

Expanding Digital Equity in New York City Index (EDEN Index)

ReadMe File

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History:

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Version:

EDEN Index 1.0

Prerequisites:

Microsoft Excel software (version 2016 and beyond) under a Windows environment is recommended to use the EDEN Model template.

Background

What is the EDEN Index?

Expanding Digital Equity in New York City (EDEN) is an index of digital equity indicators that can be used to map digital equity in the City of New York. The Index seeks to enable the City to understand the digital equity effects of its policies, investments, and contracted providers' behavior by quantifying impact across 5 dimensions: Access, Skill, Use, Supportive Environment, and Historical Disenfranchisement. Each dimension contains an extensive set of metrics for the City to measure and assess success.

There are 2 variations of the EDEN Index:

1. **The Complete EDEN Index**: The most comprehensive form of the EDEN Index, this version includes 70 measures to construct its digital equity assessments. Many of the indicators can be accessed through public primary and secondary data sources. However, some measures may require independent data collection.
2. **The Core EDEN Index**: A subset of the Complete EDEN Index, this version includes only the 30 most important and easily determinable digital equity metrics. All input data can be accessed through public datasets, requiring no independent data collection.

Who is the EDEN Index for?

The City of New York can use the EDEN Index to capture digital equity at the zip code-level at a point in time. Providers of broadband, education, employment, healthcare, government, community, and small business services can also use the Index to visualize digital equity in the zip codes they service to assess and contextualize their work.

How does the model work?

The Core and Complete Indexes work by pulling service data related to 5 measures of digital equity: Access, Skills, Use, Supportive Environment, and Historical Disenfranchisement. The City of New York should assign different weights to each dimension, depending on the relative conditions of a particular zip code, and the specific service being evaluated.

For each dimension, users pull data from a variety of data sources to input success metrics. Once the user has plugged in the necessary data, the model outputs total scores for each of the 5 dimensions, as well as an overall score based on the inputs and weights for each dimension.

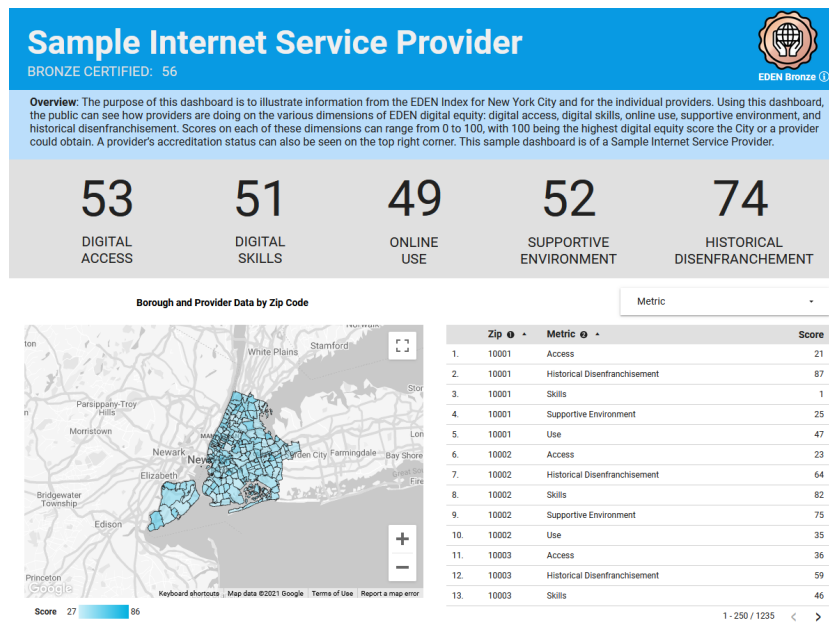
Why are there 2 variations and which should I use?

The Core EDEN Index is simpler and faster to implement, and may be used by the City to create a baseline digital equity score before embarking on a more comprehensive Complete EDEN assessment. The Complete EDEN Index is more thorough, but requires greater investment of City staff time and resources due to additional technical data wrangling tasks such as accessing APIs, normalizing data, and configuring data models.

