HHS Public Access

Author manuscript

Circulation. Author manuscript; available in PMC 2018 March 21.

Published in final edited form as:

Circulation. 2017 March 21; 135(12): 1104–1119. doi:10.1161/CIRCULATIONAHA.116.025349.

Ranking businesses and municipal locations by spatiotemporal cardiac arrest risk to guide public defibrillator placement

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Abstract

Background—Efforts to guide automated external defibrillator (AED) placement for out-of-hospital cardiac arrest (OHCA) treatment have focused on identifying broadly defined location categories without considering hours of operation. Broad location categories may be composed of many businesses with varying accessibility. Identifying specific locations for AED deployment incorporating operating hours and time of OHCA occurrence may improve AED accessibility. We aim to identify specific businesses and municipal locations that maximize OHCA coverage based on spatiotemporal assessment of OHCA risk in the immediate vicinity of franchise locations.

Methods—This study was a retrospective population-based cohort study using data from the Toronto Regional RescuNET Epistry cardiac arrest database. We identified all non-traumatic public OHCAs occurring in Toronto, Canada from Jan. 2007–Dec. 2015. We identified 41 unique businesses and municipal location types with 20 or more locations in Toronto from the YellowPages, Canadian Franchise Association, and the City of Toronto Open Data Portal. We obtained their geographic coordinates and hours of operation from websites, phone, or in-person. We determined the number of OHCAs that occurred within 100 m of each location when it was open (*spatiotemporal coverage*) for Toronto overall and downtown. The businesses and municipal locations were then ranked by spatiotemporal OHCA coverage. To evaluate temporal stability of the rankings, we calculated intra-class correlation (ICC) of the annual coverage values.

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Conflict of Interest Disclosures

Dr. Brooks has reported receiving a CIHR grant to study PulsePoint, which is a mobile device application to crowdsource basic life support, including public access defibrillation, for victims of OHCA. Dr. Morrison has reported having peer reviewed grant funding for cardiac arrest research from the National Institute of Health, Canadian Institute of Health Research, Heart and Stroke Foundation of Canada and I receive salary support from the Robert and Dorothy Pitts endowed chair in Emergency Medicine and Acute Care at Li Ka Shing Knowledge Institute, St Michael's Hospital, University of Toronto. Prof. Chan has reported receiving a grant from the ZOLL Foundation.

Results—There were 2,654 non-traumatic public OHCAs. Tim Hortons ranked first in Toronto covering 286 OHCAs. Starbucks ranked first in downtown covering 110 OHCAs. Coffee shops and bank machines from the five largest Canadian banks occupied eight of the top 10 spots in both Toronto and downtown. The rankings exhibited high temporal stability with ICC values of 0.88 (95% CI, 0.83–0.93) in Toronto and 0.79 (95% CI, 0.71–0.86) in downtown.

Conclusions—We identified and ranked businesses and municipal locations by spatiotemporal OHCA risk in their immediate vicinity. This approach may help policy makers and funders to identify and prioritize potential partnerships for AED deployment in public access defibrillator programs.

Keywords

Cardiac arrest; Automated external defibrillator; Resuscitation

Subject Terms

Cardiopulmonary Resuscitation and Emergency Cardiac Care; Cardiopulmonary Arrest

Introduction

Use of automated external defibrillators (AEDs) has been shown to increase survival after sudden cardiac arrest by reducing the delay to treatment and allowing for rapid defibrillation.[1–5] As such, AEDs are disseminated through public access defibrillation (PAD) programs to encourage bystander response in communities worldwide.[6, 7] However, even with the increasing effort and resources devoted to these programs, bystander AED use remains low.[8–10] This is a prominent health concern as out-of-hospital cardiac arrest (OHCA) is associated with a less than ten percent survival rate and about 400 000 deaths in North America alone.[11, 12]

Efforts to improve AED use have initially focused on identifying locations with high spatial OHCA risk, such as office buildings or shopping malls, for targeted AED placement.[13–19] The use of spatial OHCA risk has led to the development of optimization models which demonstrate that locations for AED placement can be prioritized to efficiently target OHCA hotspots.[20] However, temporal availability of AEDs was not considered in these studies and is rarely considered when deciding where to place the AEDs. Previous work done by our group and others has demonstrated that AEDs placed in locations that are not accessible 24 hours a day significantly reduce the potential usefulness of AEDs.[21, 22] Optimizing AED locations with knowledge of temporal availability could mitigate the loss of coverage associated with building hours of operation.[22]

We hypothesized that the next step to improve AED placement in existing PAD programs is to examine the potential impact of a strategy that entails partnership with franchise businesses for broad deployment of AEDs. Developing partnerships with franchise businesses can be extremely beneficial to PAD programs as they may provide financial support to purchase and distribute the AEDs as well as improve awareness of AED locations through marketing campaigns connected with their brand.

The goal of this study is to determine and rank order the spatiotemporal OHCA risk in the immediate vicinity of specific businesses and municipal locations in Toronto, Canada for the purpose of evaluating AED deployment potential to support the development of private-public PAD partnerships. This study extends previous research that focused only on spatial OHCA risk in broad location categories, by examining both spatial and temporal OHCA risk, as well as more granular location types including individual businesses and municipal locations. Using these rankings, policy makers and funders can identify the best organizations to seek partnership with to maximize OHCA coverage of AEDs placed in their locations. We hypothesized that certain franchise businesses would be more advantageous than others for this purpose because of their locations and opening hours in relation to actual spatiotemporal cardiac arrest risk.

Methods

Study Design and Setting

This was a retrospective population-based cohort study using data from the Toronto Regional RescuNET cardiac arrest database, Rescu Epistry, which is compliant with the Resuscitation Outcomes Consortium (ROC) Epistry-Cardiac Arrest database and the Strategies for Post Arrest Care database; the methodologies of these two databases are described elsewhere.[23, 24] Approval for this study was obtained from the St. Michael's Hospital Research Ethics Board and no informed consent for participants was required.

We included all non-traumatic, public-location OHCA episodes that occurred in Toronto from January 2007 – December 2015. Public locations included airports, heliports, construction sites, office buildings, medical offices, industrial sites, mining sites, railways, streets, hotels, restaurants, bars, casinos, shopping malls, single stores, strip malls, schools, recreation facilities, sports fields, parks, stadiums, golf courses, and dockyards, and excluded hospitals and nursing homes. Geographical data for the location of each OHCA episode, namely street address and latitude-longitude coordinates, were converted to the Universal Transverse Mercator (UTM) format.

A list of registered AEDs, as of March 2015, was obtained from Toronto Paramedic Services. The data set contains 912 publicly and privately owned AEDs that are registered with the owner's consent, located in 737 unique addresses. AED registration is voluntary in Toronto. For each AED, the address, location type, and hours of operations were detailed.

Data Collection for businesses and municipal locations

The businesses and municipal locations included in this study were identified from the Canadian Franchise Association (CFA), YellowPages and the City of Toronto's Open Data Portal.[25–27] The CFA is the Canadian franchise industry's sole recognized national trade association. It produces an annual franchise directory with up-to-date information on current franchisees, including the number of locations in Canada, USA, and internationally. YellowPages provides a comprehensive directory of restaurants, shops, and services in major cities worldwide. Listings are obtained through phone companies and are verified by a YellowPages data quality team. The Toronto Open Data Portal is part of Toronto's Open

Data initiative to make data available for any public use such as research, website and mobile app development, and data visualization. The Open Data Portal is maintained by the City of Toronto and contains the address, phone number, facility name, and facility type for municipally operated services in categorized datasets. Information on the portal is collected and maintained by municipal staff.

All franchises in the CFA directory with more than 20 locations in Toronto were included. Similarly, all stores or businesses listed in YellowPages with more than 20 locations in Toronto were included. Finally, all datasets in the Toronto Open Data Portal in the "business", "locations and mapping", and "parks and recreation" categories with 20 or more entries were included. Next, we gathered the addresses of each location from either YellowPages, Google, or via the official company website. Each address was then converted to UTM format and plotted using a geographic information system (QGIS - v2.4.0, Open Source Geospatial Foundation, Beaverton, OR) to ensure the locations were inside the Toronto boundaries. In total, we identified 41 businesses and municipal locations, totaling 4,949 individual facilities (see Supplemental Table 1 for a summary of the included businesses and municipal locations). Businesses that were typically only accessible through a larger building, such as restaurant chains found exclusively in shopping mall food courts, were excluded from the study. We categorized and examined the businesses and municipal locations for both downtown Toronto, as defined by the City of Toronto[28], and Toronto as a whole.

We gathered the hours of operation of each facility through online resources, by phone, or in-person visits. Hours of operation could not be confirmed for 91 of the 223 Separate Schools (i.e. religious schools) and 453 of the 952 Automated Teller Machines (ATMs) included in this study. For these location types, we assumed hours of operation based on collected/known hours of operations for facilities in the same location type. The assumed hours used were 8:00am – 5:00pm for Separate Schools and 8:00am – 11:00pm for in-branch ATMs. We conducted sensitivity analyses (Supplemental Material Section 1.2, Supplemental Tables 2 – 7) to examine the impact of the assumed hours on OHCA coverage.

