Review of CRC A88 Project -- Part One
Age Distribution

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MARAMA MOVES Workgroup Conference Call
July 15, 2014

What is the CRC Project?

- **Goal: Improve the default inputs used by USEPA in MOVES modeling**
- **Selected critical inputs to improve:**

  Passenger car & truck age distribution

  Passenger car & truck population

  Combination long-haul VMT

  Heavy-duty extended idling
- **For Age and population IHS data was obtained for 2011**

CRC data -- Age Distributions

Source Vehicle Types of CRC data:

20, Passenger Car

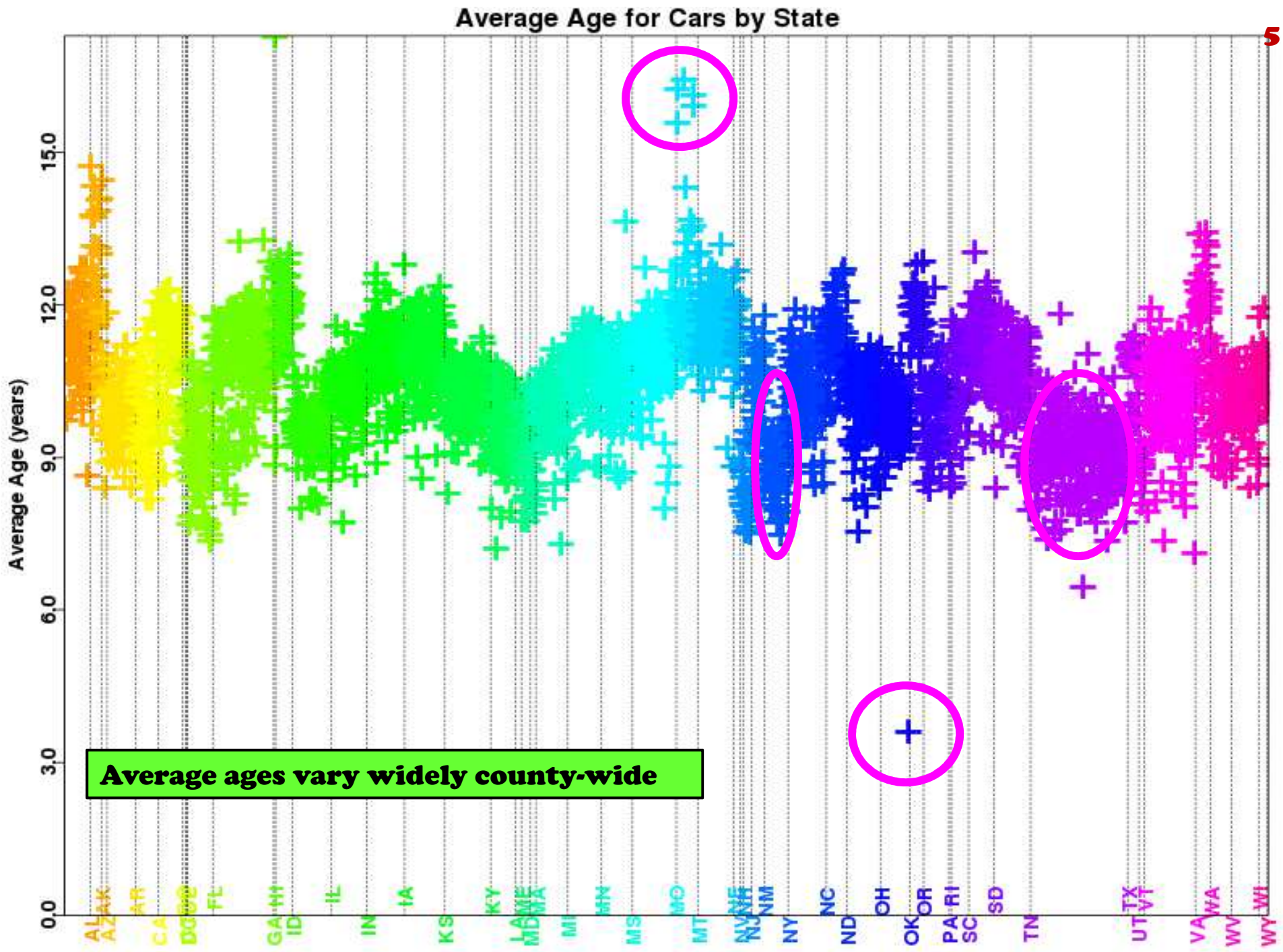
30, Passenger Truck and Light Commercial Truck

