

Analyzing Visitor Trends at Toronto Public Library Branches (2012 - 2022):*

possible insights into community engagement for strategic resource allocation

Christina Nguyen

September 26, 2024

This paper analyzes the visitation trends of Toronto Public Library (TPL)'s branches from 2012 through to 2022 as a base to understand community engagement and resource utilization. We identify patterns in branch usage, highlighting significant fluctuations and growth areas. The findings can be used by administrators and community engagement planners to inform strategic decisions about resource allocation and service improvement. Ultimately, this research can enhance the TPL's ability to meet the evolving needs of its diverse user base.

1 Introduction

The Toronto Public Library (TPL) system has over 100 branches, which serve as vital hubs for community engagement, information access, and public services. Given the size of this urban library system and its role in supporting the diverse needs of Toronto's population, understanding how patrons use these branches is key to effective resource allocation, program development, and long-term planning. However, while the annual collection of visit data offers a wealth of information, there remains a large gap in understanding why certain branches experience more or less traffic, and how external factors such as demographic shifts, neighborhood developments, and public transportation access can influence branch visits. Filling this gap provides a deeper, comprehensive view of how library services can adapt to meet the evolving needs of Toronto's communities. This paper sets the foundation for that type of community-focused research.

With sensors at the entrances and exits, each TPL branch collected data about how many visits they received annually, from 2012 to 2022. The visits were based on entries only, and may have counted the same person multiple times per day if they left and re-entered the branch

*This code and data are available at: <https://github.com/ChristinaDNgyuen/tpl-opendata-libraries>

(City of Toronto 2024a). Several other data collection factors can affect the analysis of this data, which is discussed in the [Data collection considerations](#) section of this paper. This data helps TPL better service patrons, by understanding which branches get more or less traffic and which trends may emerge over time (for example, in the course of one decade). R is used to process and present the data (R Core Team 2024).

In the [data section below](#), I explored the annual visits to Toronto Public Library (TPL) branches from 2012 to 2022, with a focus on making the data usable and informative. Initially, the raw data from Open Data Toronto was by replacing branch code abbreviations with their full names using a reference dataset. I then conducted a comprehensive examination of library engagement by calculating total visits per branch over the entire decade, identifying the top and bottom ten branches in terms of cumulative visits. Further, I computed key summary statistics — mean, median, mode, and standard deviation of visits for each branch — giving insights into overall performance and trends. Graphs were made to illustrate the mean and median visits, along with standard deviation as error bars, allowing for a better understanding of branch usage variability and helping inform resource allocation for library administration.

2 Data

The data comes from Open Data Toronto (City of Toronto 2024a), which hosts official open data from city divisions and agencies. This particular data measures the number of visits to each branch per year.

2.1 Total visits per branch

First, we calculate the total number of visits per branch over all the years from 2012 - 2022. That is, how many visits did Albion have over the 10 years? How many visits did Agincourt have over the 10 years? and vice versa, for all branches. See Table 1 below.

```
Rows: 1129 Columns: 4
-- Column specification -----
Delimiter: ","
chr (1): BranchCode
dbl (3): _id, Year, Visits

i Use `spec()` to retrieve the full column specification for this data.
i Specify the column types or set `show_col_types = FALSE` to quiet this message.

# A tibble: 1,129 x 4
  `_id` Year BranchCode Visits
```

```

      <dbl> <dbl> <chr>      <dbl>
1         1  2012 AB        522309
2         2  2012 ACD       214076
3         3  2012 AD         88065
4         4  2012 AG       434320
5         5  2012 AH         67184
6         6  2012 AN        96885
7         7  2012 AP        74678
8         8  2012 BB        61252
9         9  2012 BC        95843
10        10  2012 BD        62326
# i 1,119 more rows

