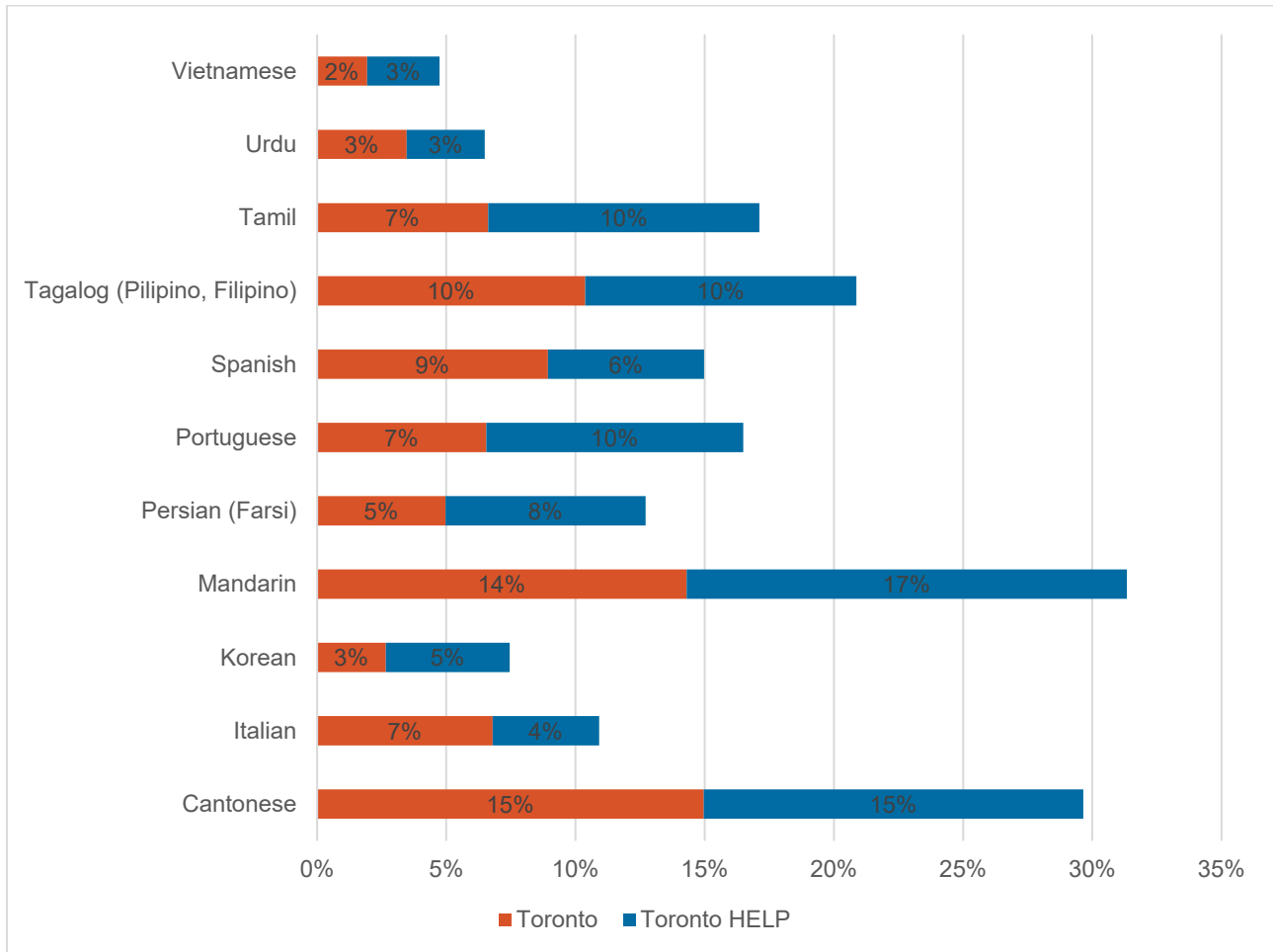*Figure 4 - Languages Spoken, Official vs non-Official*