How might outputs of the EDEN Index be used?

The EDEN Index could be used to publish a City-wide snapshot of digital equity via a public dashboard. Provider-specific assessments can be used to determine when providers have met or exceeded their commitments to the City and contributions to digital equity.

For example, the screenshot below shows a dashboard that visualizes the EDEN Score for a sample provider. The public can see EDEN Index scores for that provider across the 5 dimensions, as well as detailed data by zip code. The public can also see the accreditation level of that provider. (For more information about the proposed accreditation process that could be used in conjunction with this Index, [please see the EDEN Operational Plan here.](#))



Getting Started

Open the latest version of the Complete or Core EDEN Index. To get started with either EDEN model, make a copy of the Excel spreadsheet. Each provider or zip code should get its own tab in the spreadsheet.

Locating Data

Before entering data directly into the model, locate and record the data required in the Model Inputs worksheet. The methodology for deriving inputs is the same for both Core and Complete EDEN Index. Start by identifying the zip code you wish to assess, and note it in cell B3. Then, for each datapoint in each dimension, locate the zip code-specific data.

[Appendices A and B](#) at the end of this document detail from where each value can be pulled. [Table 1](#) in Appendix A lists the sources and URLs, while [Tables 2 through 6](#) detail which sources are necessary for each dimension. Sources are divided into primary sources (which are readily accessible) and secondary sources (which may have additional barriers to access).

In cases where there are no primary or secondary data sources available, the table indicates the data should be attained by surveying residents. Note that none of the Core EDEN Index data sources have this need.

Example

In the Core EDEN Index, the first measure under the Access dimension is “Percent of households with desktop or laptop computers.”

To obtain the value for this measure, refer to Table 2 and find the row corresponding to “Percent of households with desktop or laptop computers.” Using Table 2, the primary source of data is listed as “Microsoft,” and the secondary source is listed as “NTIA.” It is recommended to begin with the primary source of data, Microsoft.

Table 2: Datasets for Access Measures

	FCC	FCC Form 477	NTIA	US Census Bureau	Microsoft	geolSP	NCES	NYC Open Data
Number of fixed phone subscriptions per 100 inhabitants				1		2		
Number of mobile phone subscriptions per 100 inhabitants	1		2					
Percent of inhabitants with internet enabled	2	1						
Percent of households with desktop or laptop computers			2		1			

Look up “Microsoft” under the “Shorthand” column in Table 1. It is shown that this indicator is pulled from “Microsoft’s Airband Initiative,” which is a GitHub repository of Microsoft’s October 2020 open source data on broadband usage. Open the attached hyperlink to access the data source.

Table 1: Data Sources

Original Source	Shorthand	Dataset	Frequency	Access Type	URL
Microsoft's Airband Initiative	Microsoft	US Broadband Usage Percentages Dataset	Varies	Free for analysis	https://github.com/microsoft/USBroadbandUsagePercentages

Assigning Weights

The EDEN Index provides nuanced digital equity snapshots by enabling the City to assign different weights to different measures. These weights can be assigned in Column D of the Model Inputs tab based on the type of provider being evaluated and the goals of a specific investment.

Specifically, the weights enable the City to:

- Compare digital products and service categories that collectively enable a community to reach digital parity;
- Account for the dimensions that each of the digital products and service categories can influence; and
- Reflect the true variability of digital needs by zip code.

