Summary Stats

html: code-fold: true df-print: paged

## Description and Overview

This code summarizes the dataset that is a result of this script: 10\_mode-choice-cleaning

GitHub: This .Rmd code (possibly qmd if I have to change it with the new update to R Studio) is synced to Github, and when this code is knit, it’s also synced to GitHub, as a .md file, which makes the knitted code easy to read (kind of like python code.) Currently in a FORK: <https://github.com/annitodd/GEMS-data/blob/main/gems-mode-choice>

### Latest Updates

####DEC 6: the next step is to go back to the 10\_ code, and add income

another to-do is ALSO use the raw raw data in the folder that I found

## Setup

### libraries

library(arrow)  
library(tidyverse)  
library(readxl)  
library(rstudioapi)  
library(scales)  
library(writexl)  
library(sjmisc)  
library(fmlogit)  
library(tidyverse) # use this last

### file path directories

# get current root directory of the user's Github repo  
root <- getwd() # Saves current WD   
#while ((basename(root) != "GEMS-data")) {  
# root <- dirname(root)  
#} # Sets root equal to the location of the Github repo  
#source(file.path(root, "paths.R")) # Runs paths.R file found in users Github repo

data\_path <- 'C:/FHWA/For FHWA folks/Mode\_choice\_estimation/Data'  
data\_results <- 'C:/FHWA\_R2/mode\_choice\_estimation/data'

## Data: open and slim down

### read in big dataset

full merged dataset

df\_temp <- read\_parquet(file.path(data\_results, "10-mode-choice-cleaning\_output-full-merged.parquet"))  
names(df\_temp)

[1] "rawdatafrom\_trippub\_ATB" "mode\_ATB"   
 [3] "trip\_purpose\_ATB" "start\_time\_bin\_ATB"   
 [5] "orig\_fips11\_ATB" "dest\_fips11\_ATB"   
 [7] "rawdatafrom\_tripct\_ATB" "hh\_fips11\_ATB"   
 [9] "rawdatafrom\_hhct\_ATB" "origin\_microtypeXgeotype\_ATB"  
 [11] "origin\_geotype\_ATB" "origin\_microtype\_ATB"   
 [13] "origin\_geoXmicrotype\_ATB" "dest\_microtypeXgeotype\_ATB"   
 [15] "dest\_geotype\_ATB" "dest\_microtype\_ATB"   
 [17] "dest\_geoXmicrotype\_ATB" "hh\_microtypeXgeotype\_ATB"   
 [19] "hh\_geotype\_ATB" "hh\_microtype\_ATB"   
 [21] "hh\_geoXmicrotype\_ATB" "HOUSEID"   
 [23] "PERSONID" "TDTRPNUM"   
 [25] "STRTTIME" "ENDTIME"   
 [27] "TRVLCMIN" "TRPMILES"   
 [29] "TRPTRANS" "TRPACCMP"   
 [31] "TRPHHACC" "VEHID"   
 [33] "TRWAITTM" "NUMTRANS"   
 [35] "TRACCTM" "DROP\_PRK"   
 [37] "TREGRTM" "WHODROVE"   
 [39] "WHYFROM" "LOOP\_TRIP"   
 [41] "TRPHHVEH" "HHMEMDRV"   
 [43] "HH\_ONTD" "NONHHCNT"   
 [45] "NUMONTRP" "PSGR\_FLG"   
 [47] "PUBTRANS" "TRIPPURP"   
 [49] "DWELTIME" "TDWKND"   
 [51] "VMT\_MILE" "DRVR\_FLG"   
 [53] "WHYTRP1S" "ONTD\_P1"   
 [55] "ONTD\_P2" "ONTD\_P3"   
 [57] "ONTD\_P4" "ONTD\_P5"   
 [59] "ONTD\_P6" "ONTD\_P7"   
 [61] "ONTD\_P8" "ONTD\_P9"   
 [63] "ONTD\_P10" "ONTD\_P11"   
 [65] "ONTD\_P12" "ONTD\_P13"   
 [67] "TDCASEID" "TRACC\_WLK"   
 [69] "TRACC\_POV" "TRACC\_BUS"   
 [71] "TRACC\_CRL" "TRACC\_SUB"   
 [73] "TRACC\_OTH" "TREGR\_WLK"   
 [75] "TREGR\_POV" "TREGR\_BUS"   
 [77] "TREGR\_CRL" "TREGR\_SUB"   
 [79] "TREGR\_OTH" "WHYTO"   
 [81] "TRAVDAY" "HOMEOWN"   
 [83] "HHSIZE" "HHVEHCNT"   
 [85] "HHFAMINC" "DRVRCNT"   
 [87] "HHSTATE" "HHSTFIPS.x"   
 [89] "NUMADLT" "WRKCOUNT"   
 [91] "TDAYDATE" "HHRESP"   
 [93] "LIF\_CYC" "MSACAT"   
 [95] "MSASIZE" "RAIL"   
 [97] "URBAN" "URBANSIZE"   
 [99] "URBRUR" "GASPRICE"   
[101] "CENSUS\_D" "CENSUS\_R"   
[103] "CDIVMSAR" "HH\_RACE"   
[105] "HH\_HISP" "HH\_CBSA"   
[107] "SMPLSRCE" "R\_AGE"   
[109] "EDUC" "R\_SEX"   
[111] "PRMACT" "PROXY"   
[113] "WORKER" "DRIVER"   
[115] "WTTRDFIN" "WHYTRP90"   
[117] "R\_AGE\_IMP" "R\_SEX\_IMP"   
[119] "HBHUR" "HTHTNRNT"   
[121] "HTPPOPDN" "HTRESDN"   
[123] "HTEEMPDN" "HBHTNRNT"   
[125] "HBPPOPDN" "HBRESDN"   
[127] "STRTTIME\_num" "ORIG\_COUNTRY"   
[129] "ORIG\_ST" "ORIG\_CNTY"   
[131] "ORIG\_CT" "DEST\_COUNTRY"   
[133] "DEST\_ST" "DEST\_CNTY"   
[135] "DEST\_CT" "HHSTFIPS.y"   
[137] "HHCNTYFP" "HHCT"

Recall that they don’t equally merge, as we saw before (hhct has more households on file). Anna notes that this is likely because lots of households took the survey but only some of them filled out the trips diary part. ## START HERE AFTER TGIVING

df\_temp |>  
 count(rawdatafrom\_trippub\_ATB,rawdatafrom\_tripct\_ATB,rawdatafrom\_hhct\_ATB)

# A tibble: 2 × 4  
 rawdatafrom\_trippub\_ATB rawdatafrom\_tripct\_ATB rawdatafrom\_hhct\_ATB n  
 <dbl> <dbl> <dbl> <int>  
1 1 1 1 923572  
2 NA NA 1 12474

df\_temp <- ungroup(df\_temp)

The number of **observations** in the dataset (these should give the same answer):

df\_temp |> summarise(n())

# A tibble: 1 × 1  
 `n()`  
 <int>  
1 936046

df\_temp |> summarise(n\_distinct(HOUSEID,PERSONID,TDTRPNUM))

# A tibble: 1 × 1  
 `n\_distinct(HOUSEID, PERSONID, TDTRPNUM)`  
 <int>  
1 936046

number of **people** in the dataset:

df\_temp |> summarise(n\_distinct(HOUSEID,PERSONID))

# A tibble: 1 × 1  
 `n\_distinct(HOUSEID, PERSONID)`  
 <int>  
1 231668

number of **people** in the dataset **with trips** (there are FEWER people with trips than there are total people:

df\_temp |>   
 filter(rawdatafrom\_trippub\_ATB==1,rawdatafrom\_tripct\_ATB==1,rawdatafrom\_hhct\_ATB==1) |> summarise(n\_distinct(HOUSEID,PERSONID))

# A tibble: 1 × 1  
 `n\_distinct(HOUSEID, PERSONID)`  
 <int>  
1 219194

The number of **households** in the dataset:

df\_temp |> summarise(n\_distinct(HOUSEID))

# A tibble: 1 × 1  
 `n\_distinct(HOUSEID)`  
 <int>  
1 129696

The number of **households** in the dataset **with trips**:

df\_temp |>   
 filter(rawdatafrom\_trippub\_ATB==1,rawdatafrom\_tripct\_ATB==1,rawdatafrom\_hhct\_ATB==1) |> summarise(n\_distinct(HOUSEID))

# A tibble: 1 × 1  
 `n\_distinct(HOUSEID)`  
 <int>  
1 117222

df\_trips\_only <- df\_temp |>   
 filter(rawdatafrom\_trippub\_ATB==1,rawdatafrom\_tripct\_ATB==1,rawdatafrom\_hhct\_ATB==1)  
  
df\_trips\_only |>   
 count(rawdatafrom\_trippub\_ATB,rawdatafrom\_tripct\_ATB,rawdatafrom\_hhct\_ATB)

# A tibble: 1 × 4

rawdatafrom\_trippub\_ATB rawdatafrom\_tripct\_ATB rawdatafrom\_hhct\_ATB n 1 1 1 1 923572

df\_trips\_only <- ungroup(df\_trips\_only)

### list of variables and descriptions

names(df\_trips\_only)