Figure 5 - Mother Tongue Spoken

Income-level and low-income / energy poverty status: The HELP FSA's have significantly lower average total household incomes compared to the GTA (Figure 6) and a higher prevalence of low-income households (Figure 7).
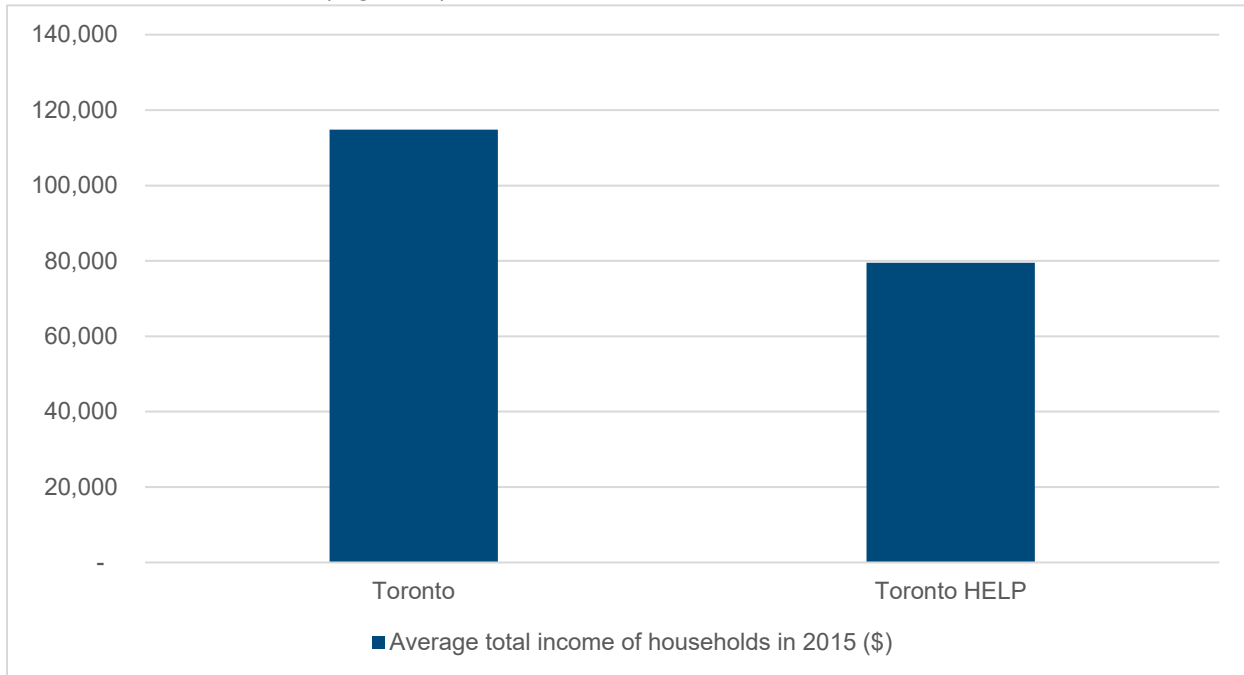