CORE EDEN Index .XLSX

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A1:B1 fx User Inputs

	A	B	C	D	E	F	G
17							
18							
19							
20	Assignment of 'weights' for providers						
21		Access	Skills	Use	Supportive	Disenfranchise	Total
22	Broadband and Cellular Providers (Including	0.33	0	0.01	0.33	0.33	1
23	Education Providers	0	0.25	0.25	0.25	0.25	1
24	Employment Providers	0.25	0.25	0	0.25	0.25	1
25	Healthcare Providers	0	0.25	0.25	0.25	0.25	1
26	Government Services	0.2	0.2	0.2	0.2	0.2	1
27	Community Services	0	0.25	0.25	0.25	0.25	1
28	Financial Services	0.25	0	0.25	0.25	0.25	1
29	Small Business Owners	0	0.3	0.1	0.3	0.3	1
30							
31							
32							
33							
34							
35							
36							
37							
38							
39							
40							
41							
42							
43							

MODEL Inputs Core_Model Example- BB Example- CODA

The default values above are recommended to start. Ideally, the Mayor's Office of the Chief Technology Officer should invite community, urban infrastructure, broadband, and equity experts to provide feedback on the most appropriate weights for each category and type of provider. Note that in the recommended default values, proposed weights are 0 for certain types of providers, indicating that those metrics should not be counted towards their scores in the EDEN Index.

	A	B	C	D
1	EDEN Index Scorecard			
2	Cumulative Score		0.357	Overall Weight
3	Access			0.2
4	<i>Access to device</i>			
5	Percentage of households with desktop or laptop computers			
6	Presence of a computer or tablet in household			
7	<i>Quality of connectivity</i>			
8	Average latency			
9	Secure internet servers per million inhabitants			
10	Average bandwidth per user (in bits/second)			
11	Minimum upload and download speed			
12	<i>Point of access</i>			
13	Percentage of households with internet access			
14	Percentage of households with internet access at home			
15	Percentage of households with internet access at work			
16	Percentage of households with hotspot access (public or third party free hotspot)			

Inputting Data into the Model

Once the input data for the model have been retrieved and recorded in the Model Inputs worksheet, input the values into the model. Start by entering the name and type of digital service provider at the top. Below the provider name, record the “freshness” of the data that is being entered into the model.

	A	B	C
1			
2	Zipcode:	10453	
3	Providers (of Digital Access and Services):	Broadband and Cellular: Starry, Flume	
4	Dates:	Jan 2020 - Jan 2021	
5	EDEN Index Scorecard (Example)		

Example

As shown in the ‘Example: BB’ tab, the spreadsheet could be filled out for the broadband and cellular provider Starry Flume.

At the top of the model, in columns A and B, the zip code, provider name, and type of service provider are noted: 10453, Starry Flume, and Broadband and Cellular Provider. Note the date range from which the data in this model will draw: January 2020 – January 2021.

Then, for each measure under the 5 dimensions, the values found from Tables 1 through 6 in column G are recorded. For Starry Flume, the first measure is the “Percent of households with access to desktop or laptop computers.” As this value is 30%, “30” is noted in cell G9. This process has been repeated for each measure under each dimension.

	A	B	C	D	E	F	G	H
1								
2	Zipcode:	10453						
3	Providers (of Digital Access and Services):	Broadband and Cellular: Starry, Flume						
4	Dates:	Jan 2020 - Jan 2021						
5	EDEN Index Scorecard (Example)							
6	Cumulative Score		0.478	Overall Weight	Score			
7	Access			0.33	0.083			
8	Access to device					100		
9			Percentage of households with desktop or laptop computers				30	
10			Presence of a computer or tablet in household				100	

Generating Outputs

With inputted data points for each of the 5 dimensions and corresponding weights, the model returns aggregate measures for each of the 5 dimensions and an overall cumulative score. The aggregate weights are normalized to yield a score ranging from 0 to 1.

Example

As shown in the 'Example: BB" tab, the aggregate weights for each of the 5 dimensions for the sample provider Starry Flume are as follows:

- Access: 0.083
- Skills: 0
- Use: 0.002
- Supportive Environment: 0.165
- Historical Disenfranchisement: 0.229

The aggregate score for 2 dimensions, Access and Use, are highlighted in red because they are less than 20% of their maximum aggregate score. The Skills dimension is also flagged in red as the score is 0 (though this can easily be disregarded as the weight for that section was assigned to be 0).