```

```

# A tibble: 1,129 x 4
  RowID  Year BranchName AnnualNumberofVisits
  <dbl> <dbl> <chr>      <dbl>
1         1  2012 AB        522309
2         2  2012 ACD       214076
3         3  2012 AD         88065
4         4  2012 AG       434320
5         5  2012 AH         67184
6         6  2012 AN        96885
7         7  2012 AP        74678
8         8  2012 BB        61252
9         9  2012 BC        95843
10        10  2012 BD        62326
# i 1,119 more rows

```

BranchNameTotalVisits	
TRL	12,490,809
CL	11,797,812
FV	3,779,178
WS	3,671,407
BRW	3,627,813
AG	3,373,889
CED	3,363,500
BL	3,335,607

BranchName	TotalVisits
RI	3,307,601
ND	3,153,955
PK	3,034,290
AB	3,019,098
MAL	2,987,018
LS	2,977,643
RN	2,833,494
BF	2,602,907
DP	2,455,891
SWS	2,367,159
DM	2,327,942
ACD	2,309,471
SA	2,277,424
PA	2,173,803
EA	2,098,356
BR	2,022,746
MAS	1,960,599
PL	1,923,839
BE	1,891,080
HP	1,873,036
DO	1,871,793
ES	1,855,289
RD	1,750,059
LO	1,739,145
TH	1,728,127
CH	1,725,253
YW	1,708,327

BranchName	TotalVisits
EN	1,680,546
GHP	1,557,927
SJ	1,547,342
DA	1,530,185
JD	1,468,039
LE	1,455,497
YO	1,439,828
FP	1,436,702
MRV	1,395,110
ST	1,361,385
CE	1,311,773
FO	1,262,926
HW	1,211,365
HIL	1,193,110
MA	1,142,741
MCG	1,134,464
SL	1,079,769
SC	1,073,004
MS	1,053,955
PM	1,052,586
DU	1,035,654
CS	1,005,647
FH	996,165
DR	979,769
AN	965,932
KE	922,500
PU	906,714

BranchName	TotalVisits
BUR	904,520
GE	898,071
JS	883,192
WE	880,813
AD	874,578
BC	865,056
MI	853,527
PV	843,726
WY	819,930
OV	783,167
SP	745,846
JO	739,380
BB	704,285
MD	688,115
CC	687,784
NT	635,512
AH	607,512
HC	606,237
QS	594,631
BD	547,021
MP	528,051
LB	509,557
AP	484,452
GW	472,509
HB	456,338
EG	452,949
WP	443,702

BranchName	TotalVisits
EB	443,209
RX	419,591
PE	405,127
HS	398,503
VV	390,612
TA	355,080
NE	338,654
DT	330,385
SI	237,143
TOD	233,032
SW	192,247
BKONE	191,417
SB	157,078
OS	118,728
ME	92,011

In this two-column table, we see the name of the branch on the left, and the total number of visits it had over the ten years on the right. Below the table is readjusted into two smaller tables, one to display the top 10 most visited libraries, and one to display the bottom 10 most visited libraries.

```
# A tibble: 10 x 2
  BranchName TotalVisits
  <chr>         <dbl>
1 TRL           12490809
2 CL            11797812
3 FV             3779178
4 WS             3671407
5 BRW            3627813
6 AG             3373889
7 CED            3363500
8 BL             3335607
9 RI             3307601
```

10 ND

3153955

BranchNameTotalVisits	
TRL	12,490,809
CL	11,797,812
FV	3,779,178
WS	3,671,407
BRW	3,627,813
AG	3,373,889
CED	3,363,500
BL	3,335,607
RI	3,307,601
ND	3,153,955

A tibble: 10 x 2

	BranchName	TotalVisits
	<chr>	<dbl>
1	TA	355080
2	NE	338654
3	DT	330385
4	SI	237143
5	TOD	233032
6	SW	192247
7	BKONE	191417
8	SB	157078
9	OS	118728
10	ME	92011

BranchNameTotalVisits	
TA	355,080
NE	338,654
DT	330,385
SI	237,143

BranchName	TotalVisits
TOD	233,032
SW	192,247
BKONE	191,417
SB	157,078
OS	118,728
ME	92,011