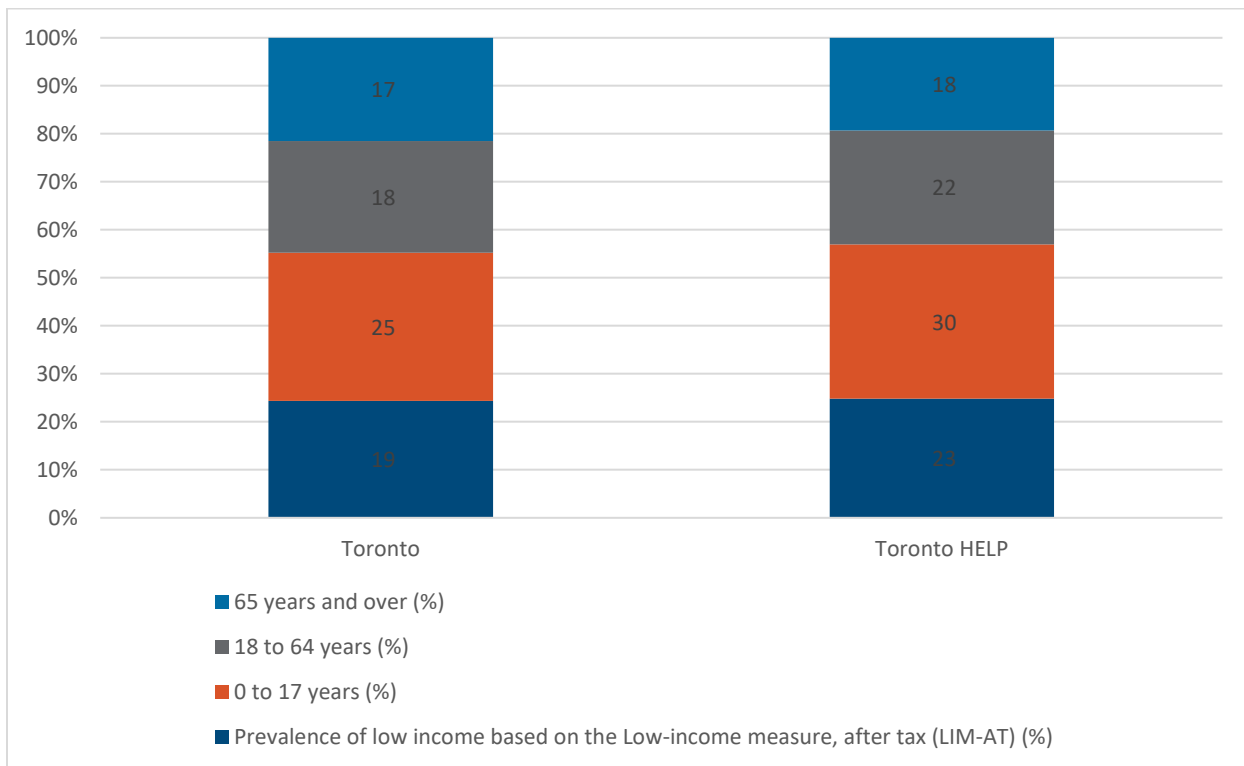*Figure 6 – Toronto & HELP High Energy Burden FSAs, Average Total Income of Households*

Figure 7 - Toronto & HELP High Energy Burden FSAs, Prevalence of Low Income Based on the Low-income measure, after-tax (LIM-AT) (%)

<u>Tenure type (owner vs. renter):</u> Ownership is slightly more prevalent than renters in the HELP FSAs (Figure 8).
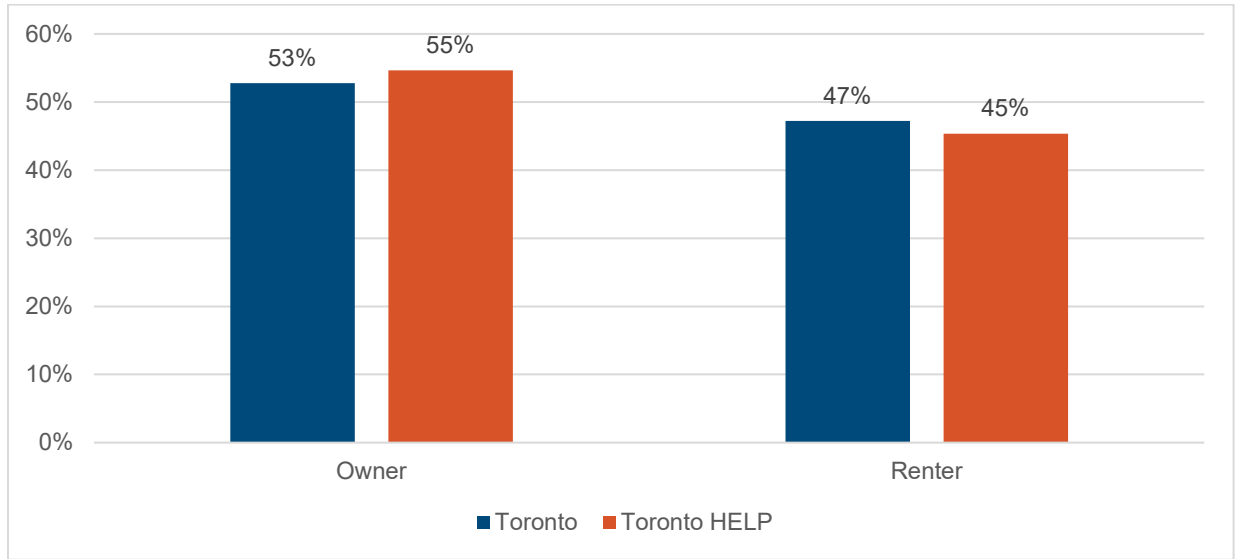
Figure 8 - Private Households by Tenure

