A Pipeline for Tracking Community-Defined Systems Indicators Using the ACS API and R

Ben Taft
Higher Expectations for Racine County
ben.taft@career2cradle.org

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What community are we talking about?

CONTEXT

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StriveTogether®

Every child. Cradle to career.

- Network of 70 partnerships
  - Place-based
  - Backbone not service providers
  - Collective impact
- Continuous Improvement
  - Inspired by Cincinnatti Children's
  - Influenced by Agile methods

- Shared community vision
- Evidence-based decisions
- Collaborative action
- Investment & sustainability

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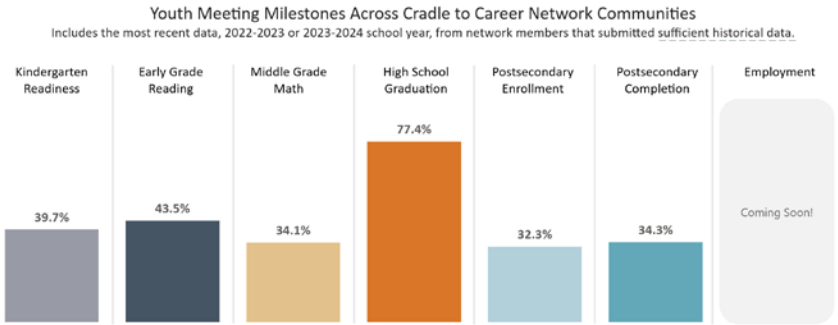
KPIs and other corporate speak

Outcome Areas



Systems Indicators

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Systems indicators are qualitative and quantitative measurements that reveal inequities in how resources, decision-making power and opportunities are distributed to inform policies and practices within institutions, organizations and programs that are interdependent and/or related.

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Data folks in StriveTogether's network

Strengths

- Subject matter experts
- Excellent spreadsheet skills
- Passionate about improving their communities
- Tuned in to clients at local agencies

Weaknesses

- No experience writing software
- No knowledge of data structures or algorithms
- No familiarity with version control
- Brutally time constrained

Artisanal presentations and dashboards backed by spreadsheets.

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Tasks by Expertise

Non-coders

- Formally describe question
- Identify relevant ACS variables
- Create query tables
- Informally describe computations needed

Coders

- Guide description of question
- Provide broad menu of possible ACS variables
- Write scripts to perform computations
- Archive query tables and scripts in version control

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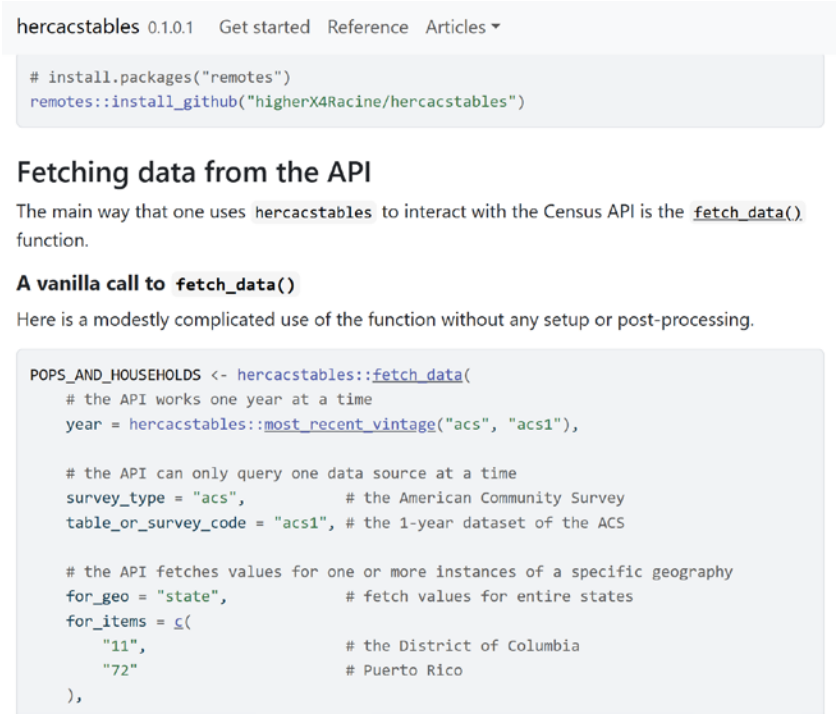
This is the shameless plug for my R package

RESOURCES

hercacstables



hercacstables 0.1.0.1 Get started Reference Articles

```
# install.packages("remotes")
remotes::install_github("higherX4Racine/hercacstables")
```

Fetching data from the API

The main way that one uses `hercacstables` to interact with the Census API is the `fetch_data()` function.