2.2 Mean, median, mode, and standard deviations of branch visits

A tibble: 104 x 5

	BranchName	MeanVisits	MedianVisits	ModeVisits	StdDevVisits
	<chr>	<dbl>	<dbl>	<dbl>	<dbl>
1	AB	274463.	260950	522309	145100.
2	ACD	209952.	229609	214076	128133.
3	AD	79507.	97083	88065	33218.
4	AG	306717.	356784	434320	139970.
5	AH	55228.	67355	67184	25009.
6	AN	87812	96885	96885	29927.
7	AP	44041.	51313	74678	19724.
8	BB	64026.	71442	61252	19132.
9	BC	78641.	91963	95843	32992.
10	BD	49729.	51489	62326	19900.

i 94 more rows

BranchName	MeanVisits	MedianVisits	ModeVisits	StdDevVisits
AB	274,463.455	260,950.0	522,309	145,099.677
ACD	209,951.909	229,609.0	214,076	128,132.710
AD	79,507.091	97,083.0	88,065	33,217.927
AG	306,717.182	356,784.0	434,320	139,970.334
AH	55,228.364	67,355.0	67,184	25,009.174
AN	87,812.000	96,885.0	96,885	29,927.298
AP	44,041.091	51,313.0	74,678	19,723.867

BranchName	MeanVisits	MedianVisits	ModeVisits	StdDevVisits
BB	64,025.909	71,442.0	61,252	19,131.573
BC	78,641.455	91,963.0	95,843	32,992.019
BD	49,729.182	51,489.0	62,326	19,899.816
BE	171,916.364	187,288.0	235,687	58,120.511
BF	236,627.909	246,900.0	353,141	102,381.182
BKONE	17,401.545	16,034.0	39,749	11,072.478
BL	303,237.000	362,150.0	373,581	108,215.183
BR	183,886.000	232,857.0	40,479	84,896.765
BRW	329,801.182	399,650.0	392,397	143,162.582
BUR	82,229.091	85,122.0	151,087	46,811.004
CC	62,525.818	67,906.0	89,195	22,960.353
CE	119,252.091	125,613.0	143,138	40,635.919
CED	305,772.727	355,089.0	415,753	122,562.517
CH	172,525.300	198,018.0	215,588	65,808.290
CL	1,072,528.364	1,447,718.0	1,493,796	530,112.361
CS	91,422.455	103,458.0	120,622	33,386.194
DA	139,107.727	158,188.0	168,594	45,351.604
DM	211,631.091	248,880.0	248,880	73,590.878
DO	170,163.000	168,733.0	339,600	82,237.668
DP	223,262.818	247,425.0	229,132	75,437.681
DR	89,069.909	96,392.0	133,892	36,622.573
DT	30,035.000	36,185.0	40,644	14,576.697
DU	94,150.364	105,000.0	117,090	28,886.228
EA	190,759.636	223,854.0	205,341	62,829.053
EB	40,291.727	45,807.0	54,894	15,598.539
EG	41,177.182	47,549.0	51,552	17,556.085
EN	152,776.909	171,685.0	188,863	62,127.173