Analysis

Analysis 1: Ranking businesses and municipal locations by spatiotemporal OHCA coverage—For each of the 41 businesses and municipal locations, we calculated the following data elements using all public non-traumatic OHCAs: the total number of their facilities; the total number of OHCAs that occurred within 100m of any of their facilities (*"assumed 24/7 coverage"*); the total number of OHCAs that occurred within 100m of their facilities and when the respective facility was open based on its hours of operations (*"actual coverage"*); the *assumed 24/7 coverage* minus *actual coverage* all divided by *assumed 24/7 coverage* (*"coverage loss"*), the *actual coverage* divided by the *number of facilities* (*"coverage efficiency"*). Cardiac arrest coverage was calculated independently for each of the 41 businesses and municipal locations. Therefore if an OHCA was covered by two different businesses, it was counted as a covered OHCA for both businesses. The 100m coverage radius (109.4 yards) was based on American Heart Association recommendations and a three minute response goal.[7, 29, 30]

We repeated the coverage analysis using only OHCAs that were not already covered by the existing registered AEDs in Toronto. In other words, all OHCAs that occurred within 100m of a registered AED while the AED was available, based on hours of operation of the buildings housing the AED, were excluded from this analysis.

Analysis 2: Temporal stability of the businesses and municipal location coverage rankings—To measure the variation in the rankings over time, we separated the cardiac arrest data by year of occurrence and calculated the *actual coverage* provided by each business and municipal location in each year. We then computed the intra-class correlation (ICC) of the annual values and a corresponding 95% confidence interval using a two way random effect model, ICC(C,1), as defined by McGraw et al[31].

Analysis 3: Ranking broad location categories by spatiotemporal OHCA coverage—To enable comparisons with other studies and for generalizability, the 41 businesses and municipal locations were grouped into one of 14 broader location categories and the same metrics from Analysis 1 were recalculated. We also repeated this coverage analysis using only OHCAs that were not already covered by the existing registered AEDs in Toronto.

Results

Characteristics of cardiac arrest episodes

A total of 27,650 non-traumatic OHCAs occurred from January 2007 – December 2015 in the city of Toronto. Of these, 2,654 occurred in a public setting with 506 of them occurring in the downtown area. The characteristics of the included public cardiac arrests are summarized in Table 1.

Analysis 1: Ranking businesses and municipal locations by spatiotemporal OHCA coverage—Table 2 ranks the 41 businesses and municipal locations in descending order of *actual coverage* in Toronto. The top-ranked businesses were Tim Hortons (*actual coverage*=286), Royal Bank of Canada automated teller machine (ATMs) (*actual coverage*=243) and Subway Restaurants (*actual coverage*=228). Coffee shops (Tim Hortons, Starbucks, and Second Cup) and ATMs of the five major Canadian banks (Royal Bank of Canada, Bank of Nova Scotia, Canadian Imperial Bank of Commerce, Toronto-Dominion Bank, and Bank of Montreal) occupied eight of the top 10 location types. The top-ranked businesses in coverage efficiency were 7-Eleven (*coverage efficiency*=1.92), Burger King, (*coverage efficiency*=1.73), and Second Cup, (*coverage efficiency*=1.39). The businesses with the largest coverage loss were Wendy's (*coverage loss*=78.6%), UPS Stores (*coverage loss*=67.7%), and Scotiabank Branches (*coverage loss*=62.9%). The geographical distribution of the top five ranked location types are shown in Supplemental Figures 1 – 6.

Table 3 summarizes the result of the downtown subgroup analysis. The top-ranked businesses by *actual coverage* were Starbucks (*actual coverage*=110), Tim Hortons (*actual coverage*=97), and RBC ATMs (*actual coverage*=94). The same coffee shop chains and bank ATMs in the top 10 of Table 2, occupied eight of the top 10 rankings in downtown, but in a different order. The top-ranked businesses by *coverage efficiency* were Burger King

(*coverage efficiency*=4.25), 7-Eleven (*coverage efficiency*=3.50), and Pizza Nova (*coverage efficiency*=3.17). The largest coverage losses were experienced by schools: Separate (religious) Schools (*coverage loss*=100.0%), Public Schools (*coverage loss*=77.8%), and Private Schools (*coverage loss*=71.4%).

Table 4 ranks the 41 businesses and municipal locations with respect to the public OHCAs that were not already covered by a registered AED in Toronto. Coffee shops (Tim Hortons, Starbucks, and Second Cup) and ATMs of the five major Canadian banks remained in the top 10. The rankings for the downtown subgroup can be found in Supplemental Table 8.

Analysis 2: Temporal stability of the businesses and municipal location coverage rankings—Table 5 shows the *actual coverage* for each business and municipal location in Toronto for each year from 2007 to 2015. Table 6 shows the same data for the downtown subgroup. Results in both tables were sorted by average annual *actual coverage*. Rankings for each individual year were also determined. The ICC values were 0.88 (95% CI, 0.83 to 0.93) for Toronto overall and 0.79 (95% CI, 0.71 to 0.86) for downtown Toronto, indicating high stability of the coverage values over time.

Analysis 3: Ranking broad location categories by spatiotemporal OHCA coverage—Tables 7 and 8 summarize the rankings of the broad location categories for Toronto and downtown Toronto, respectively. They are ranked in descending order of *actual coverage*. Reflecting the individual business and municipal location rankings, the bank ATM category and coffee shop category were both ranked highly. The bank ATM category was ranked first in both Toronto and downtown Toronto. The coffee shop category was ranked 3rd and 2nd in the two areas, respectively. Restaurant chains ranked highly as well, but consisted of the most number of individual businesses (n = 9) than any other category (see Supplemental Table 1 for the taxonomy of individual businesses and municipal locations in broad location categories). Convenience stores had the highest *coverage efficiency* in both Toronto (*coverage efficiency*=1.21) and downtown (*coverage efficiency*=3.00). The largest coverage losses were experienced by schools in both Toronto (*coverage loss*=56.3%), and downtown Toronto (*coverage loss*=73.5%).

The broad location category rankings with respect to the public OHCAs that are not already covered by a registered AED in Toronto can be found in Supplemental Tables 9 and 10. In this case, bank ATMs, coffee shops, and restaurant chains retained their top three rankings in both Toronto, and downtown Toronto.

Discussion

In this study, we determined novel rankings of specific businesses and municipal locations by spatiotemporal OHCA coverage in Toronto, Canada. We found that eight of the top ten location types in both Toronto overall and downtown Toronto were coffee shops and bank ATMs. Furthermore, the rankings were fairly stable over time. For example, most of the top ten location types in *actual coverage* remained in the top ten for every year from 2007 to 2015. When the individual businesses and municipal locations were consolidated into broad

location categories, coffee shops and bank ATMs remained among the highest ranking location categories in spatiotemporal coverage.

The analysis presented in Table 4 sheds light on the potential impact of implementing a private-public AED partnership in a realistic case where there are existing AEDs deployed. We found that ATMs and coffee shops retained their high ranking even after removing OHCAs already covered by existing AEDs. However, these findings are specific to Toronto and are not meant to be generalized to other settings as each city's existing public AED network is unique.

Besides providing high coverage for spatiotemporal OHCA risk, bank ATMs and coffee shops may be promising locations for AED deployment for additional reasons. For example, ATMs offer additional security (e.g., video cameras), weather protection (e.g., electricity to heat an AED cabinet), increased accessibility (many are available 24/7 and located outdoors), and broad recognition (most people would know where to find an ATM locally and they are easily recognized, even in foreign cities). Like ATMs, coffee shops tend to be geographically widespread, located in more populated areas with operating hours that extend past general working hours, and have strong brand recognition. Our results also show that ATMs and coffee shops have high *coverage efficiency*, which means that partnerships with these businesses may make more effective use of limited resources for AED deployment. Furthermore, our stability results suggest that ATMs and coffee shops, like the other high potential locations for AED deployment, will remain good choices in the future, which is an important consideration since AEDs are typically not moved after they are deployed. Relocating AEDs also has the negative side effect of disrupting any public association between AEDs and specific locations. We believe the combinations of characteristics described make these businesses strong candidates for potential PAD program partnerships.

Our stability results are consistent with a previous study that demonstrated temporal stability of OHCA incidence in Toronto.[32] In fact, our ICC values were even higher than found in the previous study, which examined OHCA incidence in all 140 neighborhoods in Toronto. These neighborhoods aggregate the risk of many different businesses and communities into one number. We believe that examining more granular location categories such as specific businesses and municipal locations results in more consistent measurements from year to year. Our analysis of risk in specific locations further supports the notion of committing resources to high risk areas to help improve survival outcomes, as high-risk areas will remain high-risk long term.

Rankings based on the broad location categories (Tables 7 and 8) are important for generalizability of our findings beyond Toronto, Canada. Our findings are in line with previous studies conducted in Denmark and Canada that examined the spatial-only OHCA risk at broad location categories. They identified large businesses (businesses with at least 150 employees), supermarkets, offices, and retail stores as locations with high absolute OHCA risk.[13, 15] However, it is also important to examine specific businesses and municipal locations since OHCA risk can vary significantly within a broad location category. For example, the restaurant chain category is ranked second in spatiotemporal coverage among the broad location categories, but the nine individual restaurants that make up the category

rank between 3rd and 37th out of 41 total businesses/municipal locations, with an average rank of 24. Furthermore, to achieve the coverage indicated by a broad location category would potentially require working with many different (often competing) businesses, each with their own decision making processes. Overall, by examining specific location types we can obtain more accurate estimates of spatiotemporal cardiac arrest risk to help direct policy decisions and public-private partnerships to improve future PAD placement.

Ranking locations by *actual coverage* takes into account temporal accessibility, which has been shown to significantly impact the potential availability of AEDs in an emergency situation.[21, 22] If AEDs are placed inside a business, then *actual coverage* is the appropriate metric to consider. However, if AEDs can be made available 24 hours a day (e.g., in a cabinet outside the building), then the relevant coverage metric becomes *assumed 24/7 coverage*. The *coverage loss* metric, which measures the relative difference between *assumed 24/7 coverage* and *actual coverage*, quantifies the additional value of having around the clock access to AEDs. For example, Wendy's is ranked first in terms of *coverage loss*, which means that 24/7 accessible AEDs would be much more valuable than AEDs placed inside the restaurant, which would be unavailable when the restaurant is closed.