A vanilla call to `fetch_data()`

Here is a modestly complicated use of the function without any setup or post-processing.

```
POPS_AND_HOUSEHOLDS <- hercacstables::fetch_data(
    # the API works one year at a time
    year = hercacstables::most_recent_vintage("acs", "acs1"),

    # the API can only query one data source at a time
    survey_type = "acs",           # the American Community Survey
    table_or_survey_code = "acs1", # the 1-year dataset of the ACS

    # the API fetches values for one or more instances of a specific geography
    for_geo = "state",             # fetch values for entire states
    for_items = c(
        "11",                      # the District of Columbia
        "72"                       # Puerto Rico
    ),
```

Goal: systems indicators with ACS data can be defined once, then calculated on demand for any partnership.

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Unpacking Variable Details

Explore the contents of the ACS

```
UNPACKED_LABELS <-
hercacstables::GLOSSARY_OF_ACS_VARIABLES |>
    hercacstables::hoist_table_glossary(
        .group = "B27010",
        .fields = c("Age Range",
                    "Number of Plans",
                    "Type of Coverage")
    ) |>
    dplyr::filter(
        .data$Dataset == "ACS5"
    ) |>
    hiRx::only_informative_columns()
```

Index	Variable	Age Range	Number of Plans	Type of Coverage
1	B27010_001E		NA	NA
2	B27010_002E	Under 19 years	NA	NA
26	B27010_026E	19 to 34 years	With two or more types of health insurance coverage	NA
37	B27010_037E	35 to 64 years	With one type of health insurance coverage	With direct-purchase health insurance only
60	B27010_060E	65 years and over	With two or more types of health insurance coverage	With employer-based and Medicare coverage

Define queries in tables called “glossaries”

Once per **system indicator**:

- The information to pull from the Census API
- Post-fetch script to wrangle raw Census data
- Parameters
  - Survey
  - Variables
  - Subject values glossary

Once per **partnership**:

- Decennial vintage
- Geoids for geographic footprint
- Parameters
  - Type of geography
  - Specific geoids
  - Lists of containing geoids

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Systems indicator glossary

```
PLUMBING_VARIABLES <- GROUP |>
    hercacstables::unpack_group_details() |>
    dplyr::filter(
        .data$Dataset == "ACS5"
    ) |>
    dplyr::rename(
        Tenure = "A",
        Plumbing = "B"
    ) |>
    dplyr::filter(
        dplyr::if_all(c("Tenure", "Plumbing"),
                      \(.) (nchar(.) > 0))
    )
```

Dataset	Group	Index	Variable	Tenure	Plumbing
ACS5	B25049	3	B25049_003E	Owner occupied	Complete plumbing facilities
ACS5	B25049	4	B25049_004E	Owner occupied	Lacking plumbing facilities
ACS5	B25049	6	B25049_006E	Renter occupied	Complete plumbing facilities
ACS5	B25049	7	B25049_007E	Renter occupied	Lacking plumbing facilities

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Geographic footprint glossary

```
YEAR <- hercacstables::most_recent_vintage("acs", "acs5")

RAW_PLUMBING <- tibble::tribble(
    ~ geo,                        ~ items, ~ other,
    "us",                         "1",     list(),
    "region",                     "2",     list(),
    "state",                      "55",    list(),
    "county",                     "101",   list(state = 55),
    "school district (unified)", "12360", list(state = 55)
) |>
    purrr::pmap(
        \(geo, items, other) rlang::inject(
            hercacstables::fetch_data(
                variables = c("NAME", PLUMBING_VARIABLES$Variable),
                year = YEAR,
                for_geo = geo,
                for_items = items,
                survey_type = "acs",
                table_or_survey_code = "acs5",
                !!!other
            )
        )
    )
```