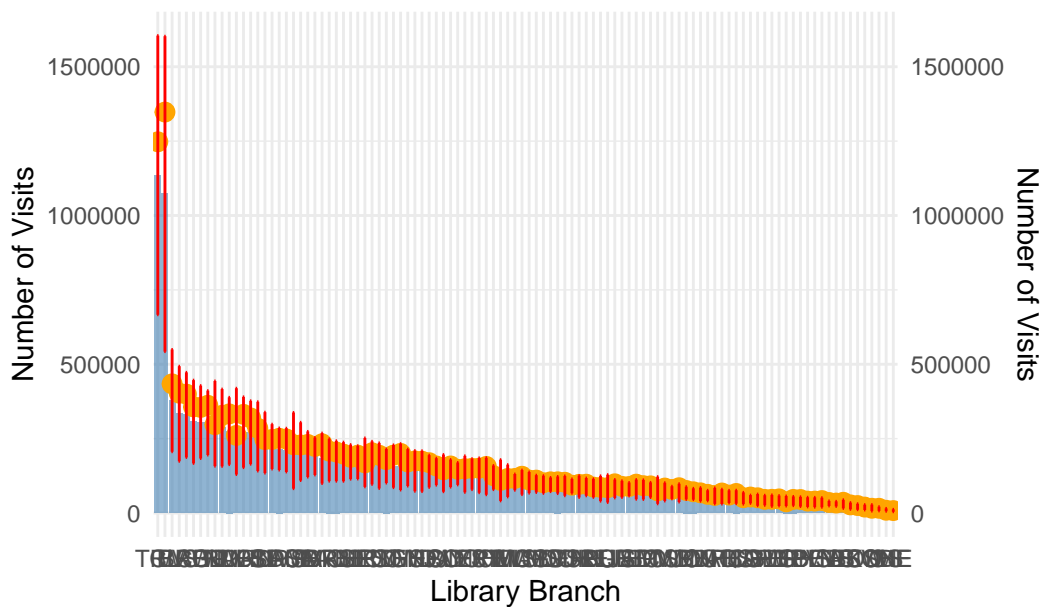
BranchName	MeanVisits	MedianVisits	ModeVisits	StdDevVisits
ES	168,662.636	202,550.0	220,158	72,439.420
FH	90,560.455	93,575.0	93,424	24,251.194
FO	140,325.111	169,371.0	96,613	54,216.862
FP	130,609.273	150,363.0	150,663	52,008.034
FV	377,917.800	434,143.0	442,214	171,988.624
GE	81,642.818	98,279.0	104,885	31,061.152
GHP	141,629.727	175,028.0	205,973	68,478.099
GW	42,955.364	45,950.0	58,289	16,971.763
HB	41,485.273	46,188.0	59,603	19,424.323
HC	55,112.455	60,375.0	80,642	21,235.828
HIL	108,464.545	116,053.0	150,059	54,266.915
HP	170,276.000	194,450.0	164,444	55,806.885
HS	36,227.545	40,175.0	51,300	16,595.516
HW	110,124.091	109,813.0	209,196	69,383.746
JD	133,458.091	158,197.0	165,105	46,483.414
JO	67,216.364	75,850.0	87,163	21,529.266
JS	80,290.182	89,668.0	95,315	28,100.871
KE	83,863.636	87,203.0	117,782	31,310.012
LB	46,323.364	53,775.0	53,681	14,022.451
LE	132,317.909	147,050.0	134,816	37,698.470
LO	158,104.091	179,513.0	181,942	57,400.713
LS	270,694.818	319,555.0	370,557	106,563.756
MA	103,885.545	116,263.0	127,129	27,348.425
MAL	271,547.091	331,665.0	358,262	119,062.386
MAS	178,236.273	208,021.0	242,057	71,167.434
MCG	103,133.091	123,663.0	132,919	41,304.536
MD	68,811.500	79,232.5	57,388	21,289.934