	A	B	C	D	E	F	G	H
2	Zipcode:	10453						
3	Providers (of Digital Access and Services):	Broadband and Cellular: Starry, Flume						
4	Dates:	Jan 2020 - Jan 2021						
EDEN Index Scorecard (Example)								
6	Cumulative Score		0.478	Overall Weight	Score			
7	Access			0.33	0.083			
8	Access to device				130			
9			Percentage of households with desktop or laptop computers			30		
10			Presence of a computer or tablet in household			100		
11	Quality of connectivity				80			
12			Average latency			20		
13			Secure internet servers per million inhabitants			20		
14			Average bandwidth per user (in bits/second)			20		
15			Minimum upload and download speed			20		
16	Point of access				40			
17			Percentage of households with internet access			10		
18			Percentage of households with internet access at home			10		
19			Percentage of households with internet access at work			10		
20			Percentage of households with hotspot access (public or			10		
21	Skills			0	0.000			
22	Academics				50			
23			Percent enrollment in primary education (taught STEM, critical thinking, coding, etc.)			5		
24			Graduation ratio from primary education			3		
25			Percent enrollment in secondary education (taught STEM, critical thinking, coding, etc.)			10		
26			Graduation ratio from primary and secondary education			20		
27			Percent enrollment in tertiary education			1		
28			Graduation rate from tertiary education			1		
29			Percent above mean years of schooling			10		
30	Use			0.01	0.002			
31	General internet use				40			
32			Percent of residents that used internet at least once in the			20		
33			Percent of residents that used internet at least once in the			20		
34	Supportive Environment			0.33	0.165			
35	Broadband affordability				100			
36			Cost of broadband access at home: monthly cost as a percentage of monthly income			60		
37			Cost of cheapest internet-enabled devices (PC or mobile): total cost as a percentage of annual income			40		
38	Security				50			
39			Percent of residents who are of victims of crime (including cybercrime, violent crime, and domestic abuse)			50		
40	Historical Disenfranchisement			0.33	0.229			
41	Minority background				100			
42			Percent of residents who are racial or ethnic minorities			100		
43	Gender				55			
44			Percent of residents who are women			55		
45	Housing ownership				100			
46			Percent of residents renting their home			100		
47	Poverty rate				200			
48			Percent of residents at or below the federal poverty rate			100		
49			Percent of residents who are SNAP recipients			100		
50	Disability				40			
51			Percent of residents receiving disability			40		
52	Median income				0			

Interpreting Outputs

The model outputs 2 valuable insights:

1. Scores for a zip code-community's digital equity for the 5 dimensions; and
2. A total aggregate score for each provider by zip code.

The scores for each dimension provider nuanced insight into how a provider is performing, as not all dimensions are equally relevant for each provider.

For example, a broadband and cellular provider such as Starry Flume does not directly influence the academic life expectancy of a community (under the Skill dimension). However, it does influence:

- The quality of connectivity (Dimension: Access);
- The rate of internet usage (Dimension: Use);
- The affordability of its services (Dimension: Supportive Environment); and
- The availability of its service in historically underserved areas (Dimension: Historical Disenfranchisement) in a particular zip code.

Therefore, when assessing Starry Flume's impact, the City should upweight the scores in the Access, Use, Supportive Environment, and Historical Disenfranchisement dimensions and downweight the scores in the Skill dimension. When scrutinizing the overall model score more closely, the City might examine the metrics in the Access, Use, Supportive Environment, and Historical Disenfranchisement dimensions and disregard the Skills section entirely.

We also recommend coupling the EDEN model with [a dashboard](#) to visualize results more easily, and iterating on the Index over time.

Appendices: Data Sources for Core and Complete EDEN Indexes

The following tables include the data sources used to capture the measures in the EDEN Index. The first table includes information about the original sources of data. The following tables, one for each of the five EDEN dimensions, show the recommended primary and secondary datasets for each measure, with distinctions for measures included only in the Complete Index, and those included in both the Core and Complete Indexes. (Note: Some measures only have one recommended dataset.)