[1] "rawdatafrom\_trippub\_ATB" "mode\_ATB"   
 [3] "trip\_purpose\_ATB" "start\_time\_bin\_ATB"   
 [5] "orig\_fips11\_ATB" "dest\_fips11\_ATB"   
 [7] "rawdatafrom\_tripct\_ATB" "hh\_fips11\_ATB"   
 [9] "rawdatafrom\_hhct\_ATB" "origin\_microtypeXgeotype\_ATB"  
 [11] "origin\_geotype\_ATB" "origin\_microtype\_ATB"   
 [13] "origin\_geoXmicrotype\_ATB" "dest\_microtypeXgeotype\_ATB"   
 [15] "dest\_geotype\_ATB" "dest\_microtype\_ATB"   
 [17] "dest\_geoXmicrotype\_ATB" "hh\_microtypeXgeotype\_ATB"   
 [19] "hh\_geotype\_ATB" "hh\_microtype\_ATB"   
 [21] "hh\_geoXmicrotype\_ATB" "HOUSEID"   
 [23] "PERSONID" "TDTRPNUM"   
 [25] "STRTTIME" "ENDTIME"   
 [27] "TRVLCMIN" "TRPMILES"   
 [29] "TRPTRANS" "TRPACCMP"   
 [31] "TRPHHACC" "VEHID"   
 [33] "TRWAITTM" "NUMTRANS"   
 [35] "TRACCTM" "DROP\_PRK"   
 [37] "TREGRTM" "WHODROVE"   
 [39] "WHYFROM" "LOOP\_TRIP"   
 [41] "TRPHHVEH" "HHMEMDRV"   
 [43] "HH\_ONTD" "NONHHCNT"   
 [45] "NUMONTRP" "PSGR\_FLG"   
 [47] "PUBTRANS" "TRIPPURP"   
 [49] "DWELTIME" "TDWKND"   
 [51] "VMT\_MILE" "DRVR\_FLG"   
 [53] "WHYTRP1S" "ONTD\_P1"   
 [55] "ONTD\_P2" "ONTD\_P3"   
 [57] "ONTD\_P4" "ONTD\_P5"   
 [59] "ONTD\_P6" "ONTD\_P7"   
 [61] "ONTD\_P8" "ONTD\_P9"   
 [63] "ONTD\_P10" "ONTD\_P11"   
 [65] "ONTD\_P12" "ONTD\_P13"   
 [67] "TDCASEID" "TRACC\_WLK"   
 [69] "TRACC\_POV" "TRACC\_BUS"   
 [71] "TRACC\_CRL" "TRACC\_SUB"   
 [73] "TRACC\_OTH" "TREGR\_WLK"   
 [75] "TREGR\_POV" "TREGR\_BUS"   
 [77] "TREGR\_CRL" "TREGR\_SUB"   
 [79] "TREGR\_OTH" "WHYTO"   
 [81] "TRAVDAY" "HOMEOWN"   
 [83] "HHSIZE" "HHVEHCNT"   
 [85] "HHFAMINC" "DRVRCNT"   
 [87] "HHSTATE" "HHSTFIPS.x"   
 [89] "NUMADLT" "WRKCOUNT"   
 [91] "TDAYDATE" "HHRESP"   
 [93] "LIF\_CYC" "MSACAT"   
 [95] "MSASIZE" "RAIL"   
 [97] "URBAN" "URBANSIZE"   
 [99] "URBRUR" "GASPRICE"   
[101] "CENSUS\_D" "CENSUS\_R"   
[103] "CDIVMSAR" "HH\_RACE"   
[105] "HH\_HISP" "HH\_CBSA"   
[107] "SMPLSRCE" "R\_AGE"   
[109] "EDUC" "R\_SEX"   
[111] "PRMACT" "PROXY"   
[113] "WORKER" "DRIVER"   
[115] "WTTRDFIN" "WHYTRP90"   
[117] "R\_AGE\_IMP" "R\_SEX\_IMP"   
[119] "HBHUR" "HTHTNRNT"   
[121] "HTPPOPDN" "HTRESDN"   
[123] "HTEEMPDN" "HBHTNRNT"   
[125] "HBPPOPDN" "HBRESDN"   
[127] "STRTTIME\_num" "ORIG\_COUNTRY"   
[129] "ORIG\_ST" "ORIG\_CNTY"   
[131] "ORIG\_CT" "DEST\_COUNTRY"   
[133] "DEST\_ST" "DEST\_CNTY"   
[135] "DEST\_CT" "HHSTFIPS.y"   
[137] "HHCNTYFP" "HHCT"

This is the data dictionary from NHTS:

dictionary\_v1\_2 <- read\_csv("dictionary\_v1\_2.csv") %>%   
 relocate ("Label","Name")  
dictionary\_v1\_2

# A tibble: 244 × 8  
 Label Name Type Length HH PER VEH TRIP   
 <chr> <chr> <chr> <dbl> <chr> <chr> <chr> <lgl>  
 1 Alternative Mode of Transportatio… ALT\_… C 2 <NA> P <NA> NA   
 2 Alternative Mode of Transportatio… ALT\_… C 2 <NA> P <NA> NA   
 3 Alternative Mode of Transportatio… ALT\_… C 2 <NA> P <NA> NA   
 4 Self-reported annualized mile est… ANNM… N 6 <NA> <NA> V NA   
 5 Best estimate of annual miles BEST… N 8 <NA> <NA> V NA   
 6 Flag any edits/adjustments to BES… BEST… C 2 <NA> <NA> V NA   
 7 How BESTMILE was computed BEST… C 2 <NA> <NA> V NA   
 8 Flag identifying BESTMILE outlier… BEST… C 2 <NA> <NA> V NA   
 9 Frequency of Bicycle Use for Trav… BIKE C 2 H <NA> <NA> NA   
10 Bicycle to Reduce Financial Burde… BIKE… C 2 H <NA> <NA> NA   
# ℹ 234 more rows

### make smaller dataset

choose only some vars: keep all of the ones that we made. These all end in “\_ATB”

names(df\_trips\_only)

[1] "rawdatafrom\_trippub\_ATB" "mode\_ATB"   
 [3] "trip\_purpose\_ATB" "start\_time\_bin\_ATB"   
 [5] "orig\_fips11\_ATB" "dest\_fips11\_ATB"   
 [7] "rawdatafrom\_tripct\_ATB" "hh\_fips11\_ATB"   
 [9] "rawdatafrom\_hhct\_ATB" "origin\_microtypeXgeotype\_ATB"  
 [11] "origin\_geotype\_ATB" "origin\_microtype\_ATB"   
 [13] "origin\_geoXmicrotype\_ATB" "dest\_microtypeXgeotype\_ATB"   
 [15] "dest\_geotype\_ATB" "dest\_microtype\_ATB"   
 [17] "dest\_geoXmicrotype\_ATB" "hh\_microtypeXgeotype\_ATB"   
 [19] "hh\_geotype\_ATB" "hh\_microtype\_ATB"   
 [21] "hh\_geoXmicrotype\_ATB" "HOUSEID"   
 [23] "PERSONID" "TDTRPNUM"   
 [25] "STRTTIME" "ENDTIME"   
 [27] "TRVLCMIN" "TRPMILES"   
 [29] "TRPTRANS" "TRPACCMP"   
 [31] "TRPHHACC" "VEHID"   
 [33] "TRWAITTM" "NUMTRANS"   
 [35] "TRACCTM" "DROP\_PRK"   
 [37] "TREGRTM" "WHODROVE"   
 [39] "WHYFROM" "LOOP\_TRIP"   
 [41] "TRPHHVEH" "HHMEMDRV"   
 [43] "HH\_ONTD" "NONHHCNT"   
 [45] "NUMONTRP" "PSGR\_FLG"   
 [47] "PUBTRANS" "TRIPPURP"   
 [49] "DWELTIME" "TDWKND"   
 [51] "VMT\_MILE" "DRVR\_FLG"   
 [53] "WHYTRP1S" "ONTD\_P1"   
 [55] "ONTD\_P2" "ONTD\_P3"   
 [57] "ONTD\_P4" "ONTD\_P5"   
 [59] "ONTD\_P6" "ONTD\_P7"   
 [61] "ONTD\_P8" "ONTD\_P9"   
 [63] "ONTD\_P10" "ONTD\_P11"   
 [65] "ONTD\_P12" "ONTD\_P13"   
 [67] "TDCASEID" "TRACC\_WLK"   
 [69] "TRACC\_POV" "TRACC\_BUS"   
 [71] "TRACC\_CRL" "TRACC\_SUB"   
 [73] "TRACC\_OTH" "TREGR\_WLK"   
 [75] "TREGR\_POV" "TREGR\_BUS"   
 [77] "TREGR\_CRL" "TREGR\_SUB"   
 [79] "TREGR\_OTH" "WHYTO"   
 [81] "TRAVDAY" "HOMEOWN"   
 [83] "HHSIZE" "HHVEHCNT"   
 [85] "HHFAMINC" "DRVRCNT"   
 [87] "HHSTATE" "HHSTFIPS.x"   
 [89] "NUMADLT" "WRKCOUNT"   
 [91] "TDAYDATE" "HHRESP"   
 [93] "LIF\_CYC" "MSACAT"   
 [95] "MSASIZE" "RAIL"   
 [97] "URBAN" "URBANSIZE"   
 [99] "URBRUR" "GASPRICE"   
[101] "CENSUS\_D" "CENSUS\_R"   
[103] "CDIVMSAR" "HH\_RACE"   
[105] "HH\_HISP" "HH\_CBSA"   
[107] "SMPLSRCE" "R\_AGE"   
[109] "EDUC" "R\_SEX"   
[111] "PRMACT" "PROXY"   
[113] "WORKER" "DRIVER"   
[115] "WTTRDFIN" "WHYTRP90"   
[117] "R\_AGE\_IMP" "R\_SEX\_IMP"   
[119] "HBHUR" "HTHTNRNT"   
[121] "HTPPOPDN" "HTRESDN"   
[123] "HTEEMPDN" "HBHTNRNT"   
[125] "HBPPOPDN" "HBRESDN"   
[127] "STRTTIME\_num" "ORIG\_COUNTRY"   
[129] "ORIG\_ST" "ORIG\_CNTY"   
[131] "ORIG\_CT" "DEST\_COUNTRY"   
[133] "DEST\_ST" "DEST\_CNTY"   
[135] "DEST\_CT" "HHSTFIPS.y"   
[137] "HHCNTYFP" "HHCT"

df\_trips\_only\_small <- df\_trips\_only |>   
 select(contains("\_ATB")) %>%   
 select(-contains("rawdatafrom"))

names(df\_trips\_only\_small)