Coverage efficiency, which measures the *actual coverage* per facility, is an indicator of how much coverage can be provided by an AED placed at a single location. Businesses with high *coverage efficiency* tended to have fewer total facilities compared to the average. For almost all location types analyzed, *coverage efficiency* was higher in downtown Toronto, most likely due to increased population density. While coverage efficiency does not equal cost-effectiveness, it can be used to gauge the value of an AED placed in a specific business or municipal location. We hypothesize that placing AEDs in businesses with high coverage efficiency will be more cost-effective than placing AEDs in low coverage efficiency locations. AED placement strategies based on OHCA risk and optimization have been found to be cost-effective.[13, 30]

These rankings may be helpful to municipalities, public safety agencies, and policy makers involved in public access defibrillation programs, especially where public-private partnerships for AEDs are being considered. Business-based partnerships for AED deployment have several advantages beyond coverage of OHCA risk. For example, these organizations may provide financial support to buy AEDs and marketing support to improve PAD program awareness in connection with their brand. By deploying AEDs in all locations of well-known and highly visible franchises (e.g., well-known coffee shop chains) and undertaking a well-planned public awareness campaign, communities may be able to increase access to and awareness of AEDs. Large businesses with a national presence may also be able to provide the necessary financial resources, infrastructure, and leadership to support a nationwide PAD program partnership.

There are some previous examples of public-private partnerships in AED deployment. Recently, over 60 public AEDs were installed in outdoor cabinets integrated with advertisement boards in Vienna in partnership with a local advertising company.[33, 34] Across Japan, AEDs have also been installed in vending machines as well as advertisement boards.[35] Both partnerships were made possible through creative financing, including

contributions from advertising and vending machine revenues, the AED distributor, and the municipalities. In addition to the possibility of broad geographical coverage, like that provided by advertisement boards and vending machines, businesses and municipal locations have the additional potential to improve response by having trained employees act as responders on-site. Our rankings examined the total coverage of all facilities of a single business, modeling the potential coverage of universal AED deployment, i.e., placing AEDs all locations of the business. Universal deployment can give bystanders confidence that they will find an AED at any location of that business. However, not all locations of the same business may have the same risk, and resource limitations may outweigh the benefits of universal deployment. In that case, optimizing AED deployment to a subset of the locations may provide maximum benefit within a constrained budget.[20, 22, 30]

Coverage, risk, and AED accessibility are only a few of the factors that need to be considered when designing a PAD program. Additional factors such as security, signage, EMS integration, registration with local EMS dispatch, existing AEDs placements, and the presence of trained responders are key considerations as well. For example, an area with good coverage from existing AEDs may only receive marginal benefit from additional AED deployment in that area. More benefit might be realized from by expanding the “coverage radius” of existing AEDs in that area, through improved signage, accessibility, or employee training. [36]

Limitations

As a measure of temporal availability, we used the hours of operation associated with each facility. These hours of operation were collected at one point in the year, but we note that hours may fluctuate seasonally. Hours of operations used in the analysis do no account for holiday closures.

In our analysis of ranking stability we assumed that all facilities of each business or municipal location were present every year, based on presence at the time of data collection. Thus, depending on whether there were more or fewer locations of a certain business in the past, our coverage values could be underestimated or overestimated, respectively.

We used 20 businesses as a cutoff so as to focus on large, recognizable businesses in this study. These large businesses would make the most sense for public-private partnerships from the perspective of visibility. However, due to this cut off it is possible we did not include certain businesses and municipal locations in the study that could be beneficial towards improving OHCA coverage and developing AED programs.

This analysis was conducted with cardiac arrest and franchise data from Toronto. The businesses we examined were specific to Toronto and may not exist in other cities. It is also important to note that public OHCAs, the focus of this paper, comprise a minority of all OHCAs.

Conclusion

We determined novel rankings of specific businesses and municipal locations in terms of spatiotemporal OHCA coverage in Toronto, Canada and found they exhibit high temporal

stability, suggesting that locations that maximize coverage would continue to do so over time. Overall, we found coffee shops and bank ATMs ranked highly. Our rankings can help policy makers and funders to identify and prioritize potential partnerships for AED deployment, which can increase the distribution and awareness of AED locations and ultimately help improve OHCA survival.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

The authors acknowledge Cathy Zhan for help with gathering demographic data associated with the cardiac arrests. The authors would like to thank the Rescu Epistry investigators and all emergency medical service operators, providers and medical directors as well as the in-hospital staff in the SPARC network hospitals working together in the front line of emergency patient care for their continued commitment contributions to high quality care and primary data collection in resuscitation research at Rescu, Li Ka Shing Knowledge Institute.

Funding/Support

Funding Sources: This project was funded by a ZOLL Foundation grant. The Resuscitation Outcomes Consortium Epistry study is supported by a cooperative agreement (5U01 HL077863) with the National Heart, Lung, and Blood Institute in partnership with the National Institute of Neurological Disorders and Stroke, Canadian Institutes of Health Research–Institute of Circulatory and Respiratory Health, Defense Research and Development Canada, Heart and Stroke Foundation of Canada, and American Heart Association. Rescu Epistry is funded by a centre grant from the Laerdal Foundation, and knowledge translation collaborative grants and operating grants from Canadian Institutes of Health Research and the Heart and Stroke Foundation of Canada.

References

1. Weisfeldt ML, Sitlani CM, Ornato JP, Rea T, Aufderheide TP, Davis D, Dreyer J, Hess EP, Jui J, Maloney J, Sopko G, Powell J, Nichol G, Morrison LJ. for the ROC Investigators. Survival after application of automatic external defibrillators before arrival of the emergency medical system: Evaluation in the resuscitation outcomes consortium population of 21 million. J Am Coll Cardiol. 2010; 55:1713–1720. [PubMed: 20394876]
2. Becker L, Eisenberg M, Fahrenbruch C, Cobb L. Public locations of cardiac arrest : Implications for public access defibrillation. Circulation. 1998; 97:2106–2109. [PubMed: 9626169]
3. Valenzuela TD, Roe DJ, Nichol G, Clark LL, Spaite DW, Hardman RG. Outcomes of rapid defibrillation by security officers after cardiac arrest in casinos. N Engl J Med. 2000; 343:1206–1209. [PubMed: 11071670]
4. Caffrey SL, Willoughby PJ, Pepe PE, Becker LB. Public use of automated external defibrillators. N Engl J Med. 2002; 347:1242–1247. [PubMed: 12393821]
5. Murakami Y, Iwami T, Kitamura T, Nishiyama C, Nishiuchi T, Hayashi Y, Kawamura T. Outcomes of out-of-hospital cardiac arrest by public location in the public-access defibrillation era. J Am Heart Assoc. 2014; 3:e000533. [PubMed: 24755149]
6. Hallstrom AP, Ornato JP, Weisfeldt M, Travers A, Christenson J, McBurnie MA, Zalenski R, Becker LB, Schron EB, Proschan M. Public Access Defibrillation Trial I. Public-access defibrillation and survival after out-of-hospital cardiac arrest. New Engl J Med. 2004; 351:637–646. [PubMed: 15306665]
7. Aufderheide T, Hazinski MF, Nichol G, Steffens SS, Buroker A, McCune R, Stapleton E, Nadkarni V, Potts J, Ramirez RR, Eigel B, Epstein A, Sayre M, Halperin H, Cummins RO. Community lay rescuer automated external defibrillation programs: Key state legislative components and implementation strategies: A summary of a decade of experience for healthcare providers, policymakers, legislators, employers, and community leaders from the american heart association emergency cardiovascular care committee, council on clinical cardiology, and office of state advocacy. Circulation. 2006; 113:1260–1270. [PubMed: 16415375]

8. Berdowski J, Blom MT, Bardai A, Tan HL, Tijssen JG, Koster RW. Impact of onsite or dispatched automated external defibrillator use on survival after out-of-hospital cardiac arrest. Circulation. 2011; 124:2225–2232. [PubMed: 22007075]

9. Peberdy MA, Kaye W, Ornato JP, Larkin GL, Nadkarni V, Mancini ME, Berg RA, Nichol G, Lane-Trultt T. Cardiopulmonary resuscitation of adults in the hospital: A report of 14720 cardiac arrests from the national registry of cardiopulmonary resuscitation. Resuscitation. 2003; 58:297–308. [PubMed: 12969608]

10. McNally B, Robb R, Mehta M, Vellano K, Valderrama AL, Yoon PW, Sasson C, Crouch A, Perez AB, Merritt R, Kellermann A. Out-of-hospital cardiac arrest surveillance --- cardiac arrest registry to enhance survival (cares), united states, october 1, 2005--december 31, 2010. MMWR Surveill Summ. 2011; 60:1–19.