BranchName	MeanVisits	MedianVisits	ModeVisits	StdDevVisits
ME	8,364.636	8,300.0	7,612	4,144.009
MI	77,593.364	91,352.0	93,400	25,535.208
MP	58,672.333	62,863.0	66,278	17,822.225
MRV	126,828.182	150,788.0	168,413	58,635.994
MS	95,814.091	101,804.0	119,263	29,793.289
ND	286,723.182	328,400.0	407,488	129,923.133
NE	30,786.727	33,536.0	39,158	8,639.624
NT	57,773.818	59,211.0	88,266	26,930.155
OS	10,793.455	9,372.0	9,372	4,877.968
OV	71,197.000	84,013.0	79,205	30,809.041
PA	197,618.455	230,567.0	279,483	76,764.428
PE	36,829.727	40,100.0	35,235	16,311.622
PK	275,844.545	333,245.0	315,734	113,154.890
PL	174,894.455	205,094.0	205,094	67,953.631
PM	95,689.636	104,919.0	119,602	23,843.533
PU	82,428.545	86,237.0	134,834	42,550.633
PV	76,702.364	74,638.0	103,343	45,711.373
QS	54,057.364	65,850.0	60,209	22,740.078
RD	159,096.273	194,268.0	231,360	76,596.957
RI	300,691.000	296,948.0	421,962	143,190.402
RN	257,590.364	284,820.0	325,843	116,430.082
RX	38,144.636	45,502.0	45,502	16,513.726
SA	207,038.545	228,745.0	352,949	97,911.965
SB	14,279.818	15,950.0	21,484	7,120.583
SC	134,125.500	145,453.5	83,038	62,531.690
SI	23,714.300	27,351.5	41,997	11,478.885
SJ	140,667.455	174,275.0	198,384	68,596.233

BranchName	MeanVisits	MedianVisits	ModeVisits	StdDevVisits
SL	98,160.818	110,738.0	99,144	29,157.389
SP	67,804.182	85,114.0	92,352	30,730.411
ST	123,762.273	156,659.0	210,047	62,255.253
SW	19,224.700	19,972.0	20,256	9,055.411
SWS	215,196.273	251,375.0	254,166	70,707.457
TA	32,280.000	35,466.0	40,929	8,571.669
TH	157,102.455	194,581.0	205,064	71,928.389
TOD	21,184.727	25,246.0	21,401	10,149.504
TRL	1,135,528.091	1,247,697.0	1,137,016	469,120.356
VV	35,510.182	41,950.0	65,984	16,154.758
WE	80,073.909	89,225.0	84,777	22,727.136
WP	40,336.545	37,725.0	35,561	16,918.922
WS	333,764.273	402,862.0	488,396	159,894.697
WY	102,491.250	110,846.0	107,079	35,647.162
YO	130,893.455	148,942.0	208,985	61,370.625
YW	155,302.455	200,531.0	212,775	77,982.711

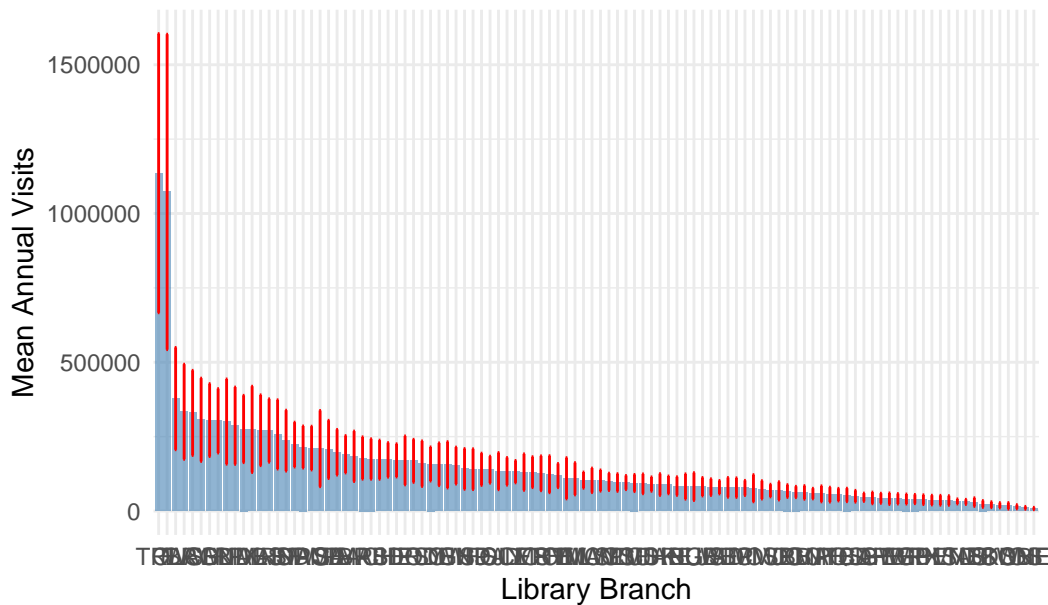
From these summary statistics, we can create two smaller graphs; the first, to look at mean and median (Figure 1); the second, to look at mean and standard deviation (Figure 2).