[1] "mode\_ATB" "trip\_purpose\_ATB"   
 [3] "start\_time\_bin\_ATB" "orig\_fips11\_ATB"   
 [5] "dest\_fips11\_ATB" "hh\_fips11\_ATB"   
 [7] "origin\_microtypeXgeotype\_ATB" "origin\_geotype\_ATB"   
 [9] "origin\_microtype\_ATB" "origin\_geoXmicrotype\_ATB"   
[11] "dest\_microtypeXgeotype\_ATB" "dest\_geotype\_ATB"   
[13] "dest\_microtype\_ATB" "dest\_geoXmicrotype\_ATB"   
[15] "hh\_microtypeXgeotype\_ATB" "hh\_geotype\_ATB"   
[17] "hh\_microtype\_ATB" "hh\_geoXmicrotype\_ATB"

### Examine:

#### the key vars

names(df\_trips\_only\_small)

[1] "mode\_ATB" "trip\_purpose\_ATB"   
 [3] "start\_time\_bin\_ATB" "orig\_fips11\_ATB"   
 [5] "dest\_fips11\_ATB" "hh\_fips11\_ATB"   
 [7] "origin\_microtypeXgeotype\_ATB" "origin\_geotype\_ATB"   
 [9] "origin\_microtype\_ATB" "origin\_geoXmicrotype\_ATB"   
[11] "dest\_microtypeXgeotype\_ATB" "dest\_geotype\_ATB"   
[13] "dest\_microtype\_ATB" "dest\_geoXmicrotype\_ATB"   
[15] "hh\_microtypeXgeotype\_ATB" "hh\_geotype\_ATB"   
[17] "hh\_microtype\_ATB" "hh\_geoXmicrotype\_ATB"

#### Number of distinct in each group

summary <- df\_trips\_only\_small |>  
 summarise("Number Obs" = n(),  
 across(contains("\_ATB"),~n\_distinct(.x),.names = "{.col} distinct"),  
 .groups = "drop")  
summary

# A tibble: 1 × 19  
 `Number Obs` `mode\_ATB distinct` trip\_purpose\_ATB dis…¹ start\_time\_bin\_ATB d…²  
 <int> <int> <int> <int>  
1 923572 7 9 3  
# ℹ abbreviated names: ¹​`trip\_purpose\_ATB distinct`,  
# ²​`start\_time\_bin\_ATB distinct`  
# ℹ 15 more variables: `orig\_fips11\_ATB distinct` <int>,  
# `dest\_fips11\_ATB distinct` <int>, `hh\_fips11\_ATB distinct` <int>,  
# `origin\_microtypeXgeotype\_ATB distinct` <int>,  
# `origin\_geotype\_ATB distinct` <int>, `origin\_microtype\_ATB distinct` <int>,  
# `origin\_geoXmicrotype\_ATB distinct` <int>, …

summary %>% sjmisc::rotate\_df(rn="N distinct")

N distinct V1  
1 Number Obs 923572  
2 mode\_ATB distinct 7  
3 trip\_purpose\_ATB distinct 9  
4 start\_time\_bin\_ATB distinct 3  
5 orig\_fips11\_ATB distinct 52765  
6 dest\_fips11\_ATB distinct 52783  
7 hh\_fips11\_ATB distinct 33586  
8 origin\_microtypeXgeotype\_ATB distinct 37  
9 origin\_geotype\_ATB distinct 7  
10 origin\_microtype\_ATB distinct 7  
11 origin\_geoXmicrotype\_ATB distinct 37  
12 dest\_microtypeXgeotype\_ATB distinct 37  
13 dest\_geotype\_ATB distinct 7  
14 dest\_microtype\_ATB distinct 7  
15 dest\_geoXmicrotype\_ATB distinct 37  
16 hh\_microtypeXgeotype\_ATB distinct 37  
17 hh\_geotype\_ATB distinct 7  
18 hh\_microtype\_ATB distinct 7  
19 hh\_geoXmicrotype\_ATB distinct 37

##### the distinct values

df\_trips\_only\_small %>%   
 distinct(origin\_geoXmicrotype\_ATB)

# A tibble: 37 × 1  
 origin\_geoXmicrotype\_ATB  
 <chr>   
 1 E\_4   
 2 C\_3   
 3 E\_5   
 4 A\_5   
 5 A\_4   
 6 B\_1   
 7 B\_4   
 8 B\_5   
 9 B\_2   
10 F\_5   
# ℹ 27 more rows

df\_trips\_only\_small %>%   
 distinct(dest\_geoXmicrotype\_ATB)

# A tibble: 37 × 1  
 dest\_geoXmicrotype\_ATB  
 <chr>   
 1 E\_4   
 2 C\_3   
 3 E\_5   
 4 A\_4   
 5 A\_5   
 6 B\_4   
 7 B\_1   
 8 B\_2   
 9 B\_5   
10 F\_5   
# ℹ 27 more rows

df\_trips\_only\_small %>%   
 distinct(hh\_geoXmicrotype\_ATB)

# A tibble: 37 × 1  
 hh\_geoXmicrotype\_ATB  
 <chr>   
 1 E\_4   
 2 A\_5   
 3 B\_1   
 4 B\_5   
 5 F\_5   
 6 B\_2   
 7 C\_6   
 8 B\_4   
 9 A\_1   
10 C\_5   
# ℹ 27 more rows

df\_trips\_only\_small %>%   
 distinct(start\_time\_bin\_ATB)

# A tibble: 3 × 1  
 start\_time\_bin\_ATB  
 <chr>   
1 other\_time   
2 evening\_rush   
3 morning\_rush

df\_trips\_only\_small %>%   
 distinct(trip\_purpose\_ATB)

# A tibble: 9 × 1  
 trip\_purpose\_ATB  
 <chr>   
1 school   
2 home   
3 work   
4 social   
5 medical   
6 other   
7 shopping   
8 meals   
9 transp\_someone

#### how many combinatorials

distinct mode X trip purpose

summary <- df\_trips\_only\_small |>  
 group\_by(mode\_ATB,trip\_purpose\_ATB) %>%   
 summarise("Number Obs" = n(),  
 across(contains("\_ATB"),~n\_distinct(.x),.names = "{.col} distinct"),  
 .groups = "drop")  
summary

# A tibble: 63 × 19  
 mode\_ATB trip\_purpose\_ATB `Number Obs` `start\_time\_bin\_ATB distinct`  
 <chr> <chr> <int> <int>  
 1 bike home 3420 3  
 2 bike meals 349 3  
 3 bike medical 39 2  
 4 bike other 199 3  
 5 bike school 395 3  
 6 bike shopping 851 3  
 7 bike social 1754 3  
 8 bike transp\_someone 122 3  
 9 bike work 905 3  
10 bus home 7493 3  
# ℹ 53 more rows  
# ℹ 15 more variables: `orig\_fips11\_ATB distinct` <int>,  
# `dest\_fips11\_ATB distinct` <int>, `hh\_fips11\_ATB distinct` <int>,  
# `origin\_microtypeXgeotype\_ATB distinct` <int>,  
# `origin\_geotype\_ATB distinct` <int>, `origin\_microtype\_ATB distinct` <int>,  
# `origin\_geoXmicrotype\_ATB distinct` <int>,  
# `dest\_microtypeXgeotype\_ATB distinct` <int>, …

summary %>% sjmisc::rotate\_df(rn="N distinct")