11. Mozaffarian D, Benjamin EJ, Go AS, Arnett DK, Blaha MJ, Cushman M, de Ferranti S, Despres JP, Fullerton HJ, Howard VJ, Huffman MD, Judd SE, Kissela BM, Lackland DT, Lichtman JH, Lisabeth LD, Liu S, Mackey RH, Matchar DB, McGuire DK, Mohler ER 3rd, Moy CS, Muntner P, Mussolino ME, Nasir K, Neumar RW, Nichol G, Palaniappan L, Pandey DK, Reeves MJ, Rodriguez CJ, Sorlie PD, Stein J, Towfighi A, Turan TN, Virani SS, Willey JZ, Woo D, Yeh RW, Turner MB. Heart disease and stroke statistics--2015 update: A report from the american heart association. Circulation. 2015; 131:e29–322. [PubMed: 25520374]

12. Robertson RM. Sudden death from cardiac arrest — improving the odds. N Engl J Med. 2000; 343:1259–1260. [PubMed: 11071678]

13. Folke F, Lippert FK, Nielsen SL, Gislason GH, Hansen ML, Schramm TK, Sorensen R, Fosbol EL, Andersen SS, Rasmussen S, Kober L, Torp-Pedersen C. Location of cardiac arrest in a city center: Strategic placement of automated external defibrillators in public locations. Circulation. 2009; 120:510–517. [PubMed: 19635969]

14. Gratton M, Lindholm DJ, Campbell JP. Public-access defibrillation: Where do we place the aeds? Prehosp Emerg Care. 1999; 3:303–305. [PubMed: 10534029]

15. Brooks SC, Hsu JH, Tang SK, Jeyakumar R, Chan TC. Determining risk for out-of-hospital cardiac arrest by location type in a canadian urban setting to guide future public access defibrillator placement. Ann Emerg Med. 2013; 61:530–538. e532. [PubMed: 23522611]

16. Fedoruk JC, Currie WL, Gobet M, Currie WL, Gobet M. Locations of cardiac arrest: Affirmation for community public access defibrillation (pad) program. Prehosp Disaster Med. 2002; 17:202–205. [PubMed: 12929951]

17. Reed DB, Birnbaum A, Brown LH, O'Connor RE, Fleg JL, Peberdy MA, Van Ottingham L, Hallstrom AP. Investigators PT. Location of cardiac arrests in the public access defibrillation trial. Prehosp Emerg Care. 2006; 10:61–67. [PubMed: 16526143]

18. Davies CS, Colquhoun MC, Boyle R, Chamberlain DA. A national programme for on-site defibrillation by lay people in selected high risk areas: Initial results. Heart. 2005; 91:1299–1302. [PubMed: 16162620]

19. Iwami T, Hiraide A, Nakanishi N, Hayashi Y, Nishiuchi T, Uejima T, Morita H, Shigemoto T, Ikeuchi H, Matsusaka M, Shinya H, Yukioka H, Sugimoto H. Outcome and characteristics of out-of-hospital cardiac arrest according to location of arrest: A report from a large-scale, population-based study in osaka, japan. Resuscitation. 2006; 69:221–228. [PubMed: 16519986]

20. Chan TC, Li H, Lebovic G, Tang SK, Chan JY, Cheng HC, Morrison LJ, Brooks SC. Identifying locations for public access defibrillators using mathematical optimization. Circulation. 2013; 127:1801–1809. [PubMed: 23553657]

21. Hansen CM, Wissenberg M, Weeke P, Ruwald MH, Lamberts M, Lippert FK, Gislason GH, Nielsen SL, Kober L, Torp-Pedersen C, Folke F. Automated external defibrillators inaccessible to more than half of nearby cardiac arrests in public locations during evening, nighttime, and weekends. Circulation. 2013; 128:2224–2231. [PubMed: 24036607]

22. Sun CLF, Demirtas D, Brooks SC, Morrison LJ, Chan TCY. Overcoming spatial and temporal barriers to public access defibrillators via optimization. J Am Coll Cardiol. 2016; 68:836–845. [PubMed: 27539176]

23. Morrison LJ, Nichol G, Rea TD, Christenson J, Callaway CW, Stephens S, Pirrallo RG, Atkins DL, Davis DP, Idris AH, Newgard C. Rationale, development and implementation of the resuscitation

outcomes consortium epistry-cardiac arrest. Resuscitation. 2008; 78:161–169. [PubMed: 18479802]

24. Lin S, Morrison LJ, Brooks SC. Development of a data dictionary for the strategies for post arrest resuscitation care (sparc) network for post cardiac arrest research. Resuscitation. 2011; 82:419–422. [PubMed: 21276647]
25. YellowPages. [Accessed January 24 2015] Yellowpages.Ca. Available at: http://www.yellowpages.ca/
26. Canadian Franchise Association. Canadian franchise association; Available at: http://www.cfa.ca/ [Accessed January 14 2015]
27. City of Toronto. [Accessed September 26 2015] Accessing City Hall. Open data - city of toronto. Jan 13. 2017 Available at: http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=9e56e03bb8d1e310VgnVCM10000071d60f89RCRD
28. City of Toronto. [Accessed April 11, 2015] Demographics. Living in downtown and the centres. Mar. 2012 Available at: http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=87160621f3161410VgnVCM10000071d60f89RCRD&vgnextchannel=1e68f40f9aae0410VgnVCM10000071d60f89RCRD
29. Gundry JW, Comess KA, DeRook FA, Jorgenson D, Bardy GH. Comparison of naive sixth-grade children with trained professionals in the use of an automated external defibrillator. Circulation. 1999; 100:1703–1707. [PubMed: 10525489]
30. Chan TCY, Demirtas D, Kwon RH. Optimizing the deployment of public access defibrillators. Manage Sci. 2016; 62:3617–3635.
31. McGraw KO, Wong SP. Forming inferences about some intraclass correlation coefficients. Psychol Methods. 1996; 1:30–46.
32. Demirtas D, Brooks SC, Morrison LJ, Chan TC. Abstract 15003: Spatiotemporal stability of public cardiac arrests. Circulation. 2015; 132:A15003–A15003.
33. Krammel M, Weidenauer D, Ettl F, Orlob S, Knogler T, van Tulder R, Schreiber W. Public access defibrillation (pad) in vienna: A new approach in technique and funding (Abstract). Resuscitation. 2013; 84:S71.
34. wien.at. [Accessed March 16 2016] More defibrillators for vienna - every second counts. Available at: https://www.wien.gv.at/english/health-socialservices/defibrillators.html
35. Mitamura H. Public access defibrillation: Advances from japan. Nat Clin Pract Cardiovasc Med. 2008; 5:690–692. [PubMed: 18779832]
36. Siddiq AA, Brooks SC, Chan TC. Modeling the impact of public access defibrillator range on public location cardiac arrest coverage. Resuscitation. 2013; 84:904–909. [PubMed: 23201501]

Clinical Perspective

What is new?

- We present novel rankings of specific businesses and municipal locations in Toronto, Canada based on spatiotemporal OHCA coverage, the number of OHCAs that occur within 100 m of a given location when that location is open based on hours of operation, and related metrics.
- We found that coffee shops (Tim Hortons, Starbucks, and Second Cup) and automated teller machines from the five major banks provided the highest OHCA coverage and their rankings were stable over time.

What are the clinical implications?

- Health organizations and policy makers focused on developing public access defibrillator programs can use our rankings to identify businesses and municipal locations to develop partnerships for AED deployment and PAD programs.
- These private-public partnerships with businesses and municipal locations may provide benefits such as financial support, increased AED awareness and accessibility, and reduce the barriers to AED deployment and distribution.

Table 1

Characteristics of included public cardiac arrests.

Characteristic*	All included Toronto cardiac arrests occurring in a public location (n=2654)	All included Downtown Toronto cardiac arrests occurring in a public location (n=506)
Average age ±SD	59.4±17.7	55.2±18.1
Male sex, n (%)	2136 (80.5)	420 (83.0)
Witnessed by bystander, n (%)	1228 (46.3)	226 (44.7)
Received bystander CPR, n (%)	1153 (43.4)	213 (42.1)
Bystander applied AED, n (%)	254 (9.6)	72 (14.2)
Ambulance response interval, median (IQR), minutes	5:55 (4:45 – 7:24)	5:11 (4:10 – 6:16)
Initial cardiac rhythm, n (%)		
Shockable†	917 (34.6)	167 (33.0)
Not Shockable†	1661 (62.6)	322 (63.6)
Survival to discharge, n (%)	416 (15.8)	88 (17.4)

SD, standard deviation; AED, automated external defibrillator; CPR, cardiopulmonary resuscitation; and IQR, interquartile range

*Number missing from total: age (76), sex (14), witnessed by bystander (15), received bystander CPR (2), bystander applied AED (46), arrival interval (54), initial cardiac rhythm (76), survival (28)

Number missing from downtown: age (1), sex (1), witnessed by bystander (4), received bystander CPR (1), bystander applied AED (11), arrival interval (12), initial cardiac rhythm (17), survival (0)

†Shockable includes, ventricular fibrillation, ventricular tachycardia and patients listed as shockable. Not shockable includes asystole, pulseless electrical activity, patients listed as not shockable, and patients whose initial rhythm was not obtained as resuscitation was stopped before rhythm analysis by protocol due to obvious signs of death.

Table 2

Businesses and municipal locations ranked by actual coverage in all of Toronto.