NAME	us	Group	Index	Value	Year
United States	1	B25049	3	82628718	2023

NAME	region	Group	Index	Value	Year
Midwest Region	2	B25049	3	19041735	2023

NAME	state	Group	Index	Value	Year
Wisconsin	55	B25049	3	1655255	2023

NAME	state	county	Group	Index	Value	Year
Racine County, Wisconsin	55	101	B25049	3	56159	2023

NAME	state	school district (unified)	Group	Index	Value	Year
Racine School District, Wisconsin	55	12360	B25049	3	38779	2023

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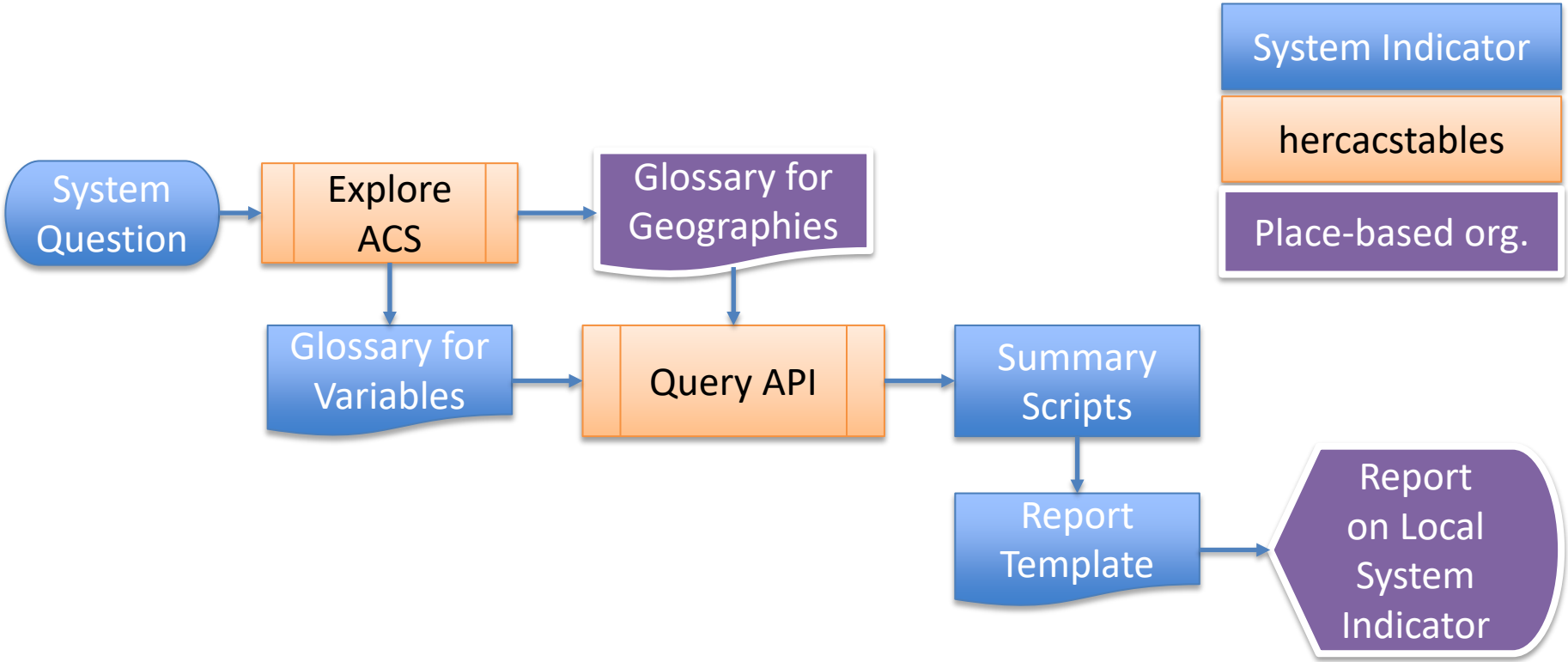

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What does this look like in practice?

EXAMPLE

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Private Insurance Coverage

The City of Racine, WI, asked us to quantify

- the percentages of people in the
  - City
  - County
  - State
- who had at least some private insurance coverage.