Appendix A: Original Data Sources

Table 1: Data Sources

Original Source	Shorthand	Dataset	Frequency	Access Type	URL
Federal Communications Commission: Fixed Broadband Deployment	FCC	Fixed Broadband Deployment Data: June, 2020 Status V1 FCC Wireline Competition	Bi-Annual	Free	https://broadbandmap.fcc.gov/#/data-download
Federal Communications Commission: Form 477	FCC Form 477	US - Fixed with Satellites (Jun 2020) Mobile Deployment Data	Bi-Annual	Free	https://www.fcc.gov/general/broadband-deployment-data-fcc-form-477
National Telecommunications and Information Administration	NTIA	County, Tract, Census Block CSV Data American Community Survey about Poverty by Age Group American Community Survey about Computer Ownership and Type of Internet Subscription	Annual	Free	https://broadbandusa.maps.arcgis.com/apps/webappviewer/index.html?id=ba2dcd585f5e43cba41b7c1ebf2a43d0
United States Census	Census	American Community	Annual	Free	https://www.census.gov/library/visualizations/interactive/learn-ab

Bureau		Survey Data Annual Public Sector Statistics Planning Database County Business Patterns and Non-Employer Statistics			out-states-acs-2019.html (Datasets can be found using the search function at this link.)
Microsoft's Airband Initiative	Microsoft	US Broadband Usage Percentages Dataset	Varies	Free for analysis	https://github.com/microsoft/USBroadbandUsagePercentages
geoISP	geoISP	Broadband Internet in Bronx, NY	Varies	Free to view data	https://geoisp.com/us/ny/bronx/
Department of Education: National Center for Education Statistics	NCES	Public Schools College Navigator Data Lab International Data Explorer	Annual	Free	https://nces.ed.gov/datatools/
New York City Open Data	NYC Open Data	Zip Code Breakdowns Neighborhood Development Area Breakdowns DYCD After-School Programs: Reading and Writing Literacy Programs Demographics by Borough DYCD data	Varies	Free	https://opendata.cityofnewyork.us/data/ (Datasets can be found using the search function at this link.)

Appendix B: Datasets Pulled from Each Data Source

Legend:

1	Primary source of data
2	Secondary source of data
	Included only in Core Index
	Included in both Core and Complete Index

Table 2: Datasets for Access Measures

	FCC	FCC Form 477	NTIA	US Census Bureau	Microsoft	geoISP	NCES	NYC Open Data
Number of fixed phone subscriptions per 100 inhabitants				1		2		
Number of mobile phone subscriptions per 100 inhabitants	1		2					
Percent of inhabitants with internet enabled	2	1						
Percent of households with desktop or laptop computers			2		1			
Presence of a computer or tablet in household			2		1			
Percent of households with mobile phone access			1			2		
Number of inhabitants with fixed internet access per 100 inhabitants		2	1					
Number of inhabitants with active mobile broadband access per 100 inhabitants			1			2		
Average latency		1				2		
Secure internet servers per million inhabitants		2	1					
Average bandwidth per user (in bits/second)		1				2		
Minimum upload and download speed		1				2		

Percent of households with internet access			1	2				
Percent of households with internet access at home				2	1			
Percent of households with internet access at work				2	1			
Percent of households with hotspot access (public or third party free hotspot)		1				2		

Table 3: Datasets for Skills Measures

	FCC	FCC Form 477	NTIA	US Census Bureau	Microsoft	geolSP	NCES	NYC Open Data
Percent of literate adults				1			2	
Percent enrollment in primary education (taught STEM, critical thinking, coding, etc.)				1			2	
Graduation ratio from primary education				1			2	
Percent enrollment in secondary education (taught STEM, critical thinking, coding, etc.)				1			2	
Graduation ratio from primary and secondary education				1			2	
Percent enrollment in tertiary education				1			2	
Graduation rate from tertiary education				1			2	
Percent above mean years of schooling				1			2	
Percent possession of 'basic' and 'above basic' digital skills					1			
Percent of inhabitants who have used basic software (word processing, spreadsheet, presentation, integrate text and images, written code, etc.)					1			
Percent of the population with a degree in an IT discipline or related disciplines imparting sufficient digital				1			2	

proficiency								
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Table 4: Datasets for Use Measures