N distinct V1 V2 V3 V4 V5  
1 mode\_ATB bike bike bike bike bike  
2 trip\_purpose\_ATB home meals medical other school  
3 Number Obs 3420 349 39 199 395  
4 start\_time\_bin\_ATB distinct 3 3 2 3 3  
5 orig\_fips11\_ATB distinct 2307 268 38 177 306  
6 dest\_fips11\_ATB distinct 2222 264 38 174 292  
7 hh\_fips11\_ATB distinct 2199 257 38 159 297  
8 origin\_microtypeXgeotype\_ATB distinct 34 26 16 28 27  
9 origin\_geotype\_ATB distinct 6 6 5 6 6  
10 origin\_microtype\_ATB distinct 6 6 6 6 6  
11 origin\_geoXmicrotype\_ATB distinct 34 26 16 28 27  
12 dest\_microtypeXgeotype\_ATB distinct 35 23 18 29 27  
13 dest\_geotype\_ATB distinct 7 6 5 6 6  
14 dest\_microtype\_ATB distinct 7 6 6 6 6  
15 dest\_geoXmicrotype\_ATB distinct 35 23 18 29 27  
16 hh\_microtypeXgeotype\_ATB distinct 35 25 16 28 26  
17 hh\_geotype\_ATB distinct 7 6 5 6 6  
18 hh\_microtype\_ATB distinct 7 6 6 6 6  
19 hh\_geoXmicrotype\_ATB distinct 35 25 16 28 26  
 V6 V7 V8 V9 V10 V11 V12 V13 V14  
1 bike bike bike bike bus bus bus bus bus  
2 shopping social transp\_someone work home meals medical other school  
3 851 1754 122 905 7493 375 515 1107 5942  
4 3 3 3 3 3 3 3 3 3  
5 638 1281 79 717 4592 306 467 871 3579  
6 640 1271 78 602 4606 298 437 818 3589  
7 549 1176 76 647 4550 295 440 816 3392  
8 33 34 17 30 35 28 28 35 36  
9 7 6 5 6 6 6 6 7 7  
10 7 6 6 6 6 6 6 7 7  
11 33 34 17 30 35 28 28 35 36  
12 31 34 18 32 36 25 27 32 35  
13 6 6 5 6 6 6 6 6 7  
14 6 6 6 6 6 6 6 6 7  
15 31 34 18 32 36 25 27 32 35  
16 32 33 17 30 36 24 28 31 36  
17 7 6 5 6 6 5 6 6 7  
18 7 6 6 6 6 6 6 6 7  
19 32 33 17 30 36 24 28 31 36  
 V15 V16 V17 V18 V19 V20 V21 V22 V23  
1 bus bus bus bus hv hv hv hv hv  
2 shopping social transp\_someone work home meals medical other school  
3 1356 1236 524 1706 269360 64586 15628 14926 33661  
4 3 3 3 3 3 3 3 3 3  
5 1102 946 378 1407 38311 20547 8717 8826 13731  
6 1061 922 348 1118 33119 17112 6311 8015 12981  
7 947 875 295 1304 31666 18149 8102 7503 12500  
8 29 34 32 34 37 37 36 37 37  
9 6 6 7 6 7 7 7 7 7  
10 6 6 7 6 7 7 7 7 7  
11 29 34 32 34 37 37 36 37 37  
12 30 35 31 31 37 37 37 37 37  
13 6 7 7 7 7 7 7 7 7  
14 6 7 7 7 7 7 7 7 7  
15 30 35 31 31 37 37 37 37 37  
16 30 29 28 32 37 37 36 37 36  
17 6 6 6 6 7 7 7 7 7  
18 6 6 6 6 7 7 7 7 7  
19 30 29 28 32 37 37 36 37 36  
 V24 V25 V26 V27 V28 V29 V30 V31 V32  
1 hv hv hv hv other other other other other  
2 shopping social transp\_someone work home meals medical other school  
3 171701 78462 53961 97786 1313 230 85 1605 130  
4 3 3 3 3 3 3 3 3 3  
5 32236 23443 18215 26825 974 191 82 403 108  
6 27855 22980 16136 24427 932 194 76 377 109  
7 25575 19732 13815 22037 922 189 78 968 107  
8 37 37 37 37 35 27 23 32 24  
9 7 7 7 7 7 6 6 7 6  
10 7 7 7 7 7 6 6 7 6  
11 37 37 37 37 35 27 23 32 24  
12 37 37 37 37 34 32 22 32 25  
13 7 7 7 7 7 6 6 7 7  
14 7 7 7 7 7 6 6 7 7  
15 37 37 37 37 34 32 22 32 25  
16 37 37 36 37 33 28 23 32 20  
17 7 7 7 7 6 6 6 6 6  
18 7 7 7 7 6 6 6 6 6  
19 37 37 36 37 33 28 23 32 20  
 V33 V34 V35 V36 V37 V38 V39 V40 V41  
1 other other other other rail rail rail rail rail  
2 shopping social transp\_someone work home meals medical other school  
3 448 875 125 1827 1563 233 54 189 164  
4 3 3 3 3 3 3 2 3 3  
5 384 548 103 1178 681 176 52 146 141  
6 384 555 103 1149 1156 173 49 140 130  
7 322 553 92 750 1154 189 53 153 134  
8 32 33 27 34 23 13 7 16 14  
9 6 7 7 7 5 4 3 5 4  
10 6 7 7 7 6 6 5 6 6  
11 32 33 27 34 23 13 7 16 14  
12 31 34 27 33 21 16 9 15 13  
13 6 7 6 7 5 4 4 5 4  
14 6 7 6 7 6 5 5 6 5  
15 31 34 27 33 21 16 9 15 13  
16 28 30 24 32 24 19 10 18 15  
17 6 6 6 6 5 5 4 4 4  
18 6 6 6 6 6 6 5 5 5  
19 28 30 24 32 24 19 10 18 15  
 V42 V43 V44 V45 V46 V47 V48 V49 V50  
1 rail rail rail rail taxi taxi taxi taxi taxi  
2 shopping social transp\_someone work home meals medical other school  
3 315 479 93 1384 1033 228 122 275 75  
4 2 3 3 3 3 3 3 3 3  
5 249 341 70 1089 701 168 100 190 56  
6 245 311 81 540 749 159 97 102 57  
7 266 343 79 1072 761 165 96 196 53  
8 15 19 11 22 29 23 21 21 17  
9 5 5 4 4 6 5 5 5 5  
10 6 6 7 6 6 6 6 6 5  
11 15 19 11 22 29 23 21 21 17  
12 19 20 11 19 28 20 22 21 17  
13 5 5 4 4 6 5 5 6 5  
14 6 6 5 6 6 6 6 7 5  
15 19 20 11 19 28 20 22 21 17  
16 19 25 11 22 29 24 21 22 17  
17 4 6 4 5 6 6 5 5 5  
18 6 6 5 6 6 6 6 6 6  
19 19 25 11 22 29 24 21 22 17  
 V51 V52 V53 V54 V55 V56 V57 V58 V59  
1 taxi taxi taxi taxi walk walk walk walk walk  
2 shopping social transp\_someone work home meals medical other school  
3 200 453 42 385 34595 6326 341 2609 3030  
4 3 3 2 3 3 3 3 3 3  
5 163 320 36 314 13656 3119 285 1720 1864  
6 162 314 34 297 13146 3022 281 1730 1831  
7 143 300 25 297 12907 3757 292 1828 1856  
8 21 28 14 24 37 36 27 35 34  
9 5 7 5 6 7 6 6 6 6  
10 6 7 6 6 7 6 6 6 6  
11 21 28 14 24 37 36 27 35 34  
12 20 24 15 26 37 36 27 35 33  
13 5 6 5 6 7 6 6 7 6  
14 6 6 6 6 7 6 6 7 6  
15 20 24 15 26 37 36 27 35 33  
16 20 25 11 23 37 35 27 34 33  
17 5 6 4 6 7 6 6 6 6  
18 6 6 5 6 7 6 6 6 6  
19 20 25 11 23 37 35 27 34 33  
 V60 V61 V62 V63  
1 walk walk walk walk  
2 shopping social transp\_someone work  
3 9255 17025 1510 6597  
4 3 3 3 3  
5 4979 8071 989 3112  
6 4833 8047 973 2970  
7 4937 7810 960 3851  
8 35 37 29 35  
9 6 7 6 6  
10 6 7 6 6  
11 35 37 29 35  
12 36 37 28 36  
13 6 7 6 6  
14 6 7 6 6  
15 36 37 28 36  
16 36 36 28 33  
17 7 6 6 6  
18 7 6 6 6  
19 36 36 28 33

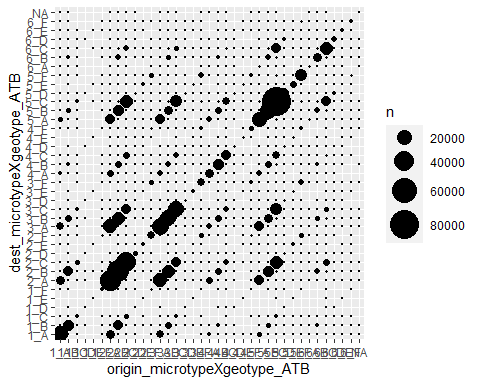
##### distinct origin destination

df\_trips\_only\_small %>%   
 count(origin\_geoXmicrotype\_ATB,dest\_geoXmicrotype\_ATB) %>%   
 pivot\_wider(names\_from = dest\_geoXmicrotype\_ATB,values\_from = n)

# A tibble: 37 × 38  
 origin\_geoXmicrotype\_…¹ A\_1 A\_2 A\_3 A\_4 A\_5 A\_6 B\_1 B\_2 B\_3  
 <chr> <int> <int> <int> <int> <int> <int> <int> <int> <int>  
 1 A\_1 23776 6717 5960 827 1367 147 33 89 80  
 2 A\_2 6786 43551 16508 3862 9385 237 51 138 155  
 3 A\_3 5854 16606 26128 3125 7765 202 46 159 244  
 4 A\_4 842 3853 3154 7346 3177 91 15 25 96  
 5 A\_5 1415 9397 7695 3202 21109 361 40 122 117  
 6 A\_6 152 221 184 91 371 645 5 18 28  
 7 B\_1 36 61 38 15 24 5 11327 7891 4330  
 8 B\_2 81 125 185 30 130 14 7841 48307 14409  
 9 B\_3 97 121 249 95 151 25 4301 14517 23096  
10 B\_4 36 79 135 117 63 9 1038 3817 3351  
# ℹ 27 more rows  
# ℹ abbreviated name: ¹​origin\_geoXmicrotype\_ATB  
# ℹ 28 more variables: B\_4 <int>, B\_5 <int>, B\_6 <int>, C\_1 <int>, C\_2 <int>,  
# C\_3 <int>, C\_4 <int>, C\_5 <int>, C\_6 <int>, D\_5 <int>, D\_6 <int>,  
# E\_2 <int>, E\_6 <int>, F\_1 <int>, F\_2 <int>, F\_3 <int>, F\_4 <int>,  
# F\_5 <int>, F\_6 <int>, `NA` <int>, D\_2 <int>, D\_3 <int>, D\_4 <int>,  
# E\_4 <int>, E\_5 <int>, D\_1 <int>, E\_3 <int>, E\_1 <int>

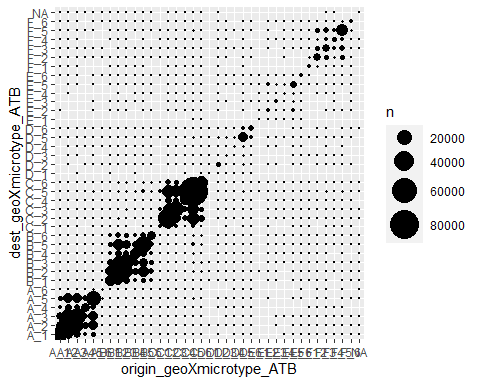
## 12/7 do only micro types not geo types

ggplot() +  
 geom\_count(data=df\_trips\_only\_small,  
 mapping=aes(x = origin\_microtypeXgeotype\_ATB, y = dest\_microtypeXgeotype\_ATB)) +  
 scale\_size\_area(max\_size = 10)