Graphical Settings

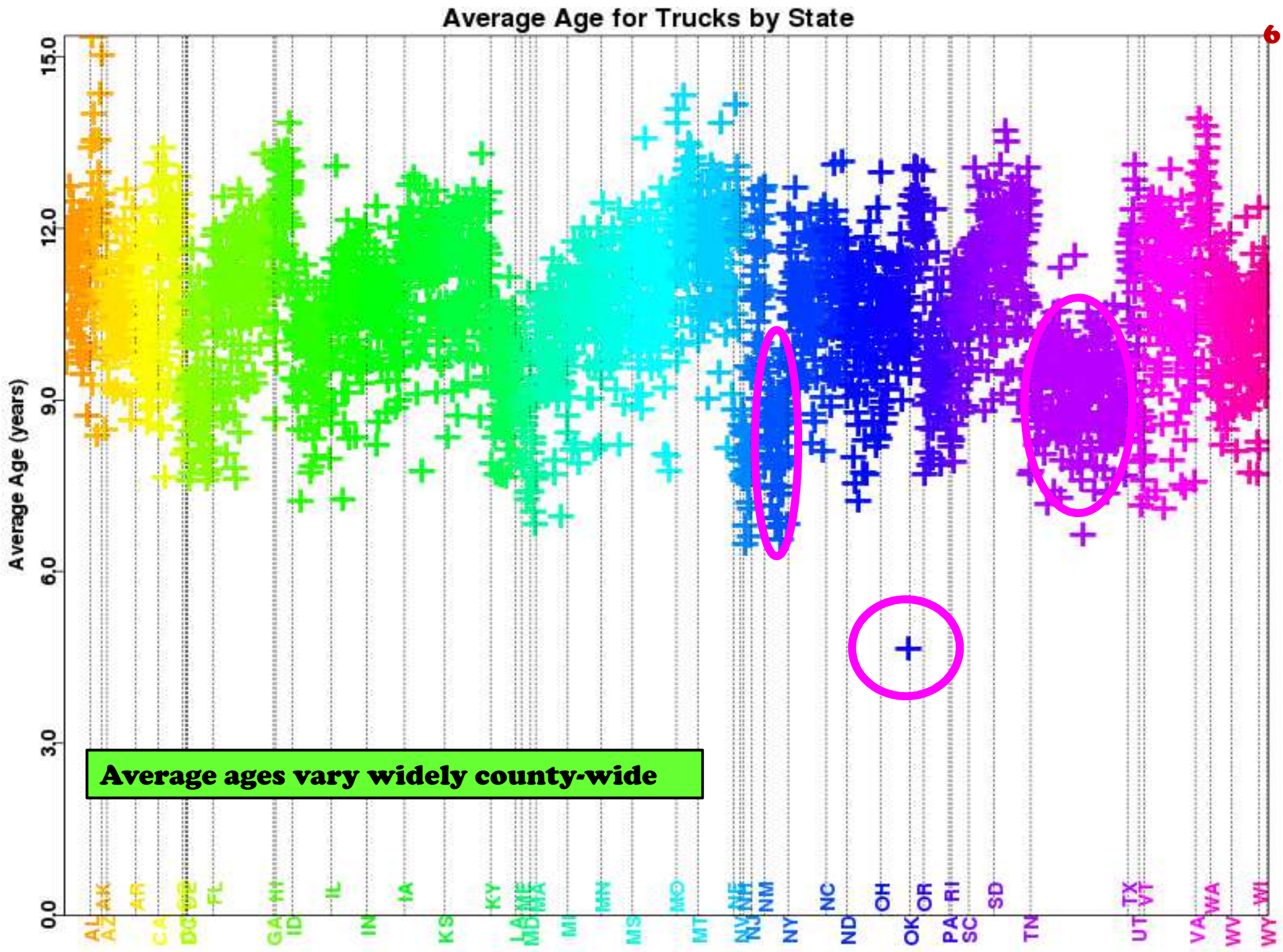
- Data are plotted by county (on x axis) and grouped by states
- Two adjacent vertical lines demarcate data boundary for the state labeled on the right
- Average age for a source vehicle type:

$$\text{Average Age} = \sum_{i=0}^{i=30} \text{fraction_}i * \text{age_}i$$

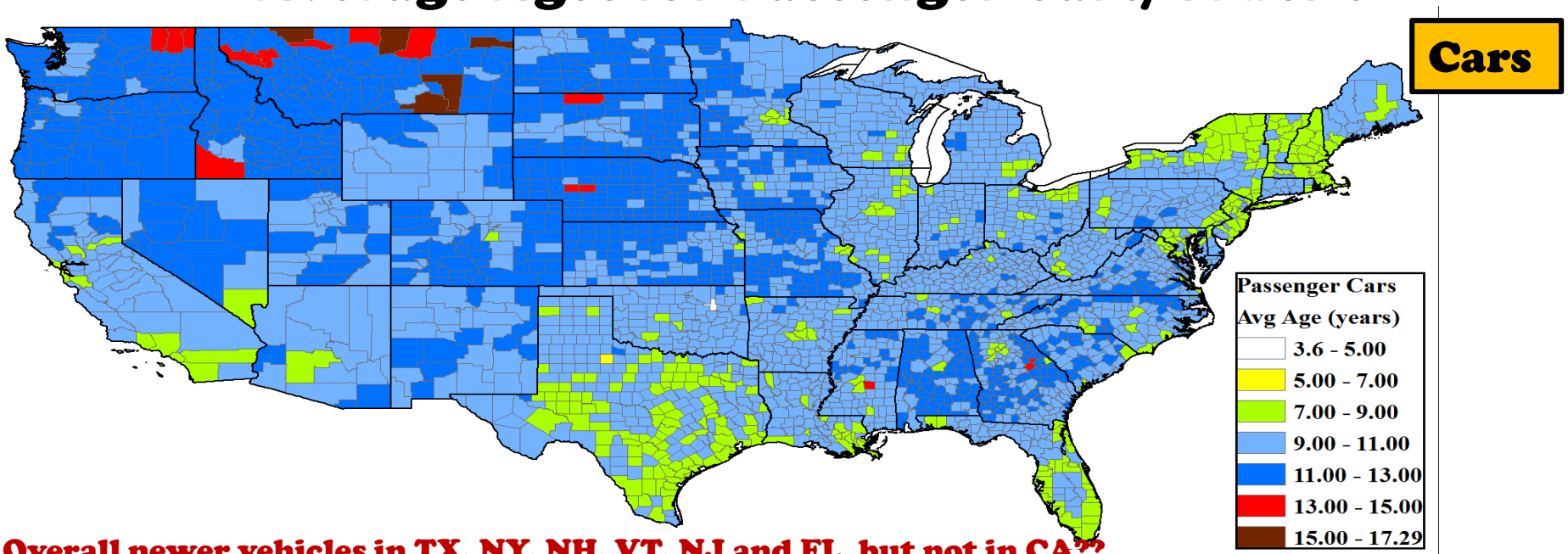
- Suspicious data points are circled in magenta