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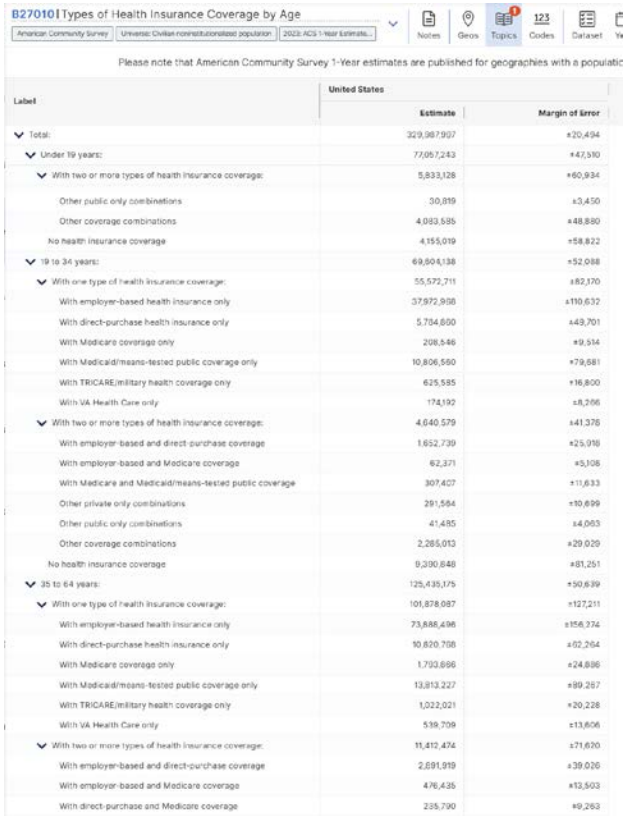
Table B27010

Classifies people by

- **age**
- **type of health insurance**.

“Label” column contains:

- <u>age range</u>
- <u>specific type(s) of insurance</u>.



B27010 | Types of Health Insurance Coverage by Age

American Community Survey | Universe: Civilian noninstitutionalized population | 2023 ACS 1-Year Estimates...

Notes | Geos | Topics | Codes | Dataset

Please note that American Community Survey 1-Year estimates are published for geographies with a populatic

Label	United States	
	Estimate	Margin of Error
Total:	329,987,907	±20,494
Under 19 years:	77,057,243	±47,510
With two or more types of health insurance coverage:	5,833,128	±60,934
Other public only combinations	30,819	±3,450
Other coverage combinations	4,083,585	±48,880
No health insurance coverage	4,155,019	±58,822
19 to 34 years:	69,604,138	±52,088
With one type of health insurance coverage:	55,572,711	±82,170
With employer-based health insurance only	37,972,998	±110,632
With direct-purchase health insurance only	5,704,600	±49,701
With Medicare coverage only	208,546	±9,514
With Medicaid/means-tested public coverage only	10,806,560	±79,681
With TRICARE/military health coverage only	625,585	±16,800
With VA Health Care only	174,192	±8,266
With two or more types of health insurance coverage:	4,640,579	±41,376
With employer-based and direct-purchase coverage	1,652,739	±25,918
With employer-based and Medicare coverage	62,371	±5,108
With Medicare and Medicaid/means-tested public coverage	307,407	±11,633
Other private only combinations	291,564	±10,699
Other public only combinations	41,485	±4,063
Other coverage combinations	2,285,013	±29,029
No health insurance coverage	9,390,848	±81,251
35 to 64 years:	125,435,175	±50,639
With one type of health insurance coverage:	101,878,087	±127,211
With employer-based health insurance only	73,888,496	±156,374
With direct-purchase health insurance only	10,820,708	±62,264
With Medicare coverage only	1,703,686	±24,886
With Medicaid/means-tested public coverage only	13,813,227	±89,287
With TRICARE/military health coverage only	1,022,021	±20,228
With VA Health Care only	539,709	±13,606
With two or more types of health insurance coverage:	11,412,474	±71,620
With employer-based and direct-purchase coverage	2,691,919	±39,026
With employer-based and Medicare coverage	476,435	±12,503
With direct-purchase and Medicare coverage	235,790	±9,263

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Insurance Ages

There are 4 different age ranges.

Age	Lower Age	Upper Age	Rows
NA	0	999	1
Children	0	18	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17
Younger Adults	19	34	18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33
Older Adults	35	64	34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50
Seniors	65	999	51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66

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Insurance Plans

There are 13 distinct types of insurance in the data.

That was too much detail!

We focused on :

- private insurance
- no insurance or only public insurance.