## 12/7 do only micro types not geo types

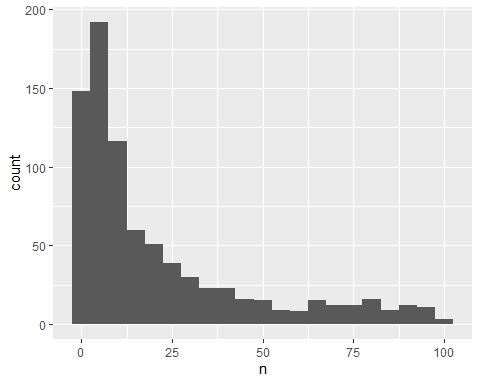
ggplot() +  
 geom\_count(data=df\_trips\_only\_small,  
 mapping=aes(x = origin\_geoXmicrotype\_ATB, y = dest\_geoXmicrotype\_ATB)) +  
 scale\_size\_area(max\_size = 10)



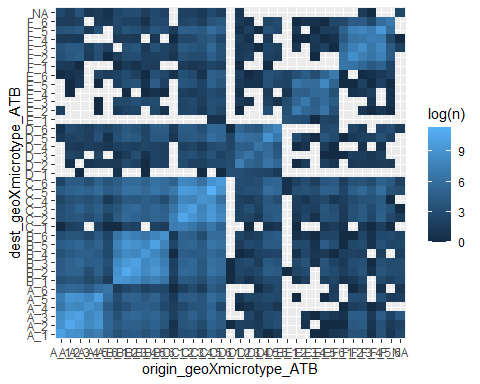
df\_trips\_only\_small %>%   
 count(origin\_geoXmicrotype\_ATB,dest\_geoXmicrotype\_ATB)

# A tibble: 1,094 × 3  
 origin\_geoXmicrotype\_ATB dest\_geoXmicrotype\_ATB n  
 <chr> <chr> <int>  
 1 A\_1 A\_1 23776  
 2 A\_1 A\_2 6717  
 3 A\_1 A\_3 5960  
 4 A\_1 A\_4 827  
 5 A\_1 A\_5 1367  
 6 A\_1 A\_6 147  
 7 A\_1 B\_1 33  
 8 A\_1 B\_2 89  
 9 A\_1 B\_3 80  
10 A\_1 B\_4 38  
# ℹ 1,084 more rows

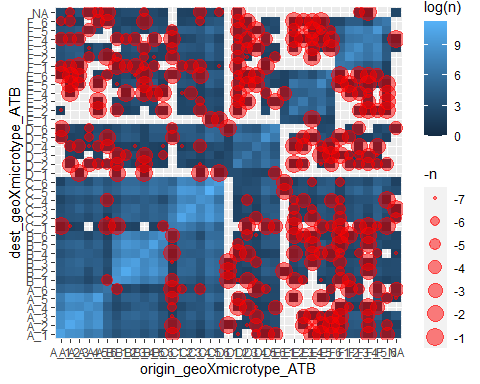
df\_trips\_only\_small %>%   
 count(origin\_geoXmicrotype\_ATB,dest\_geoXmicrotype\_ATB) %>%   
 filter(n<100) %>%   
 ggplot( aes(x = n)) +  
 geom\_histogram(binwidth = 5)



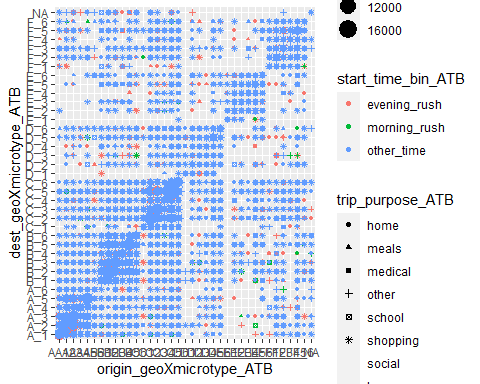
temp\_count <- df\_trips\_only\_small %>%   
 count(origin\_geoXmicrotype\_ATB,dest\_geoXmicrotype\_ATB)  
  
ggplot() +  
 geom\_tile(data=temp\_count,  
 mapping=aes(x = origin\_geoXmicrotype\_ATB,   
 y = dest\_geoXmicrotype\_ATB,  
 fill = log(n)))



ggplot() +  
 geom\_tile(data=temp\_count,  
 mapping=aes(x = origin\_geoXmicrotype\_ATB,   
 y = dest\_geoXmicrotype\_ATB,  
 fill = log(n))) +  
 geom\_point(data=temp\_count %>% filter(n<8),  
 mapping=aes(x = origin\_geoXmicrotype\_ATB,   
 y = dest\_geoXmicrotype\_ATB,  
 size = -n),  
 color = "red",  
 alpha = .5)



ggplot(df\_trips\_only\_small,   
 aes(x = origin\_geoXmicrotype\_ATB,   
 y = dest\_geoXmicrotype\_ATB,  
 color = start\_time\_bin\_ATB,  
 shape = trip\_purpose\_ATB)) +  
 geom\_count()



summary <- df\_trips\_only\_small |>  
 group\_by(origin\_geoXmicrotype\_ATB) %>%   
 summarise("Number Obs" = n(),  
 across(contains("\_ATB"),~n\_distinct(.x),.names = "{.col} distinct"),  
 .groups = "drop")  
36\*36

[1] 1296

summary

# A tibble: 37 × 19  
 origin\_geoXmicrotype\_ATB `Number Obs` `mode\_ATB distinct`  
 <chr> <int> <int>  
 1 A\_1 39466 7  
 2 A\_2 81593 7  
 3 A\_3 61463 7  
 4 A\_4 19131 7  
 5 A\_5 44675 7  
 6 A\_6 1961 7  
 7 B\_1 28130 7  
 8 B\_2 89951 7  
 9 B\_3 56005 7  
10 B\_4 25133 7  
# ℹ 27 more rows  
# ℹ 16 more variables: `trip\_purpose\_ATB distinct` <int>,  
# `start\_time\_bin\_ATB distinct` <int>, `orig\_fips11\_ATB distinct` <int>,  
# `dest\_fips11\_ATB distinct` <int>, `hh\_fips11\_ATB distinct` <int>,  
# `origin\_microtypeXgeotype\_ATB distinct` <int>,  
# `origin\_geotype\_ATB distinct` <int>, `origin\_microtype\_ATB distinct` <int>,  
# `dest\_microtypeXgeotype\_ATB distinct` <int>, …

summary %>% sjmisc::rotate\_df(rn="N distinct")

N distinct V1 V2 V3 V4 V5  
1 origin\_geoXmicrotype\_ATB A\_1 A\_2 A\_3 A\_4 A\_5  
2 Number Obs 39466 81593 61463 19131 44675  
3 mode\_ATB distinct 7 7 7 7 7  
4 trip\_purpose\_ATB distinct 9 9 9 9 9  
5 start\_time\_bin\_ATB distinct 3 3 3 3 3  
6 orig\_fips11\_ATB distinct 4297 5353 3467 1508 2338  
7 dest\_fips11\_ATB distinct 8937 11652 10989 5284 7537  
8 hh\_fips11\_ATB distinct 6755 8567 8689 3518 5308  
9 origin\_microtypeXgeotype\_ATB distinct 1 1 1 1 1  
10 origin\_geotype\_ATB distinct 1 1 1 1 1  
11 origin\_microtype\_ATB distinct 1 1 1 1 1  
12 dest\_microtypeXgeotype\_ATB distinct 29 33 32 25 32  
13 dest\_geotype\_ATB distinct 7 7 7 6 7  
14 dest\_microtype\_ATB distinct 7 7 7 7 7  
15 dest\_geoXmicrotype\_ATB distinct 29 33 32 25 32  
16 hh\_microtypeXgeotype\_ATB distinct 34 35 34 29 32  
17 hh\_geotype\_ATB distinct 7 7 6 6 6  
18 hh\_microtype\_ATB distinct 7 7 6 6 6  
19 hh\_geoXmicrotype\_ATB distinct 34 35 34 29 32  
 V6 V7 V8 V9 V10 V11 V12 V13 V14 V15 V16  
1 A\_6 B\_1 B\_2 B\_3 B\_4 B\_5 B\_6 C\_1 C\_2 C\_3 C\_4  
2 1961 28130 89951 56005 25133 53836 17087 5311 72027 52328 20920  
3 7 7 7 7 7 7 7 7 7 7 7  
4 9 9 9 9 9 9 9 9 9 9 9  
5 3 3 3 3 3 3 3 3 3 3 3  
6 149 1793 5243 3454 1321 3048 1258 120 2607 2118 1029  
7 808 6326 12083 10906 4780 9097 4341 1565 7797 7721 4314  
8 604 5208 8876 8386 3523 6343 2938 1497 6352 5989 3241  
9 1 1 1 1 1 1 1 1 1 1 1  
10 1 1 1 1 1 1 1 1 1 1 1  
11 1 1 1 1 1 1 1 1 1 1 1  
12 27 34 35 34 33 35 32 25 35 35 36  
13 7 7 7 7 7 7 7 6 7 7 7  
14 7 7 7 7 7 7 7 6 7 7 7  
15 27 34 35 34 33 35 32 25 35 35 36  
16 26 34 35 35 31 34 33 28 34 34 34  
17 6 7 7 7 7 7 7 6 6 6 6  
18 6 7 7 7 7 7 7 6 6 6 6  
19 26 34 35 35 31 34 33 28 34 34 34  
 V17 V18 V19 V20 V21 V22 V23 V24 V25 V26 V27  
1 C\_5 C\_6 D\_1 D\_2 D\_3 D\_4 D\_5 D\_6 E\_1 E\_2 E\_3  
2 132725 33068 98 2880 1689 1411 11809 5514 122 2544 2012  
3 7 7 4 6 6 7 7 5 3 7 7  
4 9 9 9 9 9 9 9 9 8 9 9  
5 3 3 3 3 3 3 3 3 3 3 3  
6 5453 2293 16 353 220 155 778 571 18 206 142  
7 12619 6501 56 731 587 427 1887 1375 57 472 487  
8 9305 4416 44 512 439 311 1318 1016 41 356 348  
9 1 1 1 1 1 1 1 1 1 1 1  
10 1 1 1 1 1 1 1 1 1 1 1  
11 1 1 1 1 1 1 1 1 1 1 1  
12 36 37 10 33 30 27 35 31 9 26 24  
13 7 7 3 7 6 6 6 6 3 6 6  
14 7 7 6 7 6 6 6 6 6 6 6  
15 36 37 10 33 30 27 35 31 9 26 24  
16 35 33 9 32 26 28 32 30 12 26 26  
17 6 6 4 6 6 6 6 6 4 6 6  
18 6 6 5 6 6 6 6 6 6 6 6  
19 35 33 9 32 26 28 32 30 12 26 26  
 V28 V29 V30 V31 V32 V33 V34 V35 V36 V37  
1 E\_4 E\_5 E\_6 F\_1 F\_2 F\_3 F\_4 F\_5 F\_6 <NA>  
2 905 5660 2001 1915 11479 11639 4753 20263 1825 243  
3 6 7 6 7 7 7 7 7 6 7  
4 9 9 9 9 9 9 9 9 9 9  
5 3 3 3 3 3 3 3 3 3 3  
6 81 275 178 47 702 530 242 1240 155 7  
7 245 756 501 358 1947 2245 1108 2863 481 115  
8 216 508 338 337 1540 1889 922 2264 345 128  
9 1 1 1 1 1 1 1 1 1 1  
10 1 1 1 1 1 1 1 1 1 1  
11 1 1 1 1 1 1 1 1 1 1  
12 23 31 32 26 29 34 29 32 29 19  
13 6 6 6 6 6 7 7 6 6 6  
14 6 6 6 6 6 7 7 6 6 7  
15 23 31 32 26 29 34 29 32 29 19  
16 23 30 28 24 30 30 28 32 28 23  
17 6 6 6 6 6 6 6 6 6 7  
18 5 6 6 6 6 6 6 6 6 7  
19 23 30 28 24 30 30 28 32 28 23