	FCC	FCC Form 477	NTIA	US Census Bureau	Microsoft	geoISP	NCES	NYC Open Data	Survey from residents
Percent of residents that used internet at least once in the last month		1	2						
Percent of residents that used internet at least once in the last week		1	2						
Percent of residents that have streamed, downloaded, or played content	1								
Percent of residents that have used AV communication (Facetime, Zoom, Google, video chat apps, etc.)	1								
Percent of residents that have created and/or managed online content (blog, postings, etc.)					1				
Percent of residents that have searched for information online	1								
Percent of residents that searched for products and/or information at least once in last 12 months									1
Percent of residents that made an online transaction at least once in the last 12 months (ordered good/service, paid bills, bought/sold product, developed commercial site/portal, etc.)									1
Percent of residents that have searched for online banking information									1
Percent of residents that have made a transfer from a website and/or app or a transfer via SMS (to pay bills, receive bills, make digital payments, etc.)									1
Percent of residents that made a digital public service transaction at least once in the last 12 months				2					1

(number of digital steps related to birth, new residence, taxes, registration, etc.)									
Percent of residents that used the internet for work at least once in the last 12 months (coding, apps developed, etc.)				2					1
Percent of residents that used social media at least once in the last 12 months (passive consumption and sharing, active consumption by creating, commenting, etc)									1
Percent of residents that engaged in public discourse online at least once in the last 12 months (voting, petitions, budgets, found information, etc.)									1

Table 5: Datasets for Supportive Environment Measures

	FCC	FCC Form 477	NTIA	US Census Bureau	Microsoft	geISP	NCES	NYC Open Data	Survey from residents
Cost of broadband access at home: monthly cost as a percentage of monthly income				1					
Cost of cheapest internet enabled devices (PC or mobile): total cost as a percentage of annual income								1	
Percent of individuals with access to bank accounts								1	
Percent of individuals with access to alternative financial services (mobile wallets, crypto, Zelle, Stripe, Kabbage, Coinbase, etc.)									1
Percent confidence in the privacy of online activities (extent of trust in information received from both government and non-government sites)									1
Presence of data protection laws [presence of legal and financial penalties when laws are not followed]			1						

Availability and strength of legislation that addresses harassment (presence of legislation, awareness of legislation, remedies for harassment, etc)			1						
Percent of residents who are of victims of crime (including cybercrime, violent crime, and domestic abuse)				1					
Percent of residents who are victims of cybercrime (online abuse/harassment, ransomware, hacking, malware, etc.)				1					
Percent of residents who are victims of domestic abuse								1	
Percent of residents who are victims of violent crime								1	

Table 6: Datasets for Historical Disenfranchisement Measures

	FCC	FCC Form 477	NTIA	US Census Bureau	Microsoft	geoISP	NCES	NYC Open Data	Survey from residents
Percent of residents who are racial or ethnic minorities				1				2	
Percent of residents who are women				1				2	
Percent of residents renting their home				1				2	
Percent of residents at or below the federal poverty rate				1				2	
Percent of residents who are SNAP recipients								1	
Percent of residents receiving disability								1	
Percent calculation: median income of zip code versus median income of New York state or New York City				1					
Percent of residents 18 years or below				1					
Percent of residents who are able to pay bills online									1

Percent of residents who are able to connect with family & friends								1	
Percent of residents who are able to complete homework							1		
Percent of students that meet truency requirements							1		
Percent of residents that use online banking at least once per week									1
Percent of residents that have applied for support services at least once in the last year							2	1	
Percent of residents who sign up and complete online accreditation programs									1
Percent of residents who access health care virtually					2				1
Percent of residents searching and applying for jobs virtually					2				1
Percent of residents working from home (including small businesses)								1	