Insurance Type	Plans	Public	Private	Rows
NA	NA	NA	NA	1, 2, 18, 34, 51
NA	1	NA	NA	3, 19, 35, 52
Employer	1	FALSE	TRUE	4, 20, 36, 53
Direct-Purchase	1	FALSE	TRUE	5, 21, 37, 54
Medicare	1	TRUE	FALSE	6, 22, 38, 55
Medicaid	1	TRUE	FALSE	7, 23, 39
TRICARE/military	1	TRUE	FALSE	8, 24, 40, 56
VA	1	TRUE	FALSE	9, 25, 41, 57
NA	2	NA	NA	10, 26, 42, 58
Employer and Direct-Purchase	2	FALSE	TRUE	11, 27, 43, 59
Employer and Medicare	2	TRUE	TRUE	12, 28, 44, 60
Medicare and Medicaid	2	TRUE	FALSE	13, 29, 46, 62
Other private-only	2	FALSE	TRUE	14, 30, 47, 63
Other public-only	2	TRUE	FALSE	15, 31, 48, 64
Other combinations	2	TRUE	TRUE	16, 32, 49, 65
No insurance	0	FALSE	FALSE	17, 33, 50, 66
Direct-Purchase and Medicare	2	TRUE	TRUE	45, 61

Define a Glossary

We combined the information about age ranges, and types of insurance into a single glossary that unpacks the meaning of each row in the table. Here are some of its rows. The full table is available as a CSV file.

Group	Index	Variable	Age	Lower Age	Upper Age	Insurance Type	Plans	Public	Private
B27010	1	B27010_001E	NA	0	999	NA	NA	NA	NA
B27010	9	B27010_009E	Children	0	18	VA	1	TRUE	FALSE
B27010	16	B27010_016E	Children	0	18	Other combinations	2	TRUE	TRUE
B27010	21	B27010_021E	Younger Adults	19	34	Direct-Purchase	1	FALSE	TRUE
B27010	24	B27010_024E	Younger Adults	19	34	TRICARE/military	1	TRUE	FALSE
B27010	38	B27010_038E	Older Adults	35	64	Medicare	1	TRUE	FALSE
B27010	47	B27010_047E	Older Adults	35	64	Other private-only	2	FALSE	TRUE
B27010	54	B27010_054E	Seniors	65	999	Direct-Purchase	1	FALSE	TRUE
B27010	60	B27010_060E	Seniors	65	999	Employer and Medicare	2	TRUE	TRUE

Postprocessing

```
wrangle_insured <- function(.raw_insured) {
    .raw_insured |>
        dplyr::left_join(
            GLOSSARY_FOR_B27010,
            by = c("Index")
        ) |>
        dplyr::summarize(
            People = sum(.data$Value, na.rm = TRUE),
            .by = c("Year",
                    "Age",
                    "Private")
        ) |>
        tidyr::pivot_wider(
            names_from = "Private",
            values_from = "People"
        ) |>
        dplyr::mutate(
            Total = .data$`TRUE` + .data$`FALSE`,
            Percentage = .data$`TRUE` / .data$Total,
        ) |>
        dplyr::rename(
            "Some Private Insurance" = "TRUE",
            "No or Public Insurance" = "FALSE"
        )
}
```

Scripts take the ACS data and compute totals, summaries, and statistics needed to show the exact system indicator.

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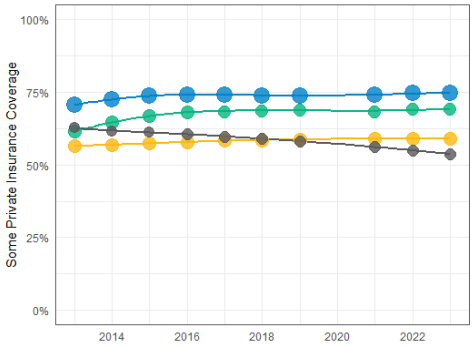
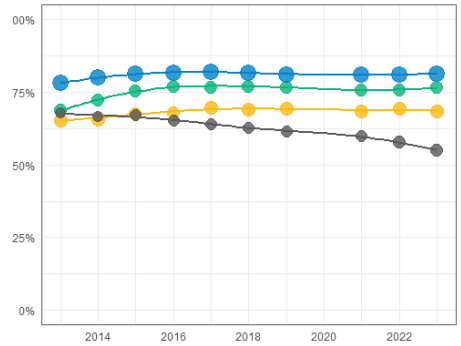
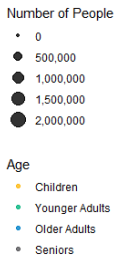
US