summary <- df\_trips\_only\_small |>  
 group\_by(origin\_geoXmicrotype\_ATB,dest\_geoXmicrotype\_ATB) %>%   
 summarise("Number Obs" = n(),  
 across(contains("\_ATB"),~n\_distinct(.x),.names = "{.col} distinct"),  
 .groups = "drop")  
36\*36

[1] 1296

summary

# A tibble: 1,094 × 19  
 origin\_geoXmicrotype\_ATB dest\_geoXmicrotype\_ATB `Number Obs`  
 <chr> <chr> <int>  
 1 A\_1 A\_1 23776  
 2 A\_1 A\_2 6717  
 3 A\_1 A\_3 5960  
 4 A\_1 A\_4 827  
 5 A\_1 A\_5 1367  
 6 A\_1 A\_6 147  
 7 A\_1 B\_1 33  
 8 A\_1 B\_2 89  
 9 A\_1 B\_3 80  
10 A\_1 B\_4 38  
# ℹ 1,084 more rows  
# ℹ 16 more variables: `mode\_ATB distinct` <int>,  
# `trip\_purpose\_ATB distinct` <int>, `start\_time\_bin\_ATB distinct` <int>,  
# `orig\_fips11\_ATB distinct` <int>, `dest\_fips11\_ATB distinct` <int>,  
# `hh\_fips11\_ATB distinct` <int>,  
# `origin\_microtypeXgeotype\_ATB distinct` <int>,  
# `origin\_geotype\_ATB distinct` <int>, …

summary %>% sjmisc::rotate\_df(rn="N distinct")

N distinct V1 V2 V3 V4 V5 V6  
1 origin\_geoXmicrotype\_ATB A\_1 A\_1 A\_1 A\_1 A\_1 A\_1  
2 dest\_geoXmicrotype\_ATB A\_1 A\_2 A\_3 A\_4 A\_5 A\_6  
3 Number Obs 23776 6717 5960 827 1367 147  
4 mode\_ATB distinct 7 7 7 7 7 6  
5 trip\_purpose\_ATB distinct 9 9 9 9 9 9  
6 start\_time\_bin\_ATB distinct 3 3 3 3 3 3  
7 orig\_fips11\_ATB distinct 3636 1854 1929 434 557 80  
8 dest\_fips11\_ATB distinct 3632 2234 1647 357 616 18  
9 hh\_fips11\_ATB distinct 3756 3055 2853 514 848 104  
10 origin\_microtypeXgeotype\_ATB distinct 1 1 1 1 1 1  
11 origin\_geotype\_ATB distinct 1 1 1 1 1 1  
12 origin\_microtype\_ATB distinct 1 1 1 1 1 1  
13 dest\_microtypeXgeotype\_ATB distinct 1 1 1 1 1 1  
14 dest\_geotype\_ATB distinct 1 1 1 1 1 1  
15 dest\_microtype\_ATB distinct 1 1 1 1 1 1  
16 hh\_microtypeXgeotype\_ATB distinct 30 27 30 19 19 18  
17 hh\_geotype\_ATB distinct 6 7 6 5 5 4  
18 hh\_microtype\_ATB distinct 6 7 6 6 6 6  
19 hh\_geoXmicrotype\_ATB distinct 30 27 30 19 19 18  
 V7 V8 V9 V10 V11 V12 V13 V14 V15 V16 V17 V18  
1 A\_1 A\_1 A\_1 A\_1 A\_1 A\_1 A\_1 A\_1 A\_1 A\_1 A\_1 A\_1  
2 B\_1 B\_2 B\_3 B\_4 B\_5 B\_6 C\_1 C\_2 C\_3 C\_4 C\_5 C\_6  
3 33 89 80 38 93 23 1 30 26 11 79 10  
4 4 5 4 4 5 2 1 3 4 2 4 4  
5 8 9 8 7 7 5 1 6 5 5 8 3  
6 3 3 3 3 3 2 1 2 2 1 3 3  
7 25 60 53 30 60 14 1 18 21 9 54 10  
8 23 60 52 30 56 13 1 19 18 8 56 10  
9 26 64 61 30 58 14 1 19 19 9 57 10  
10 1 1 1 1 1 1 1 1 1 1 1 1  
11 1 1 1 1 1 1 1 1 1 1 1 1  
12 1 1 1 1 1 1 1 1 1 1 1 1  
13 1 1 1 1 1 1 1 1 1 1 1 1  
14 1 1 1 1 1 1 1 1 1 1 1 1  
15 1 1 1 1 1 1 1 1 1 1 1 1  
16 8 9 12 9 10 6 1 5 9 5 12 4  
17 3 2 5 3 3 3 1 3 3 2 5 3  
18 6 5 6 5 6 5 1 4 6 4 6 3  
19 8 9 12 9 10 6 1 5 9 5 12 4  
 V19 V20 V21 V22 V23 V24 V25 V26 V27 V28 V29 V30  
1 A\_1 A\_1 A\_1 A\_1 A\_1 A\_1 A\_1 A\_1 A\_1 A\_1 A\_1 A\_2  
2 D\_5 D\_6 E\_2 E\_6 F\_1 F\_2 F\_3 F\_4 F\_5 F\_6 <NA> A\_1  
3 4 2 7 1 5 34 39 4 40 6 17 6786  
4 1 1 1 1 3 3 2 1 2 1 2 7  
5 3 2 4 1 4 5 8 1 6 1 4 9  
6 1 1 1 1 2 3 3 1 2 1 2 3  
7 3 2 2 1 5 28 24 1 26 1 7 2256  
8 3 2 3 1 4 26 21 1 23 1 2 1828  
9 3 2 3 1 4 29 27 1 25 1 6 3032  
10 1 1 1 1 1 1 1 1 1 1 1 1  
11 1 1 1 1 1 1 1 1 1 1 1 1  
12 1 1 1 1 1 1 1 1 1 1 1 1  
13 1 1 1 1 1 1 1 1 1 1 1 1  
14 1 1 1 1 1 1 1 1 1 1 1 1  
15 1 1 1 1 1 1 1 1 1 1 1 1  
16 2 2 3 1 4 9 12 1 9 1 3 28  
17 1 1 2 1 3 5 4 1 4 1 2 7  
18 2 2 3 1 3 5 5 1 4 1 3 7  
19 2 2 3 1 4 9 12 1 9 1 3 28  
 V31 V32 V33 V34 V35 V36 V37 V38 V39 V40 V41 V42  
1 A\_2 A\_2 A\_2 A\_2 A\_2 A\_2 A\_2 A\_2 A\_2 A\_2 A\_2 A\_2  
2 A\_2 A\_3 A\_4 A\_5 A\_6 B\_1 B\_2 B\_3 B\_4 B\_5 B\_6 C\_1  
3 43551 16508 3862 9385 237 51 138 155 73 162 49 7  
4 7 7 7 7 5 3 5 4 2 2 4 1  
5 9 9 9 9 8 8 9 8 9 9 6 5  
6 3 3 3 3 3 3 3 3 3 3 3 2  
7 4352 3267 1475 2201 145 33 87 97 46 106 34 5  
8 4371 2326 850 1471 57 32 82 89 41 81 29 5  
9 4957 4695 1587 2778 146 35 88 110 48 92 34 5  
10 1 1 1 1 1 1 1 1 1 1 1 1  
11 1 1 1 1 1 1 1 1 1 1 1 1  
12 1 1 1 1 1 1 1 1 1 1 1 1  
13 1 1 1 1 1 1 1 1 1 1 1 1  
14 1 1 1 1 1 1 1 1 1 1 1 1  
15 1 1 1 1 1 1 1 1 1 1 1 1  
16 31 32 27 26 14 9 12 13 10 11 11 3  
17 7 6 6 6 4 4 3 4 4 5 3 2  
18 7 6 6 6 6 5 6 5 5 6 6 2  
19 31 32 27 26 14 9 12 13 10 11 11 3  
 V43 V44 V45 V46 V47 V48 V49 V50 V51 V52 V53 V54  
1 A\_2 A\_2 A\_2 A\_2 A\_2 A\_2 A\_2 A\_2 A\_2 A\_2 A\_2 A\_2  
2 C\_2 C\_3 C\_4 C\_5 C\_6 D\_2 D\_3 D\_4 D\_5 D\_6 E\_4 E\_5  
3 46 54 31 158 80 2 11 5 9 22 1 1  
4 2 2 4 4 2 1 3 2 2 3 1 1  
5 6 7 7 8 8 1 4 2 5 6 1 1  
6 3 3 3 3 3 1 2 2 2 2 1 1  
7 38 39 23 99 54 1 7 4 8 12 1 1  
8 35 36 23 95 51 1 4 4 8 12 1 1  
9 37 37 23 109 53 1 7 4 8 12 1 1  
10 1 1 1 1 1 1 1 1 1 1 1 1  
11 1 1 1 1 1 1 1 1 1 1 1 1  
12 1 1 1 1 1 1 1 1 1 1 1 1  
13 1 1 1 1 1 1 1 1 1 1 1 1  
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6 2 3 1 1 1 1 2 3 3 3 3 3  
7 5 18 1 1 1 1 7 7 23 23 7 63  
8 6 17 1 1 1 1 6 6 39 27 8 116  
9 5 19 1 1 1 1 7 8 43 40 9 128  
10 1 1 1 1 1 1 1 1 1 1 1 1  
11 1 1 1 1 1 1 1 1 1 1 1 1  
12 1 1 1 1 1 1 1 1 1 1 1 1  
13 1 1 1 1 1 1 1 1 1 1 1 1  
14 1 1 1 1 1 1 1 1 1 1 1 1  
15 1 1 1 1 1 1 1 1 1 1 1 1  
16 4 7 1 1 1 1 2 2 9 10 4 17  
17 4 5 1 1 1 1 2 1 3 5 2 5  
18 4 4 1 1 1 1 1 2 6 4 3 6  
19 4 7 1 1 1 1 2 2 9 10 4 17  
 V1075 V1076 V1077 V1078 V1079 V1080 V1081 V1082 V1083 V1084 V1085 V1086  
1 F\_6 <NA> <NA> <NA> <NA> <NA> <NA> <NA> <NA> <NA> <NA> <NA>  
2 F\_6 A\_1 A\_2 A\_3 A\_5 A\_6 B\_1 B\_2 B\_3 B\_4 B\_5 B\_6  
3 924 16 9 56 7 3 15 22 22 7 14 10  
4 5 3 3 2 2 1 2 2 2 2 4 2  
5 9 4 4 5 2 1 5 7 6 4 6 4  
6 3 2 2 3 1 2 2 2 2 3 3 2  
7 98 2 3 2 2 1 1 3 3 2 4 2  
8 98 5 7 17 3 1 7 16 13 5 10 7  
9 123 4 7 38 6 2 7 15 13 4 10 7  
10 1 1 1 1 1 1 1 1 1 1 1 1  
11 1 1 1 1 1 1 1 1 1 1 1 1  
12 1 1 1 1 1 1 1 1 1 1 1 1  
13 1 1 1 1 1 1 1 1 1 1 1 1  
14 1 1 1 1 1 1 1 1 1 1 1 1  
15 1 1 1 1 1 1 1 1 1 1 1 1  
16 21 2 4 17 5 2 5 4 8 4 4 4  
17 6 2 4 6 3 1 3 2 3 4 3 3  
18 6 2 4 6 3 2 5 4 5 3 3 4  
19 21 2 4 17 5 2 5 4 8 4 4 4  
 V1087 V1088 V1089 V1090 V1091 V1092 V1093 V1094  
1 <NA> <NA> <NA> <NA> <NA> <NA> <NA> <NA>  
2 C\_2 C\_3 C\_5 C\_6 D\_6 F\_3 F\_4 <NA>  
3 5 1 23 8 4 8 1 12  
4 1 1 4 2 1 1 1 2  
5 2 1 3 3 1 2 1 5  
6 2 1 2 2 1 2 1 3  
7 1 1 1 1 1 2 1 2  
8 2 1 11 5 1 1 1 2  
9 2 1 11 5 1 5 1 3  
10 1 1 1 1 1 1 1 1  
11 1 1 1 1 1 1 1 1  
12 1 1 1 1 1 1 1 1  
13 1 1 1 1 1 1 1 1  
14 1 1 1 1 1 1 1 1  
15 1 1 1 1 1 1 1 1  
16 2 1 3 2 1 4 1 2  
17 1 1 1 1 1 3 1 2  
18 2 1 3 2 1 4 1 2  
19 2 1 3 2 1 4 1 2