Figure 1: Mean, Median, and Mode Annual Visits per Librai



Given the graph above, `mean_and_median_graph`, most library branches visually have medians (orange dots) close to the mean (blue bars). Only two branches have means significantly higher than the median, i.e. the two leftmost branches on the graph. The labels on the x-axis are difficult to read due to the large number of library branches, so we check: in the dataset, those two branches are Toronto Reference Library and North York Central Library. That means that, for TRL and NYCL, some years had exceptionally higher visits. To verify, let us look at our second graph, the one with standard deviation alongside the mean:

Figure 2: Mean Annual Visits per Library Branch with Stanc



We can see that the leftmost two branches, as we noticed earlier in the mean/median comparison, shows a high amount of variation in the number of annual visits (the red bar is comparatively large for these two, when looking at the rest of the branches).

3 Discussion

To contextualize the public library visitation data with external factors, we need to consider several key influences, such as population growth, local events, and policy changes. These factors can heavily impact how many visitors each branch gets over time, shaping trends across the library system.

3.1 1. Population growth and demographics:

Branches in areas with rapid population growth are likely to experience higher visitation. Libraries like North York Central and Toronto Reference Library have high visitation, possibly due to their location in densely populated neighborhoods or regions undergoing urban development (City of Toronto 2024b). As new housing developments emerge, so does the demand for community resources like libraries (International Federation of Library Associations and Institutions 2020).

North York Central Library: This area has seen significant urban growth and development in recent years, contributing to the branch's high visitor numbers, as evidenced by a mean of over

1 million visits per year. Agincourt likewise is located in a growing region; it sees over 300,000 visits annually, likely reflecting the increasing residential density (City of Toronto 2024b).

3.2 2. Local events and community programming:

Local events and library-specific programs, such as workshops, author talks, and literacy initiatives, can directly affect library traffic. For example: branches like Bloor/Gladstone or Barbara Frum likely benefit from their robust community programming, driving higher foot traffic and frequent use of services. This is reflected in their respective mean visits of over 303,237 and 236,628.

Despite being a newer library (it opened in 2015), Scarborough Civic Centre Library has local events (like afterschool programs, “Toronto Book Awards Celebrate Scarborough”, etc.) and its central location in a busy civic area likely has increased visits, with a mean of about 134,125 visitors annually.

3.3 3. Policy changes and budget allocations:

Libraries are impacted by policies at multiple levels of government. This includes city budget allocations, staffing decisions, and priorities for library services. Specifically, Toronto Public Library’s operations are overseen by the Toronto Public Library Board, plus city council has significant input into its funding. Policy decisions on library hours, the number of staff, and digital service expansions can directly affect visitation.

Importantly, Toronto City Council set budgets that affect the library’s ability to operate efficiently. Cuts in funding may result in shorter hours or fewer programs, leading to a reduction in visits as service decreases. Conversely, budget increases can improve services, leading to higher engagement and foot traffic. Further querying from several data sources can identify trends and develop hypotheses around this relationship.

Further, the Ontario Ministry of Heritage, Sport, Tourism and Culture Industries oversees library development at the provincial level, affecting funding streams for infrastructure, technology grants, or literacy programs (Ministry of Tourism, Culture and Gaming and Ministry of Sport 2024). If there are shifts in provincial funding priorities, certain branches may experience either growth or decline in visitation.