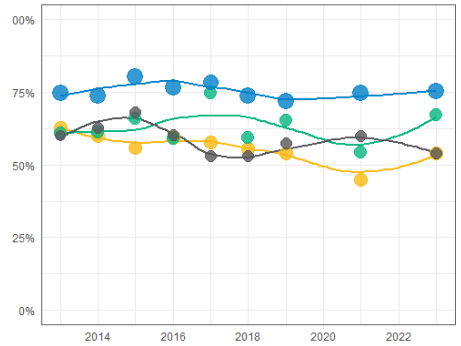


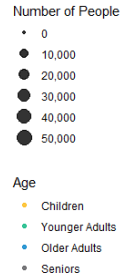
Wisconsin





Racine





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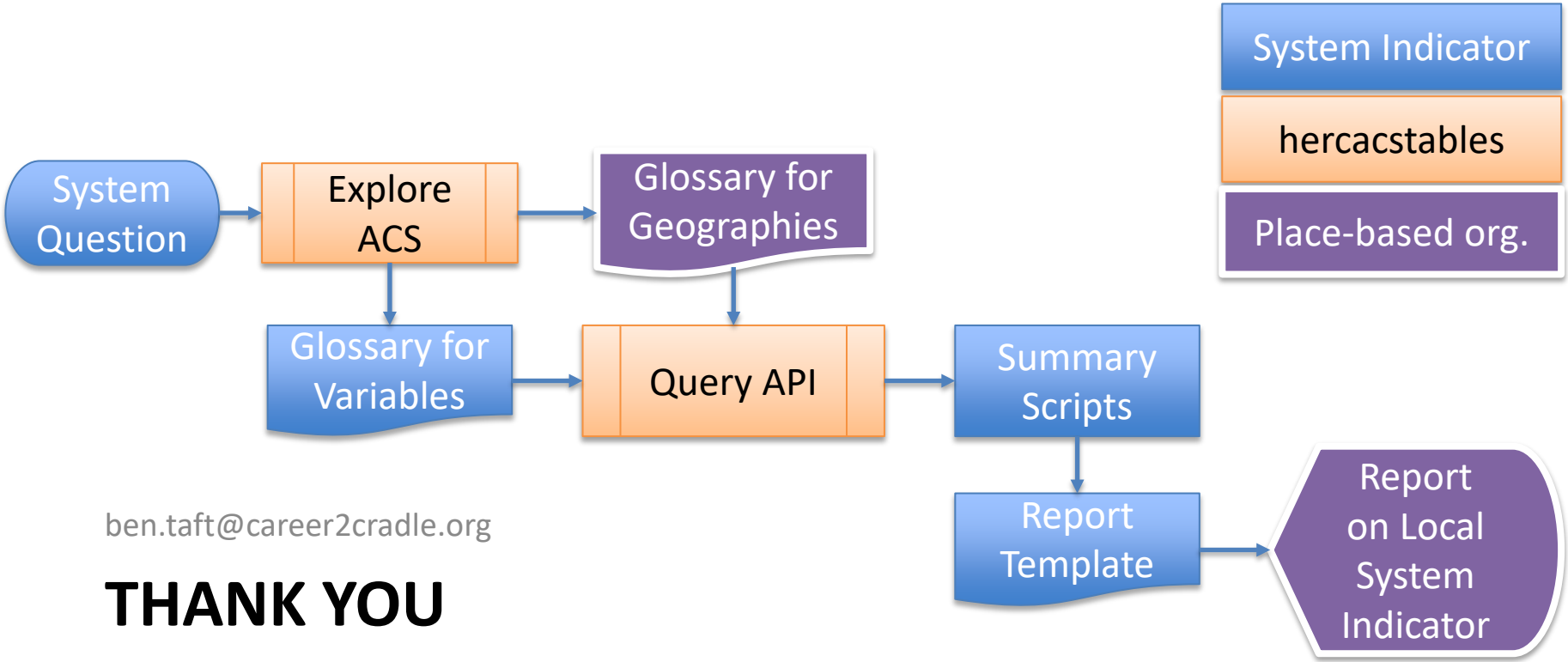

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THANK YOU

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