Rank	Location Type‡	Location Category	Actual Coverage	Assumed 24/7 Coverage, (Rank)	Number of Facilities, (Rank)	Coverage Efficiency, (Rank)	Coverage Loss, % (Rank)
1	Tim Hortons	Coffee Shop	286	329 (1)	312 (2)	0.92 (14)	13.1 (14)
2	RBC ATM	Bank ATM	243	272 (2)	264 (4)	0.92 (13)	10.7 (11)
3	Subway	Restaurant Chain	228	264 (3)	281 (3)	0.81 (19)	13.6 (15)
4	Scotiabank ATM	Bank ATM	216	232 (4)	181 (9)	1.19 (5)	6.9 (10)
5	CIBC ATM	Bank ATM	198	224 (5)	187 (8)	1.06 (6)	11.6 (13)
6	TD ATM	Bank ATM	183	216 (6)	178 (10)	1.03 (8)	15.3 (18)
7	Green P Parking	Parking Lot	177	187 (8)	229 (5)	0.77 (21)	5.3 (7)
8	Starbucks	Coffee Shop	169	208 (7)	166 (11)	1.02 (10)	18.8 (19)
9	BMO ATM	Bank ATM	141	144 (12)	142 (13)	0.99 (11)	2.1 (6)
10	Second Cup	Coffee Shop	111	148 (10)	80 (24)	1.39 (3)	25.0 (23)
11	Shoppers Drug Mart	Pharmacy	103	134 (13)	132 (14)	0.78 (20)	23.1 (22)
12	McDonald’s	Restaurant Chain	98	105 (17)	94 (22)	1.04 (7)	6.7 (9)
13	TD Branch	Bank	94	148 (10)	144 (12)	0.65 (26)	36.5 (29)
14	CIBC Branch	Bank	91	158 (9)	108 (16)	0.84 (18)	42.4 (33)
15	Pizza Pizza	Restaurant Chain	86	117 (16)	100 (19)	0.86 (17)	26.5 (24)
16	RBC Branch	Bank	69	125 (15)	103 (17)	0.67 (25)	44.8 (34)
17	Rexall	Pharmacy	63	91 (19)	51 (31)	1.24 (4)	30.8 (27)
18	Shell	Gas Station	55	55 (23)	57 (29)	0.96 (12)	0.0 (1)
19	BMO Branch	Bank	53	98 (18)	96 (21)	0.55 (30)	45.9 (35)
20	Scotiabank Branch	Bank	49	132 (14)	98 (20)	0.50 (31)	62.9 (39)
21	Petrocan	Gas Station	47	47 (28)	74 (26)	0.64 (28)	0.0 (1)
22	7-Eleven	Convenience Store	46	46 (30)	24 (38)	1.92 (1)	0.0 (1)
23	Goodlife Fitness	Recreational Facility	43	50 (26)	42 (32)	1.02 (9)	14.0 (17)
24	Public School	School	39	56 (22)	584 (1)	0.07 (41)	30.4 (26)
24	LCBO	Liquor/Beer Store	39	59 (21)	84 (23)	0.46 (33)	33.9 (28)
26	Burger King	Restaurant Chain	38	44 (31)	22 (40)	1.73 (2)	13.6 (15)

Rank	Location Type‡	Location Category	Actual Coverage	Assumed 24/7 Coverage, (Rank)	Number of Facilities, (Rank)	Coverage Efficiency, (Rank)	Coverage Loss, % (Rank)
26	Pizza Nova	Restaurant Chain	38	47 (28)	52 (30)	0.73 (24)	19.1 (20)
28	BeerStore	Liquor/Beer Store	32	51 (25)	66 (27)	0.48 (32)	37.3 (30)
29	Swiss Chalet	Restaurant Chain	31	52 (24)	35 (35)	0.89 (15)	40.4 (32)
30	Mac's	Convenience Store	28	28 (36)	37 (33)	0.76 (22)	0.0 (1)
31	Library	Library	25	50 (26)	101 (18)	0.25 (36)	50.0 (36)
32	Harvey's	Restaurant Chain	22	30 (35)	25 (37)	0.88 (16)	26.7 (25)
32	Esso	Gas Station	22	22 (38)	77 (25)	0.29 (34)	0.0 (1)
34	Swimming Pool	Recreational Facility	18	40 (32)	117 (15)	0.15 (37)	55.0 (38)
35	Metro	Grocery Store	17	18 (40)	28 (36)	0.61 (29)	5.6 (8)
36	Separate School	School	16	34 (33)	223 (6)	0.07 (39)	52.9 (37)
37	Private School	School	15	70 (20)	211 (7)	0.07 (40)	78.6 (41)
37	Wendy's	Restaurant Chain	15	25 (37)	20 (41)	0.75 (23)	40.0 (31)
37	Dairy Queen	Restaurant Chain	15	19 (39)	23 (39)	0.65 (27)	21.1 (21)
40	UPS Store	Retail Store	10	31 (34)	36 (34)	0.28 (35)	67.7 (40)
41	Canadian Tire	Retail Store	8	9 (41)	65 (28)	0.12 (38)	11.1 (12)
		Average	**79.9** *	**102.8** *	**120.7** *	0.91 †	18.2 †

Coverage Efficiency: the actual coverage divided by the number of facilities; Coverage loss: the assumed 24/7 coverage minus actual coverage all divided by assumed 24/7 coverage

*Overall average (averaged over all 41 businesses and municipal locations)

†Weighted average (over all 41 businesses and municipal locations, weighted by the *actual coverage* values of each location type)

‡ATM, Automated Teller Machine; BMO, Bank of Montreal; CIBC, Canadian Imperial Bank of Commerce; LCBO, Liquor Control Board of Ontario; RBC, Royal Bank of Canada; Separate School, religious schools (students from a religious group); Scotiabank, Bank of Nova Scotia; TD, Toronto-Dominion Bank.

The ATM locations consist of stand-alone ATMS and ATMs located in their respective bank branches.

Table 3

Businesses and municipal locations ranked by actual coverage in downtown Toronto.

Downtown Rank	Location Type‡	Location Category	Actual Coverage	Assumed 24/7 Coverage, (Rank)	Number of Facilities, (Rank)	Coverage Efficiency, (Rank)	Coverage Loss, % (Rank)
1	Starbucks	Coffee Shop	110	139 (1)	75 (1)	1.47 (20)	20.9 (19)
2	Tim Hortons	Coffee Shop	97	117 (2)	73 (2)	1.33 (22)	17.1 (15)
3	RBC ATM	Bank ATM	94	111 (3)	66 (4)	1.42 (21)	15.3 (14)
4	Scotiabank ATM	Bank ATM	77	84 (6)	33 (8)	2.33 (6)	8.3 (12)
4	Subway	Restaurant Chain	77	93 (5)	71 (3)	1.08 (26)	17.2 (16)
6	TD ATM	Bank ATM	75	97 (4)	39 (6)	1.92 (11)	22.7 (20)
7	Second Cup	Coffee Shop	67	84 (6)	41 (5)	1.63 (16)	20.2 (17)
8	CIBC ATM	Bank ATM	64	73 (8)	32 (9)	2.00 (9)	12.3 (13)
9	BMO ATM	Bank ATM	56	58 (10)	30 (10)	1.87 (12)	3.4 (7)
10	Shoppers Drug Mart	Pharmacy	53	70 (9)	25 (12)	2.12 (7)	24.3 (21)
11	Green P Parking	Parking Lot	47	50 (11)	39 (6)	1.21 (24)	6.0 (10)
12	McDonald’s	Restaurant Chain	39	42 (14)	15 (19)	2.60 (4)	7.1 (11)
13	Rexall	Pharmacy	27	39 (15)	13 (22)	2.08 (8)	30.8 (24)
14	TD Branch	Bank	26	46 (12)	22 (13)	1.18 (25)	43.5 (29)
15	CIBC Branch	Bank	25	43 (13)	17 (16)	1.47 (19)	41.9 (28)
16	Pizza Pizza	Restaurant Chain	23	34 (18)	14 (21)	1.64 (15)	32.4 (25)
16	Goodlife Fitness	Recreational Facility	23	29 (20)	13 (22)	1.77 (13)	20.7 (18)
18	7-Eleven	Convenience Store	21	21 (23)	6 (31)	3.50 (2)	0.0 (1)
19	Pizza Nova	Restaurant Chain	19	20 (25)	6 (31)	3.17 (3)	5.0 (8)
20	RBC Branch	Bank	17	38 (16)	18 (15)	0.94 (30)	55.3 (36)
20	Burger King	Restaurant Chain	17	18 (26)	4 (33)	4.25 (1)	5.6 (9)
20	LCBO	Liquor/Beer Store	17	23 (21)	17 (16)	1.00 (27)	26.1 (22)
23	BMO Branch	Bank	16	30 (19)	16 (18)	1.00 (27)	46.7 (31)
24	Scotiabank Branch	Bank	13	35 (17)	15 (19)	0.87 (32)	62.9 (38)
25	Swiss Chalet	Restaurant Chain	11	23 (21)	7 (28)	1.57 (17)	52.2 (35)
26	Harvey’s	Restaurant Chain	10	14 (29)	4 (33)	2.50 (5)	28.6 (23)

Downtown Rank	Location Type‡	Location Category	Actual Coverage	Assumed 24/7 Coverage, (Rank)	Number of Facilities, (Rank)	Coverage Efficiency, (Rank)	Coverage Loss, % (Rank)
26	BeerStore	Liquor/Beer Store	10	15 (28)	8 (26)	1.25 (23)	33.3 (26)
28	Metro	Grocery Store	8	8 (33)	4 (33)	2.00 (9)	0.0 (1)
29	UPS Store	Retail Store	7	18 (26)	8 (26)	0.88 (31)	61.1 (37)
30	Private School	School	6	21 (23)	19 (14)	0.32 (37)	71.4 (39)
31	Library	Library	5	9 (31)	12 (24)	0.42 (36)	44.4 (30)
31	Swimming Pool	Recreational Facility	5	10 (30)	7 (28)	0.71 (33)	50.0 (32)
31	Dairy Queen	Restaurant Chain	5	8 (33)	3 (37)	1.67 (14)	37.5 (27)
34	Wendy's	Restaurant Chain	3	6 (35)	3 (37)	1.00 (27)	50.0 (32)
34	Mac's	Convenience Store	3	3 (37)	2 (40)	1.50 (18)	0.0 (1)
36	Public School	School	2	9 (31)	29 (11)	0.07 (41)	77.8 (41)
36	Petrocan	Gas Station	2	2 (38)	3 (37)	0.67 (34)	0.0 (1)
38	Separate School	School	1	4 (36)	9 (25)	0.11 (40)	75.0 (40)
38	Canadian Tire	Retail Store	1	2 (38)	7 (28)	0.14 (39)	50.0 (32)
38	Shell	Gas Station	1	1 (40)	2 (40)	0.50 (35)	0.0 (1)
38	Esso	Gas Station	1	1 (40)	4 (33)	0.25 (38)	0.0 (1)
		Average	**28.8***	**37.8***	**20.3***	1.71†	20.1†

Coverage Efficiency: the actual coverage divided by the number of facilities; Coverage loss: the assumed 24/7 coverage minus actual coverage all divided by assumed 24/7 coverage

*Overall average (averaged over all 41 businesses and municipal locations)

†Weighted average (over all 41 businesses and municipal locations, weighted by the *actual coverage* values of each location type)

‡ATM, Automated Teller Machine; BMO, Bank of Montreal; CIBC, Canadian Imperial Bank of Commerce; LCBO, Liquor Control Board of Ontario; RBC, Royal Bank of Canada; Separate School, religious schools (students from a religious group); Scotiabank, Bank of Nova Scotia; TD, Toronto-Dominion Bank.