3.4 4. Digital vs. physical use:

With an increasing shift toward digital resources, some branches may see lower physical foot traffic but high engagement online. The Toronto Reference Library serves as a major hub for digital services, reflected in its role as a research center. However, it still impressively maintains over 1 million annual physical visits.

3.5 5. Cultural and economic factors:

Economic conditions also play a role in the number of TPL visits. During economic downturns, libraries often see a spike in visitors as people rely on free resources, whether for job searches, internet access, or entertainment (Rooney-Browne 2009). In contrast, economic growth may lead to changes in how libraries are used, with more digital borrowing and fewer physical visits.

4 Summary:

4.1 Trends in the larger context

The trends in library visitation data are quite possibly shaped by a combination of external factors, including population growth and urban development in certain neighborhoods, which can contribute to higher visitor counts in major branches. Local events and library programming also play a significant role in driving visitation, with branches hosting frequent community events likely to be seeing higher numbers. Policies from city and provincial governments affect operational funding and services, influencing how many people can access and benefit from libraries. Plus, economic shifts and cultural preferences, such as the rise in digital service usage, also shape visitation patterns across different branches.

To fully understand these observed patterns and to validate these theories of correlation, it would be useful to analyze community feedback (through targeted surveys), (Irwin 2014) and evaluate the effectiveness of current services (using metrics like program attendance rates, customer satisfaction surveys, and feedback forms).

4.2 Data collection considerations and next steps

In the realm of public library engagement, data collection plays a pivotal role in understanding user interactions and informing decision-making processes, particularly in a large urban system like the TPL. However, it is crucial to recognize that the metrics collected do not encapsulate the full spectrum of library engagement. For instance, a decline in physical visits over a ten-year period of 2012 - 2022 does not inherently signify a downturn in library performance or user engagement. Instead, it may reflect broader societal trends, such as the increasing prevalence of digital resources and remote access options, which can enhance accessibility and convenience for patrons. In fact, relying solely on physical visit statistics can yield a skewed understanding of how libraries are fulfilling their mission to serve and educate the community.

Future research should seek to explore these nuanced aspects of library engagement by employing a more comprehensive data collection approach. This could include qualitative methods

such as user surveys, focus groups, and interviews to capture patron experiences and perceptions regarding library services. Furthermore, integrating usage data from digital platforms and analyzing trends in remote engagement can provide a more holistic view of library impact. By broadening the scope of data collection, libraries can better understand the changing needs of their communities and adapt their services accordingly, ultimately fostering a more engaged and informed user base.

References

- City of Toronto. 2024a. “Annual Visits to Library Branches (2012-2022).” <https://opendata.toronto.ca/datasets/%5B932efbb4-644f-401b-9f59-af0b31713f44%5D>.
- . 2024b. <https://www.toronto.ca/city-government/data-research-maps/neighbourhoods-communities/neighbourhood-profiles/find-your-neighbourhood/#location=5120%20Yonge%20St&lat=43.768204255&lng=-79.41410041&zoom=11>.
- International Federation of Library Associations and Institutions. 2020. “Valuing Our Communities and Cities: The Role of Libraries in Community-Focused Urban Development.” <https://blogs.ifla.org/lpa/2020/10/30/valuing-our-communities-and-cities-the-role-of-libraries-in-community-focused-urban-development/>.
- Irwin, Bill. 2014. “Creating a Culture of Meaningful Evaluation in Public Libraries: Moving Beyond Quantitative Metrics.” <https://journals.sagepub.com/doi/full/10.1177/2158244014561214>.
- Ministry of Tourism, Culture and Gaming and Ministry of Sport. 2024. “Ontario Public Libraries.” <https://www.ontario.ca/page/ontario-public-libraries>.
- R Core Team. 2024. *R: A Language and Environment for Statistical Computing*. <https://www.R-project.org/>.
- Rooney-Browne, Christine. 2009. “Rising to the challenge: a look at the role of public libraries in times of recession.” <https://www.emerald.com/insight/content/doi/10.1108/00242530910961765/full/html>.