## Data: make wider dataset

make wider dataset to examine further:

then use the smaller to make wider dataset. This is to make the modes go across rather than down

df\_trips\_only\_small <- df\_trips\_only\_small |>  
 mutate(onePerObs = 1)

df\_trips\_only\_small\_wide <- df\_trips\_only\_small |>  
 group\_by(origin\_geoXmicrotype\_ATB,dest\_geoXmicrotype\_ATB) %>%   
 summarise("Number Obs" = n(),  
 across(contains("\_ATB"),~n\_distinct(.x),.names = "{.col}"),  
 .groups = "drop")  
df\_trips\_only\_small\_wide

# A tibble: 1,094 × 19  
 origin\_geoXmicrotype\_ATB dest\_geoXmicrotype\_ATB `Number Obs` mode\_ATB  
 <chr> <chr> <int> <int>  
 1 A\_1 A\_1 23776 7  
 2 A\_1 A\_2 6717 7  
 3 A\_1 A\_3 5960 7  
 4 A\_1 A\_4 827 7  
 5 A\_1 A\_5 1367 7  
 6 A\_1 A\_6 147 6  
 7 A\_1 B\_1 33 4  
 8 A\_1 B\_2 89 5  
 9 A\_1 B\_3 80 4  
10 A\_1 B\_4 38 4  
# ℹ 1,084 more rows  
# ℹ 15 more variables: trip\_purpose\_ATB <int>, start\_time\_bin\_ATB <int>,  
# orig\_fips11\_ATB <int>, dest\_fips11\_ATB <int>, hh\_fips11\_ATB <int>,  
# origin\_microtypeXgeotype\_ATB <int>, origin\_geotype\_ATB <int>,  
# origin\_microtype\_ATB <int>, dest\_microtypeXgeotype\_ATB <int>,  
# dest\_geotype\_ATB <int>, dest\_microtype\_ATB <int>,  
# hh\_microtypeXgeotype\_ATB <int>, hh\_geotype\_ATB <int>, …

#### How many have all 7 modes?

df\_trips\_only\_small\_wide %>%   
 pivot\_wider(  
 names\_from = mode\_ATB,  
 values\_from = "Number Obs",  
 values\_fn = sum  
 )

# A tibble: 1,094 × 24  
 origin\_geoXmicrotype\_ATB dest\_geoXmicrotype\_ATB trip\_purpose\_ATB  
 <chr> <chr> <int>  
 1 A\_1 A\_1 9  
 2 A\_1 A\_2 9  
 3 A\_1 A\_3 9  
 4 A\_1 A\_4 9  
 5 A\_1 A\_5 9  
 6 A\_1 A\_6 9  
 7 A\_1 B\_1 8  
 8 A\_1 B\_2 9  
 9 A\_1 B\_3 8  
10 A\_1 B\_4 7  
# ℹ 1,084 more rows  
# ℹ 21 more variables: start\_time\_bin\_ATB <int>, orig\_fips11\_ATB <int>,  
# dest\_fips11\_ATB <int>, hh\_fips11\_ATB <int>,  
# origin\_microtypeXgeotype\_ATB <int>, origin\_geotype\_ATB <int>,  
# origin\_microtype\_ATB <int>, dest\_microtypeXgeotype\_ATB <int>,  
# dest\_geotype\_ATB <int>, dest\_microtype\_ATB <int>,  
# hh\_microtypeXgeotype\_ATB <int>, hh\_geotype\_ATB <int>, …

df\_trips\_only\_small\_wide

# A tibble: 1,094 × 19  
 origin\_geoXmicrotype\_ATB dest\_geoXmicrotype\_ATB `Number Obs` mode\_ATB  
 <chr> <chr> <int> <int>  
 1 A\_1 A\_1 23776 7  
 2 A\_1 A\_2 6717 7  
 3 A\_1 A\_3 5960 7  
 4 A\_1 A\_4 827 7  
 5 A\_1 A\_5 1367 7  
 6 A\_1 A\_6 147 6  
 7 A\_1 B\_1 33 4  
 8 A\_1 B\_2 89 5  
 9 A\_1 B\_3 80 4  
10 A\_1 B\_4 38 4  
# ℹ 1,084 more rows  
# ℹ 15 more variables: trip\_purpose\_ATB <int>, start\_time\_bin\_ATB <int>,  
# orig\_fips11\_ATB <int>, dest\_fips11\_ATB <int>, hh\_fips11\_ATB <int>,  
# origin\_microtypeXgeotype\_ATB <int>, origin\_geotype\_ATB <int>,  
# origin\_microtype\_ATB <int>, dest\_microtypeXgeotype\_ATB <int>,  
# dest\_geotype\_ATB <int>, dest\_microtype\_ATB <int>,  
# hh\_microtypeXgeotype\_ATB <int>, hh\_geotype\_ATB <int>, …