The ATM locations consist of stand-alone ATMS and ATMs located in their respective bank branches.

Table 4

Businesses and municipal locations ranked by actual coverage in Toronto based on public OHCAs not already covered by a registered AED.

Rank	Location Type‡	Location category	Actual Coverage	Assumed 24/7 Coverage, (Rank)	Number of Facilities, (Rank)	Coverage Efficiency, (Rank)	Coverage Loss, % (Rank)
1	Tim Hortons	Coffee Shop	200	234 (1)	312 (2)	0.64 (18)	14.5 (16)
2	RBC ATM	Bank ATM	172	193 (2)	264 (4)	0.65 (16)	10.9 (12)
3	Subway	Restaurant Chain	162	190 (3)	281 (3)	0.58 (21)	14.7 (17)
4	Scotiabank ATM	Bank ATM	136	148 (5)	181 (9)	0.75 (7)	8.1 (9)
5	CIBC ATM	Bank ATM	134	152 (4)	187 (8)	0.72 (8)	11.8 (13)
6	Green P Parking	Parking Lot	127	135 (7)	229 (5)	0.55 (23)	5.9 (7)
7	TD ATM	Bank ATM	121	146 (6)	178 (10)	0.68 (14)	17.1 (19)
8	Starbucks	Coffee Shop	104	125 (8)	166 (11)	0.63 (19)	16.8 (18)
9	BMO ATM	Bank ATM	101	104 (10)	142 (13)	0.71 (9)	2.9 (6)
10	Pizza Pizza	Restaurant Chain	69	90 (12)	100 (19)	0.69 (12)	23.3 (23)
11	Shoppers Drug Mart	Pharmacy	66	83 (16)	132 (14)	0.50 (25)	20.5 (21)
12	TD Branch	Bank	62	101 (11)	144 (12)	0.43 (26)	38.6 (29)
13	McDonald's	Restaurant Chain	61	68 (19)	94 (22)	0.65 (17)	10.3 (11)
14	Second Cup	Coffee Shop	61	85 (14)	80 (24)	0.76 (6)	28.2 (25)
15	CIBC Branch	Bank	60	109 (9)	108 (16)	0.56 (22)	45.0 (32)
16	Rexall	Pharmacy	50	71 (18)	51 (31)	0.98 (3)	29.6 (26)
17	Petrocan	Gas Station	45	45 (22)	74 (26)	0.61 (20)	0.0 (1)
18	Shell	Gas Station	45	45 (22)	57 (29)	0.79 (5)	0.0 (1)
19	RBC Branch	Bank	44	86 (13)	103 (17)	0.43 (28)	48.8 (34)
20	BMO Branch	Bank	40	76 (17)	96 (21)	0.42 (29)	47.4 (33)
21	Pizza Nova	Restaurant Chain	36	44 (24)	52 (30)	0.69 (11)	18.2 (20)
22	Burger King	Restaurant Chain	34	39 (28)	22 (40)	1.55 (1)	12.8 (14)
23	7-Eleven	Convenience Store	32	32 (29)	24 (38)	1.33 (2)	0.0 (1)
24	Scotiabank Branch	Bank	30	84 (15)	98 (20)	0.31 (33)	64.3 (37)
25	Swiss Chalet	Restaurant Chain	29	47 (21)	35 (35)	0.83 (4)	38.3 (28)
26	Mac's	Convenience Store	26	26 (32)	37 (33)	0.70 (10)	0.0 (1)

Rank	Location Type‡	Location category	Actual Coverage	Assumed 24/7 Coverage, (Rank)	Number of Facilities, (Rank)	Coverage Efficiency, (Rank)	Coverage Loss, % (Rank)
27	BeerStore	Liquor/Beer Store	26	42 (26)	66 (27)	0.39 (30)	38.1 (27)
28	LCBO	Liquor/Beer Store	26	43 (25)	84 (23)	0.31 (32)	39.5 (30)
29	Public School	School	24	40 (27)	584 (1)	0.04 (41)	40.0 (31)
30	Goodlife Fitness	Recreational Facility	22	24 (34)	42 (32)	0.52 (24)	8.3 (10)
31	Esso	Gas Station	20	20 (37)	77 (25)	0.26 (34)	0.0 (1)
32	Harvey's	Restaurant Chain	17	23 (35)	25 (37)	0.68 (13)	26.1 (24)
33	Private School	School	15	58 (20)	211 (7)	0.07 (38)	74.1 (41)
34	Dairy Queen	Restaurant Chain	15	19 (38)	23 (39)	0.65 (15)	21.1 (22)
35	Metro	Grocery Store	12	13 (40)	28 (36)	0.43 (27)	7.7 (8)
36	Separate School	School	11	28 (30)	223 (6)	0.05 (40)	60.7 (36)
37	Library	Library	9	27 (31)	101 (18)	0.09 (37)	66.7 (39)
38	UPS Store	Retail Store	9	26 (32)	36 (34)	0.25 (35)	65.4 (38)
39	Swimming Pool	Recreational Facility	7	23 (35)	117 (15)	0.06 (39)	69.6 (40)
40	Wendy's	Restaurant Chain	7	14 (39)	20 (41)	0.35 (31)	50.0 (35)
41	Canadian Tire	Retail Store	6	7 (41)	65 (28)	0.09 (36)	14.3 (15)
		Average	**55.4***	**72.3***	**120.7***	**0.63**†	**18.8**†

Coverage Efficiency: the actual coverage divided by the number of facilities; Coverage loss: the assumed 24/7 coverage minus actual coverage all divided by assumed 24/7 coverage

*Overall average (averaged over all 41 businesses and municipal locations)

†Weighted average (over all 41 businesses and municipal locations, weighted by the *actual coverage* values of each location type)

‡ATM, Automated Teller Machine; BMO, Bank of Montreal; CIBC, Canadian Imperial Bank of Commerce; LCBO, Liquor Control Board of Ontario; RBC, Royal Bank of Canada; Separate School, religious schools (students from a religious group); Scotiabank, Bank of Nova Scotia; TD, Toronto-Dominion Bank.

The ATM locations consist of stand-alone ATMS and ATMs located in their respective bank branches.

Table 5

Actual coverage of the 41 businesses and government locations ranked by average actual coverage in all of Toronto per year from 2007 – 2015.

Rank	Location Type*	Number of Facilities	Actual Coverage, (Ranking)									Annual Actual Coverage mean ± SD
			2007	2008	2009	2010	2011	2012	2013	2014	2015	
1	Tim Hortons	312	33 (3)	36 (2)	26 (1)	30 (1)	28 (1)	35 (1)	19 (7)	35 (1)	44 (1)	31.8 ± 7.1
2	RBC ATM	264	35 (1)	27 (3)	25 (2)	29 (2)	19 (4)	27 (2)	25 (1)	31 (2)	25 (6)	27.0 ± 4.5
3	Subway	281	29 (5)	37 (1)	24 (3)	20 (5)	12 (9)	24 (3)	23 (4)	31 (2)	28 (4)	25.3 ± 7.1
4	Scotiabank ATM	181	34 (2)	22 (5)	21 (4)	21 (3)	19 (4)	16 (7)	25 (1)	28 (5)	30 (3)	24.0 ± 5.7
5	CIBC ATM	187	28 (6)	15 (8)	17 (7)	21 (3)	19 (4)	18 (5)	19 (7)	30 (4)	31 (2)	22.0 ± 6.0
6	TD ATM	178	23 (7)	18 (7)	20 (5)	16 (6)	21 (3)	21 (4)	20 (6)	18 (7)	26 (5)	20.3 ± 3.0
7	Green P Parking	229	30 (4)	21 (6)	16 (8)	15 (8)	19 (4)	17 (6)	23 (4)	16 (8)	20 (7)	19.7 ± 4.7
8	Starbucks	166	23 (7)	23 (4)	19 (6)	14 (9)	19 (4)	13 (9)	19 (7)	21 (6)	18 (8)	18.8 ± 3.5
9	BMO ATM	142	19 (9)	13 (10)	14 (9)	10 (10)	22 (2)	7 (14)	24 (3)	14 (9)	18 (8)	15.7 ± 5.5
10	Second Cup	80	16 (10)	15 (8)	9 (14)	16 (6)	9 (13)	9 (11)	12 (10)	11 (14)	14 (11)	12.3 ± 3.0
11	Shoppers Drug Mart	132	10 (15)	9 (13)	10 (13)	9 (12)	8 (16)	15 (8)	11 (15)	13 (11)	18 (8)	11.4 ± 3.3
12	McDonald's	94	12 (12)	12 (11)	11 (12)	7 (15)	11 (10)	6 (17)	12 (10)	13 (11)	14 (11)	10.9 ± 2.7
13	TD Branch	144	15 (11)	6 (17)	13 (11)	9 (12)	9 (13)	11 (10)	12 (10)	8 (17)	11 (14)	10.4 ± 2.7
14	CIBC Branch	108	11 (13)	6 (17)	8 (15)	10 (10)	9 (13)	9 (11)	12 (10)	14 (9)	12 (13)	10.1 ± 2.4
15	Pizza Pizza	100	9 (17)	12 (11)	14 (9)	7 (15)	11 (10)	7 (14)	8 (17)	7 (18)	11 (14)	9.6 ± 2.6
16	RBC Branch	103	9 (17)	8 (14)	7 (17)	9 (12)	6 (18)	5 (19)	10 (16)	12 (13)	3 (29)	7.7 ± 2.7
17	Rexall	51	11 (13)	5 (20)	7 (17)	6 (17)	6 (18)	6 (17)	6 (20)	6 (20)	10 (17)	7.0 ± 2.1
18	Shell	57	6 (20)	5 (20)	7 (17)	6 (17)	5 (20)	4 (23)	6 (20)	11 (14)	5 (28)	6.1 ± 2.0
19	BMO Branch	96	5 (21)	5 (20)	3 (27)	5 (19)	11 (10)	1 (35)	12 (10)	4 (25)	7 (21)	5.9 ± 3.6
20	Scotiabank Branch	98	10 (15)	8 (14)	4 (23)	3 (26)	7 (17)	2 (29)	2 (31)	7 (18)	6 (26)	5.4 ± 2.8
21	Petrocan	74	5 (21)	8 (14)	6 (20)	3 (26)	2 (31)	7 (14)	4 (25)	9 (16)	3 (29)	5.2 ± 2.4
22	7-Eleven	24	4 (25)	5 (20)	4 (23)	4 (22)	3 (25)	5 (19)	7 (18)	3 (30)	11 (14)	5.1 ± 2.5
23	Goodlife Fitness	42	8 (19)	5 (20)	5 (21)	2 (30)	4 (22)	2 (29)	6 (20)	4 (25)	7 (21)	4.8 ± 2.0
24	Public School	584	5 (21)	2 (34)	4 (23)	3 (26)	3 (25)	2 (29)	7 (18)	5 (21)	8 (18)	4.3 ± 2.1
24	LCBO	84	5 (21)	3 (28)	3 (27)	3 (26)	3 (25)	8 (13)	2 (31)	5 (21)	7 (21)	4.3 ± 2.1
26	Burger King	22	3 (27)	3 (28)	8 (15)	2 (30)	3 (25)	4 (23)	4 (25)	4 (25)	7 (21)	4.2 ± 2.0