<u>Education level:</u> Regarding education, FSAs with higher energy burden's have a slightly lower prevalence of post-secondary certificates, diplomas, or degrees (Figure 9).

Figure 9 - Level of Education for Labour Force

<u>Activity in the labour force:</u> There is a slightly higher prevalence (39% vs 35%) of the eligible population not in the labour force in the HELP FSAs experiencing higher energy burdens (Figure 10).

Figure 10 - Population aged 15 years and over by Labour force

Recommendations
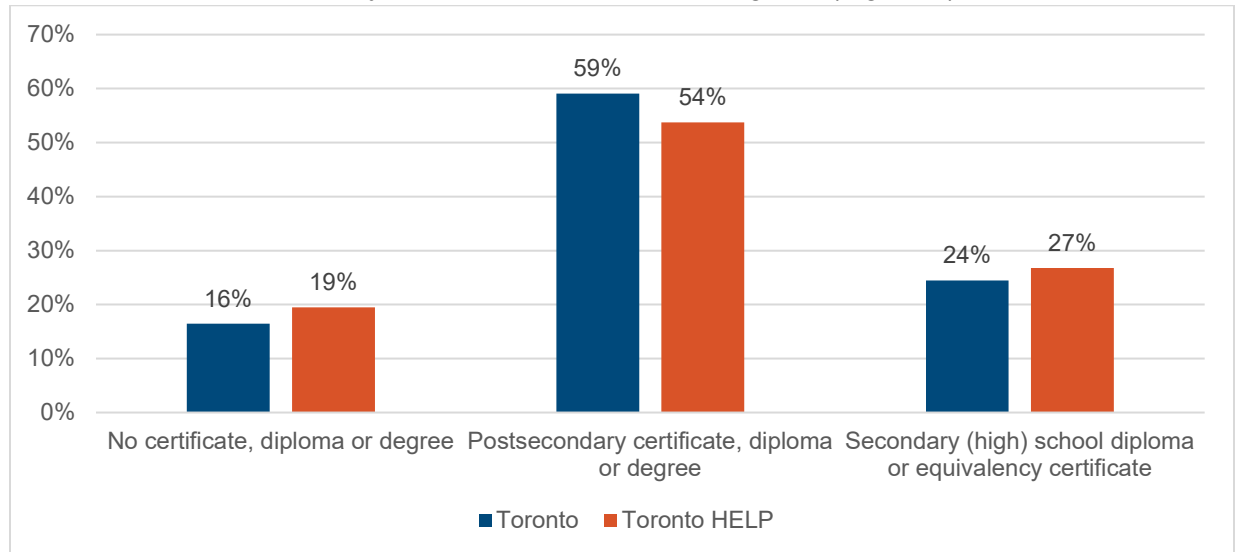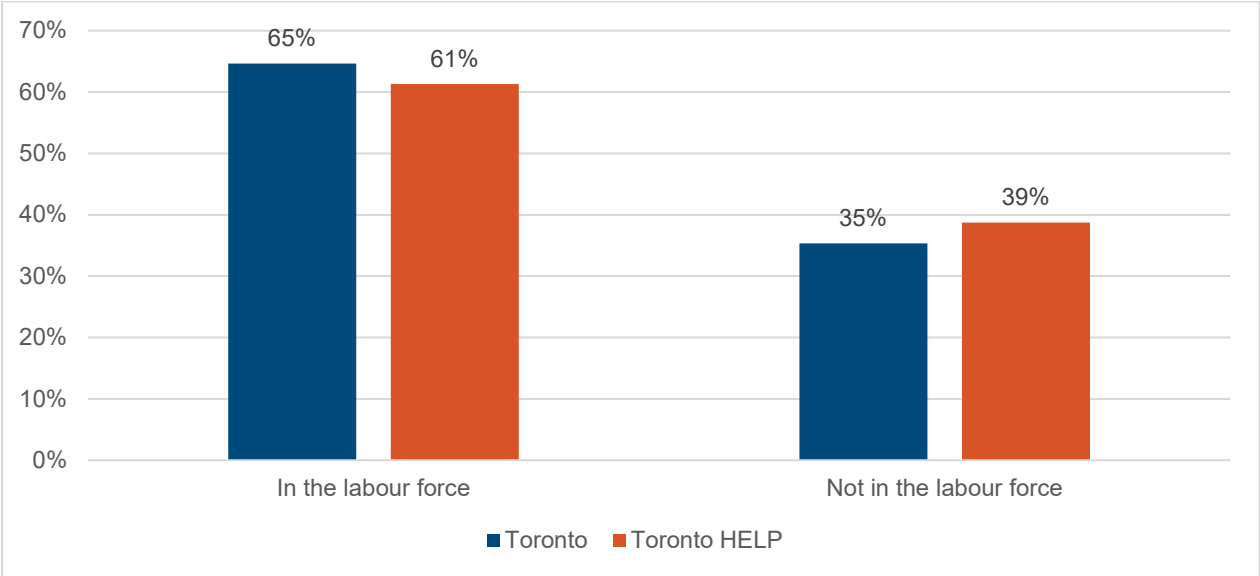
The following recommendations are based on the findings of both an extensive review of academic and grey literature concerning LIC/PACE programs in North America and an analysis of Statistics Canada census profile data for HELP participants and GTA FSAs:

- Consideration of socio-demographic variables when designing programs as these factors can motivate or hinder participation, especially amongst low-income households and seniors, in energy efficiency programs (Chen et al., 2017; Gamtessa, 2013; Parker et al., 2005). Many current HELP participants live in FSAs, where more than 29% of the population is experiencing high energy burdens and energy poverty and has a significantly lower household income than the GTA. These communities should be targeted for participation in demonstrations or pilots as they may receive more co-benefits than those in more affluent neighbourhoods.

- Marketing widely affects the programs' success. Specific marketing channels may be necessary to target specific audiences because certain audiences may have particular needs that will need to be addressed in information materials and marketing campaigns - recognizing the target audience's unique needs and challenges and designing a marketing program accordingly is essential for increased success (Dunsky Energy Consulting, 2013). Policymakers and program administrators must consider participants' education and background and expand information to facilitate participation among vulnerable people in these programs (Cluett et al., 2016; Craig, 2016). For example, consumers from vulnerable groups, including low-income families, those with lower education levels or no formal qualifications, and those who lived with someone who had a long-term health condition and disability, are likely to need more help to know how to access and proceed their application or use the new technologies (Sovacool et al., 2017). This could entail technical experts providing educational components to include in marketing campaigns (Cluett et al., 2016; Craig, 2016). The data analysis for HELP participants FSAs found that a significant portion is in neighbourhoods with high energy burdens and have lower than the GTA average annual incomes. These FSAs also have a higher proportion of households speaking languages other than English. Targeted marketing and educational materials to address energy literacy are recommended.

- Engaging and training community groups or champions can help ease communication between program administrators and potential applicants. Programs with promoters or champions who also participate in these programs (e.g., solar ambassadors who install solar panels through the solarize program) are more successful at persuading people to participate as actions are more influential and credible than words alone (Kraft-Todd et al., 2018). It is recommended that program administrators work with these groups to develop marketing and educational materials to both promote the LIC/PACE programs and address energy literacy within the communities.

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