# df\_trips\_only\_small %>%   
# count(origin\_geoXmicrotype\_ATB,dest\_geoXmicrotype\_ATB) %>%   
# pivot\_wider(names\_from = dest\_geoXmicrotype\_ATB,values\_from = n)

### make county level dataset

# df\_county\_origin <- df\_trips\_only\_small |>  
# group\_by(ORIG\_ST,ORIG\_CNTY) |>  
# summarise(Ntrips = n(),  
# across(contains("mode\_ATB"),~n\_distinct(.x),.names = "{.col}\_Ndis"),  
# .groups = "drop")  
# df\_county\_origin

### make microXgeotype level dataset

df\_microXgeotype <- df\_trips\_only\_small |>  
 group\_by(origin\_geoXmicrotype\_ATB,dest\_geoXmicrotype\_ATB) |>  
 summarise(Ntrips = n(),  
 across(contains("\_ATB"),~n\_distinct(.x),.names = "{.col}\_Ndis"),  
 .groups = "drop")  
df\_microXgeotype

# A tibble: 1,094 × 19  
 origin\_geoXmicrotype\_ATB dest\_geoXmicrotype\_ATB Ntrips mode\_ATB\_Ndis  
 <chr> <chr> <int> <int>  
 1 A\_1 A\_1 23776 7  
 2 A\_1 A\_2 6717 7  
 3 A\_1 A\_3 5960 7  
 4 A\_1 A\_4 827 7  
 5 A\_1 A\_5 1367 7  
 6 A\_1 A\_6 147 6  
 7 A\_1 B\_1 33 4  
 8 A\_1 B\_2 89 5  
 9 A\_1 B\_3 80 4  
10 A\_1 B\_4 38 4  
# ℹ 1,084 more rows  
# ℹ 15 more variables: trip\_purpose\_ATB\_Ndis <int>,  
# start\_time\_bin\_ATB\_Ndis <int>, orig\_fips11\_ATB\_Ndis <int>,  
# dest\_fips11\_ATB\_Ndis <int>, hh\_fips11\_ATB\_Ndis <int>,  
# origin\_microtypeXgeotype\_ATB\_Ndis <int>, origin\_geotype\_ATB\_Ndis <int>,  
# origin\_microtype\_ATB\_Ndis <int>, dest\_microtypeXgeotype\_ATB\_Ndis <int>,  
# dest\_geotype\_ATB\_Ndis <int>, dest\_microtype\_ATB\_Ndis <int>, …

## START HERE DEC 6

### Wide microgeo by mode to get fractions (first get the sum)

df\_microXgeotype\_wide <- df\_trips\_only\_small |>  
 count(origin\_geoXmicrotype\_ATB,dest\_geoXmicrotype\_ATB,  
 trip\_purpose\_ATB,start\_time\_bin\_ATB,  
 mode\_ATB) %>%   
 pivot\_wider(  
 names\_from = mode\_ATB,  
 values\_from = n  
 )  
df\_microXgeotype\_wide

# A tibble: 11,305 × 11  
 origin\_geoXmicrotype\_ATB dest\_geoXmicrotype\_ATB trip\_purpose\_ATB  
 <chr> <chr> <chr>   
 1 A\_1 A\_1 home   
 2 A\_1 A\_1 home   
 3 A\_1 A\_1 home   
 4 A\_1 A\_1 meals   
 5 A\_1 A\_1 meals   
 6 A\_1 A\_1 meals   
 7 A\_1 A\_1 medical   
 8 A\_1 A\_1 medical   
 9 A\_1 A\_1 medical   
10 A\_1 A\_1 other   
# ℹ 11,295 more rows  
# ℹ 8 more variables: start\_time\_bin\_ATB <chr>, bike <int>, bus <int>,  
# hv <int>, other <int>, rail <int>, taxi <int>, walk <int>

### new dataset

* county
* user class (income variation) use xiaodan’s
* trip purpose – which may or may not. Mandatory versus non-mandatory. Work and School
* trip distance bin
* departure time bin

Micro-geotype – merge this into the dataset, and then use micro type. Break up by micro geo Replace county by microtype. There are 6 microtypes. Use Origin and destination microtypes – could do that, then there would be

Need to ask Xiaodan to how to merge microtype and geo type IDs to FIPS blocks.

Then Combinatorials of

## Summary stats by coumty

### basic

how many trips in each state

summary\_table <- df\_trips\_only |>   
 group\_by(ORIG\_ST) |>  
 summarise(   
 Ntrips = n(),  
 .groups = "drop")  
summary\_table

# A tibble: 55 × 2  
 ORIG\_ST Ntrips  
 <chr> <int>  
 1 -9 4  
 2 01 2446  
 3 02 1784  
 4 04 19568  
 5 05 1497  
 6 06 183392  
 7 08 4285  
 8 09 2318  
 9 10 1978  
10 11 2099  
# ℹ 45 more rows

how many trips for each mode

summary\_table <- df\_trips\_only |>   
 group\_by(mode\_ATB) |>  
 summarise(   
 Ntrips = n(),  
 .groups = "drop") |>  
 arrange(-Ntrips)   
summary\_table

# A tibble: 7 × 2  
 mode\_ATB Ntrips  
 <chr> <int>  
1 hv 800071  
2 walk 81288  
3 bus 20254  
4 bike 8034  
5 other 6638  
6 rail 4474  
7 taxi 2813

### by county

how many trips in each county

# ggplot(df\_county\_origin,aes(x=Ntrips)) +  
# geom\_histogram(binwidth=1) +  
# coord\_cartesian(xlim = c(0, 50))

### by mode type by

# ggplot(df\_county\_origin,aes(x=mode\_Ndis)) +  
# geom\_histogram(binwidth=1)   
# # coord\_cartesian(xlim = c(0, 50))

### by purpose

# df\_county\_origin <- df\_trips\_only\_small |>  
# group\_by(mode\_ATB,trip\_purpose\_ATB) |>  
# summarise(Ntrips = n(),  
# #across(contains("mode\_ATB"),~n\_distinct(.x),.names = "{.col}\_Ndis"),  
# .groups = "drop")  
# #df\_county\_origin  
# df\_county\_origin

across(where(is.numeric),~mean(.x),.names = "{.col}\_avg"),  
 across(where(is.factor ),~n\_distinct(.x),.names = "{.col}\_Ndis"),

## Make new proportional dataset

### by microXgeotype

# ggplot(df\_county\_origin,aes(x=Ntrips)) +  
# geom\_histogram(binwidth=1) +  
# coord\_cartesian(xlim = c(0, 50))

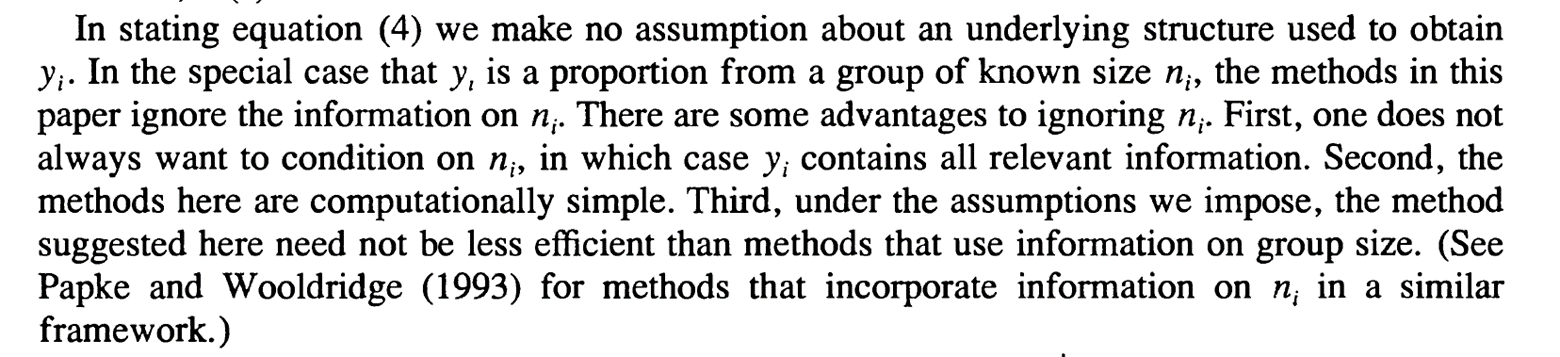
## fractional split logit

### methodology

The R package is here, I think it’s mostly based on the stata package: https://github.com/f1kidd/fmlogit

It looks like there is no need to include information about how the proportions within each observation were obtained, like how many people or whatever were used to make the proportions, see this from the seminal paper:

Papke, Leslie E., and Jeffrey M. Wooldridge. “Econometric Methods for Fractional Response Variables With an Application to 401 (K) Plan Participation Rates.” *Journal of Applied Econometrics*, vol. 11, no. 6, 1996, pp. 619–32. *JSTOR*, http://www.jstor.org/stable/2285155. Accessed 29 Nov. 2023.



This is an [example](https://www.sciencedirect.com/science/article/abs/pii/S0001457517304049) of a fractional split logit using the fraction of crashes in each TAZ as the y var, and the x vars are descriptors of the TAZ also in proportions. Lee J, Yasmin S, Eluru N, Abdel-Aty M, Cai Q. Analysis of crash proportion by vehicle type at traffic analysis zone level: A mixed fractional split multinomial logit modeling approach with spatial effects. Accid Anal Prev. 2018 Feb;111:12-22. doi: 10.1016/j.aap.2017.11.017. Epub 2017 Nov 20. PMID: 29161538.

## Render to Word

# quarto render "C:\Users\atodd\Documents\GitHub\GEMS-data\gems-mode-choice20\_mode-choice-cleaned-stats.qmd" --to docx