Rank	Location Type*	Number of Facilities	Actual Coverage, (Ranking)									Annual Actual Coverage mean ± SD
			2007	2008	2009	2010	2011	2012	2013	2014	2015	
26	Pizza Nova	52	4 (25)	6 (17)	4 (23)	5 (19)	1 (34)	4 (23)	4 (25)	2 (34)	8 (18)	4.2 ± 2.0
28	BeerStore	66	1 (34)	4 (25)	1 (38)	1 (34)	4 (22)	5 (19)	4 (25)	5 (21)	7 (21)	3.6 ± 2.1
29	Swiss Chalet	35	2 (31)	3 (28)	3 (27)	4 (22)	4 (22)	5 (19)	6 (20)	2 (34)	2 (35)	3.4 ± 1.4
30	Mac's	37	1 (34)	4 (25)	5 (21)	4 (22)	3 (25)	0 (39)	1 (36)	2 (34)	8 (18)	3.1 ± 2.5
31	Library	101	3 (27)	3 (28)	0 (39)	4 (22)	0 (39)	1 (35)	4 (25)	4 (25)	6 (26)	2.8 ± 2.0
32	Harvey's	25	0 (37)	0 (41)	3 (27)	5 (19)	3 (25)	3 (26)	0 (41)	5 (21)	3 (29)	2.4 ± 2.0
32	Esso	77	3 (27)	2 (34)	2 (35)	2 (30)	1 (34)	3 (26)	6 (20)	1 (37)	2 (35)	2.4 ± 1.5
34	Swimming Pool	117	0 (37)	3 (28)	2 (35)	0 (37)	5 (20)	3 (26)	1 (36)	4 (25)	0 (40)	2.0 ± 1.9
35	Metro	28	3 (27)	4 (25)	3 (27)	0 (37)	1 (34)	1 (35)	1 (36)	1 (37)	3 (29)	1.9 ± 1.4
36	Separate School	223	0 (37)	2 (34)	3 (27)	1 (34)	2 (31)	2 (29)	1 (36)	1 (37)	3 (29)	1.8 ± 1.3
37	Private School	211	2 (31)	1 (37)	0 (39)	2 (30)	1 (34)	2 (29)	2 (31)	0 (41)	3 (29)	1.7 ± 1.0
37	Wendy's	20	0 (37)	1 (37)	3 (27)	1 (34)	1 (34)	2 (29)	4 (25)	3 (30)	0 (40)	1.7 ± 1.4
37	Dairy Queen	23	0 (37)	3 (28)	3 (27)	0 (37)	2 (31)	0 (39)	2 (31)	3 (30)	2 (35)	1.7 ± 1.3
40	UPS Store	36	1 (34)	1 (37)	2 (35)	0 (37)	0 (39)	1 (35)	2 (31)	1 (37)	2 (35)	1.1 ± 0.8
41	Canadian Tire	65	2 (31)	1 (37)	0 (39)	0 (37)	0 (39)	0 (39)	1 (36)	3 (30)	1 (39)	0.9 ± 1.1

The ICC value for temporal variation in coverage is 0.88 (95%CI, 0.83 to 0.93).

*ATM, Automated Teller Machine; BMO, Bank of Montreal; CIBC, Canadian Imperial Bank of Commerce; LCBO, Liquor Control Board of Ontario; RBC, Royal Bank of Canada; Separate School, religious schools (students from a religious group); Scotiabank, Bank of Nova Scotia; TD, Toronto-Dominion Bank.

The ATM locations consist of stand-alone ATMS and ATMs located in their respective bank branches.

Table 6

Actual coverage of the 41 businesses and government locations ranked by average actual coverage in downtown Toronto per year from 2007 – 2015.

Downtown Rank	Downtown Location Type*	Number of Facilities	Actual Coverage, (Ranking)									Average Actual Coverage per year ± SD
			2007	2008	2009	2010	2011	2012	2013	2014	2015	
1	Starbucks	75	11 (4)	16 (3)	13 (2)	8 (1)	14 (1)	13 (1)	10 (2)	10 (3)	15 (3)	12.2 ± 2.6
2	Tim Hortons	73	11 (4)	18 (1)	8 (6)	8 (1)	6 (4)	10 (3)	12 (1)	8 (6)	16 (2)	10.8 ± 4.0
3	RBC ATM	66	12 (3)	18 (1)	10 (3)	4 (6)	6 (4)	8 (5)	7 (4)	11 (1)	18 (1)	10.4 ± 5.0
4	Scotiabank ATM	33	15 (1)	12 (5)	9 (4)	3 (13)	8 (2)	8 (5)	7 (4)	6 (8)	9 (7)	8.6 ± 3.4
4	Subway	71	13 (2)	10 (6)	7 (7)	6 (4)	4 (8)	10 (3)	6 (9)	10 (3)	11 (4)	8.6 ± 2.9
6	TD ATM	39	4 (12)	8 (8)	14 (1)	4 (6)	8 (2)	12 (2)	7 (4)	11 (1)	7 (11)	8.3 ± 3.4
7	Second Cup	41	8 (7)	13 (4)	6 (10)	5 (5)	5 (6)	3 (12)	10 (2)	7 (7)	10 (5)	7.4 ± 3.1
8	CIBC ATM	32	10 (6)	7 (9)	7 (7)	8 (1)	3 (11)	6 (8)	4 (13)	10 (3)	9 (7)	7.1 ± 2.5
9	BMO ATM	30	5 (8)	9 (7)	9 (4)	4 (6)	4 (8)	4 (11)	7 (4)	6 (8)	8 (10)	6.2 ± 2.1
10	Shoppers Drug Mart	25	5 (8)	5 (12)	6 (10)	4 (6)	5 (6)	5 (10)	7 (4)	6 (8)	10 (5)	5.9 ± 1.8
11	Green P Parking	39	5 (8)	6 (11)	7 (7)	3 (13)	0 (27)	7 (7)	5 (10)	5 (11)	9 (7)	5.2 ± 2.6
12	McDonald's	15	4 (12)	7 (9)	6 (10)	1 (21)	3 (11)	3 (12)	5 (10)	4 (13)	6 (12)	4.3 ± 1.9
13	Rexall	13	3 (14)	4 (14)	2 (15)	4 (6)	3 (11)	3 (12)	3 (14)	3 (17)	2 (18)	3.0 ± 0.7
14	TD Branch	22	3 (14)	2 (19)	5 (13)	4 (6)	2 (14)	3 (12)	2 (18)	4 (13)	1 (25)	2.9 ± 1.3
15	CIBC Branch	17	3 (14)	3 (15)	1 (21)	4 (6)	2 (14)	2 (17)	2 (18)	5 (11)	3 (16)	2.8 ± 1.2
16	Pizza Pizza	14	2 (19)	2 (19)	3 (14)	3 (13)	1 (18)	3 (12)	5 (10)	1 (24)	3 (16)	2.6 ± 1.2
16	Goodlife Fitness	13	2 (19)	1 (23)	2 (15)	3 (13)	4 (8)	6 (8)	0 (31)	0 (29)	5 (13)	2.6 ± 2.1
18	7-Eleven	6	3 (14)	3 (15)	2 (15)	1 (21)	1 (18)	2 (17)	2 (18)	2 (20)	5 (13)	2.3 ± 1.2
19	Pizza Nova	6	5 (8)	1 (23)	1 (21)	2 (18)	1 (18)	2 (17)	3 (14)	2 (20)	2 (18)	2.1 ± 1.3
20	RBC Branch	18	1 (24)	1 (23)	0 (32)	3 (13)	1 (18)	2 (17)	2 (18)	2 (20)	5 (13)	1.9 ± 1.5
20	Burger King	4	2 (19)	3 (15)	1 (21)	1 (21)	2 (14)	1 (25)	2 (18)	3 (17)	2 (18)	1.9 ± 0.8
20	LCBO	17	3 (14)	1 (23)	2 (15)	2 (18)	1 (18)	2 (17)	0 (31)	4 (13)	2 (18)	1.9 ± 1.2
23	BMO Branch	16	1 (24)	3 (15)	2 (15)	1 (21)	0 (27)	2 (17)	3 (14)	3 (17)	1 (25)	1.8 ± 1.1
24	Scotiabank Branch	15	2 (19)	5 (12)	0 (32)	0 (27)	2 (14)	2 (17)	2 (18)	0 (29)	0 (35)	1.4 ± 1.7
25	Swiss Chalet	7	2 (19)	0 (34)	1 (21)	0 (27)	1 (18)	1 (25)	3 (14)	1 (24)	2 (18)	1.2 ± 1.0
26	Harvey's	4	0 (32)	1 (23)	1 (21)	0 (27)	1 (18)	1 (25)	1 (25)	4 (13)	1 (25)	1.1 ± 1.2

Downtown Rank	Downtown Location Type*	Number of Facilities	Actual Coverage, (Ranking)									Average Actual Coverage per year ± SD
			2007	2008	2009	2010	2011	2012	2013	2014	2015	
26	BeerStore	8	0 (32)	1 (23)	1 (21)	2 (18)	0 (27)	1 (25)	1 (25)	2 (20)	2 (18)	1.1 ± 0.8
28	Metro	4	1 (24)	1 (23)	1 (21)	0 (27)	0 (27)	2 (17)	1 (25)	1 (24)	1 (25)	0.9 ± 0.6
29	UPS Store	8	0 (32)	0 (34)	2 (15)	1 (21)	1 (18)	0 (32)	2 (18)	0 (29)	1 (25)	0.8 ± 0.8
30	Private School	19	1 (24)	0 (34)	1 (21)	1 (21)	0 (27)	0 (32)	0 (31)	1 (24)	2 (18)	0.7 ± 0.7
31	Library	12	1 (24)	1 (23)	1 (21)	0 (27)	0 (27)	0 (32)	1 (25)	0 (29)	1 (25)	0.6 ± 0.5
31	Swimming Pool	7	0 (32)	2 (19)	1 (21)	0 (27)	0 (27)	1 (25)	0 (31)	0 (29)	1 (25)	0.6 ± 0.7
31	Dairy Queen	3	1 (24)	2 (19)	0 (32)	0 (27)	0 (27)	0 (32)	0 (31)	1 (24)	1 (25)	0.6 ± 0.7
34	Wendy’s	3	0 (32)	1 (23)	0 (32)	0 (27)	0 (27)	0 (32)	1 (25)	0 (29)	1 (25)	0.3 ± 0.5
34	Mac’s	2	0 (32)	0 (34)	0 (32)	0 (27)	0 (27)	1 (25)	1 (25)	0 (29)	1 (25)	0.3 ± 0.5
36	Public School	29	1 (24)	0 (34)	1 (21)	0 (27)	0 (27)	0 (32)	0 (31)	0 (29)	0 (35)	0.2 ± 0.4
36	Petrocan	3	1 (24)	1 (23)	0 (32)	0 (27)	0 (27)	0 (32)	0 (31)	0 (29)	0 (35)	0.2 ± 0.4
38	Separate School	9	0 (32)	1 (23)	0 (32)	0 (27)	0 (27)	0 (32)	0 (31)	0 (29)	0 (35)	0.1 ± 0.3
38	Canadian Tire	7	0 (32)	0 (34)	0 (32)	0 (27)	1 (18)	0 (32)	0 (31)	0 (29)	0 (35)	0.1 ± 0.3
38	Shell	2	0 (32)	0 (34)	0 (32)	0 (27)	0 (27)	0 (32)	0 (31)	0 (29)	0 (35)	0.1 ± 0.3
38	Esso	4	0 (32)	0 (34)	0 (32)	0 (27)	0 (27)	1 (25)	0 (31)	0 (29)	0 (35)	0.1 ± 0.3

The ICC value for temporal variation in coverage is 0.79 (95% CI, 0.71 to 0.86).

*ATM, Automated Teller Machine; BMO, Bank of Montreal; CIBC, Canadian Imperial Bank of Commerce; LCBO, Liquor Control Board of Ontario; RBC, Royal Bank of Canada; Separate School, religious schools (students from a religious group); Scotiabank, Bank of Nova Scotia; TD, Toronto-Dominion Bank.

The ATM locations consist of stand-alone ATMS and ATMs located in their respective bank branches.

Table 7

Broad location categories ranked by actual coverage in Toronto.

Rank	Location Category‡	Actual Coverage	Assumed 24/7 Coverage, (Rank)	Number of Facilities, (Rank)	Coverage Efficiency, (Rank)	Coverage Loss, % (Rank)
1	Bank ATM	640	697 (1)	952 (2)	0.67 (6)	8.2 (5)
2	Restaurant Chain	444	523 (2)	652 (3)	0.68 (5)	15.1 (7)
3	Coffee Shop	443	518 (3)	558 (4)	0.79 (3)	14.5 (6)
4	Bank	260	470 (4)	549 (5)	0.47 (9)	44.7 (11)
5	Parking Lot	177	187 (6)	229 (6)	0.77 (4)	5.3 (3)
6	Pharmacy	163	222 (5)	183 (8)	0.89 (2)	26.6 (8)
7	Gas Station	117	117 (8)	208 (7)	0.56 (8)	0.0 (1)
8	Convenience Store	74	74 (11)	61 (13)	1.21 (1)	0.0 (1)
9	Liquor/Beer Store	69	108 (9)	150 (10)	0.46 (10)	36.1 (10)
10	School	69	158 (7)	1018 (1)	0.07 (14)	56.3 (14)
11	Recreational Facility	61	88 (10)	159 (9)	0.38 (11)	30.7 (9)
12	Library	25	50 (12)	101 (11)	0.25 (12)	50.0 (12)
13	Retail Store	18	40 (13)	101 (11)	0.18 (13)	55.0 (13)
14	Grocery Store	17	18 (14)	28 (14)	0.61 (7)	5.6 (4)
	Average	**184.1***	**233.6***	**340.1***	**0.67**†	**17.8**†

Coverage Efficiency: the actual coverage divided by the number of facilities; Coverage loss: the assumed 24/7 coverage minus actual coverage all divided by assumed 24/7 coverage

*Overall average (averaged over all 14 broad location categories)

†Weighted average (over all 14 broad location categories, weighted by the *actual coverage* values of each location category)

‡ATM, Automated Teller Machine; BMO, Bank of Montreal; CIBC, Canadian Imperial Bank of Commerce; LCBO, Liquor Control Board of Ontario; RBC, Royal Bank of Canada; Separate School, religious schools (students from a religious group); Scotiabank, Bank of Nova Scotia; TD, Toronto-Dominion Bank.

The ATM locations consist of stand-alone ATMS and ATMs located in their respective bank branches.

Table 8

Broad location categories ranked by actual coverage in downtown Toronto.

Downtown Rank	Location Category‡	Actual Coverage	Assumed 24/7 Coverage, (Rank)	Number of Facilities, (Rank)	Coverage Efficiency, (Rank)	Coverage Loss, % (Rank)
1	Bank ATM	218	242 (1)	200 (1)	1.09 (7)	9.9 (5)
2	Coffee Shop	186	224 (2)	189 (2)	0.98 (9)	17.0 (6)
3	Restaurant Chain	148	182 (3)	127 (3)	1.17 (6)	18.7 (7)
4	Pharmacy	78	107 (5)	38 (7)	2.05 (2)	27.1 (9)
5	Bank	74	134 (4)	88 (4)	0.84 (10)	44.8 (12)
6	Parking Lot	47	50 (6)	39 (6)	1.21 (5)	6.0 (4)
7	Recreational Facility	28	38 (7)	20 (9)	1.40 (4)	26.3 (8)
8	Liquor/Beer Store	25	36 (8)	25 (8)	1.00 (8)	30.6 (10)
9	Convenience Store	24	24 (10)	8 (13)	3.00 (1)	0.0 (1)
10	School	9	34 (9)	57 (5)	0.16 (14)	73.5 (14)
11	Grocery Store	8	8 (13)	4 (14)	2.00 (3)	0.0 (1)
12	Retail Store	8	20 (11)	15 (10)	0.53 (11)	60.0 (13)
13	Library	5	9 (12)	12 (11)	0.42 (13)	44.4 (11)
14	Gas Station	4	4 (14)	9 (12)	0.44 (12)	0.0 (1)
	Average	**61.6***	**79.4***	**59.4***	**1.20**†	**19.3**†

Coverage Efficiency: the actual coverage divided by the number of facilities; Coverage loss: the assumed 24/7 coverage minus actual coverage all divided by assumed 24/7 coverage

*Overall average (averaged over all 14 broad location categories)

†Weighted average (over all 14 broad location categories, weighted by the *actual coverage* values of each location category)

‡ATM, Automated Teller Machine; BMO, Bank of Montreal; CIBC, Canadian Imperial Bank of Commerce; LCBO, Liquor Control Board of Ontario; RBC, Royal Bank of Canada; Separate School, religious schools (students from a religious group); Scotiabank, Bank of Nova Scotia; TD, Toronto-Dominion Bank.

The ATM locations consist of stand-alone ATMS and ATMs located in their respective bank branches.