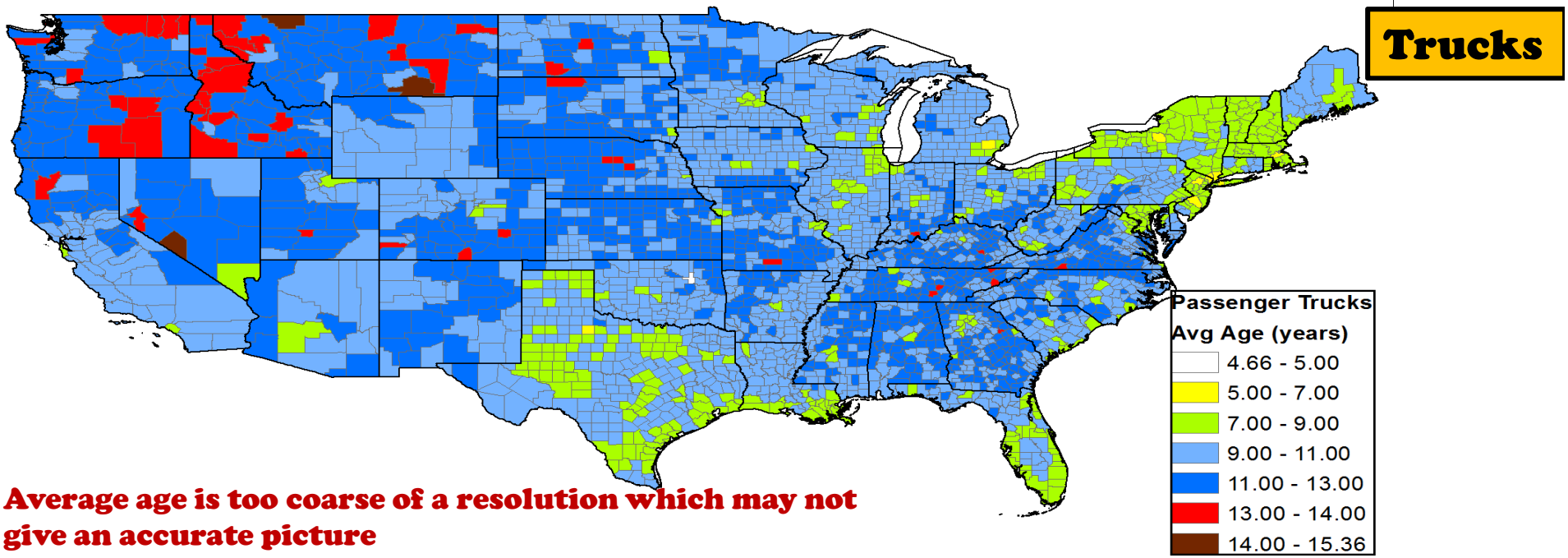
Average ages vary widely county-wide


Average Age for Trucks by State
Average Age (years)
0.0
3.0
6.0
9.0
12.0
15.0
AL
AZ
AK
AR
CA
DC
DE
FL
GA
HI
ID
IL
IN
IA
KS
KY
LA
ME
MD
MA
MI
MN
MS
MO
MT
NV
NE
NJ
NH
NM
NY
NC
ND
OH
OK
OR
PA
RI
SC
SD
TN
UT
TX
VT
VA
WA
WV
WI
WY
Average ages vary widely county-wide

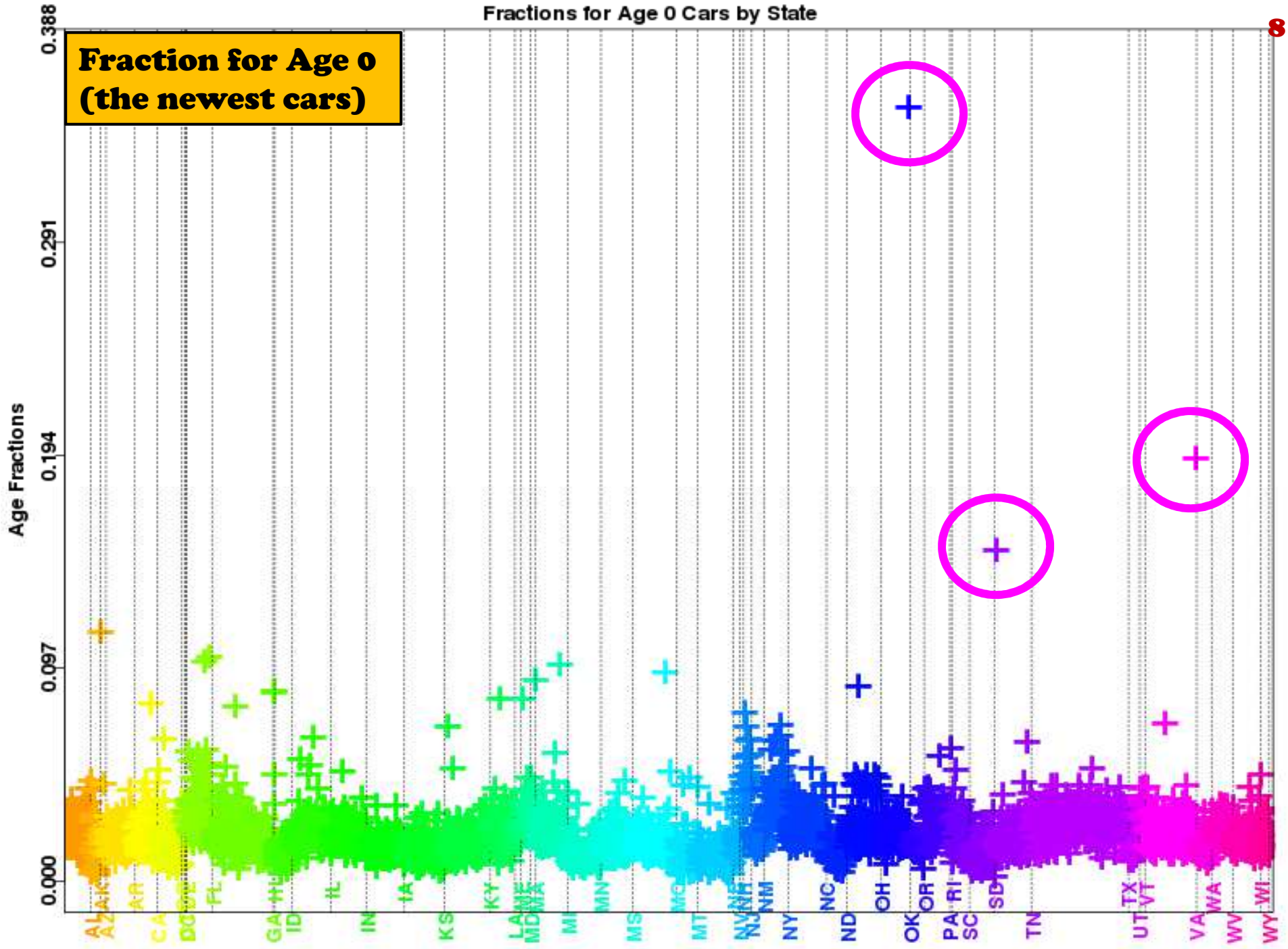
Average Ages for Passenger Cars/Trucks



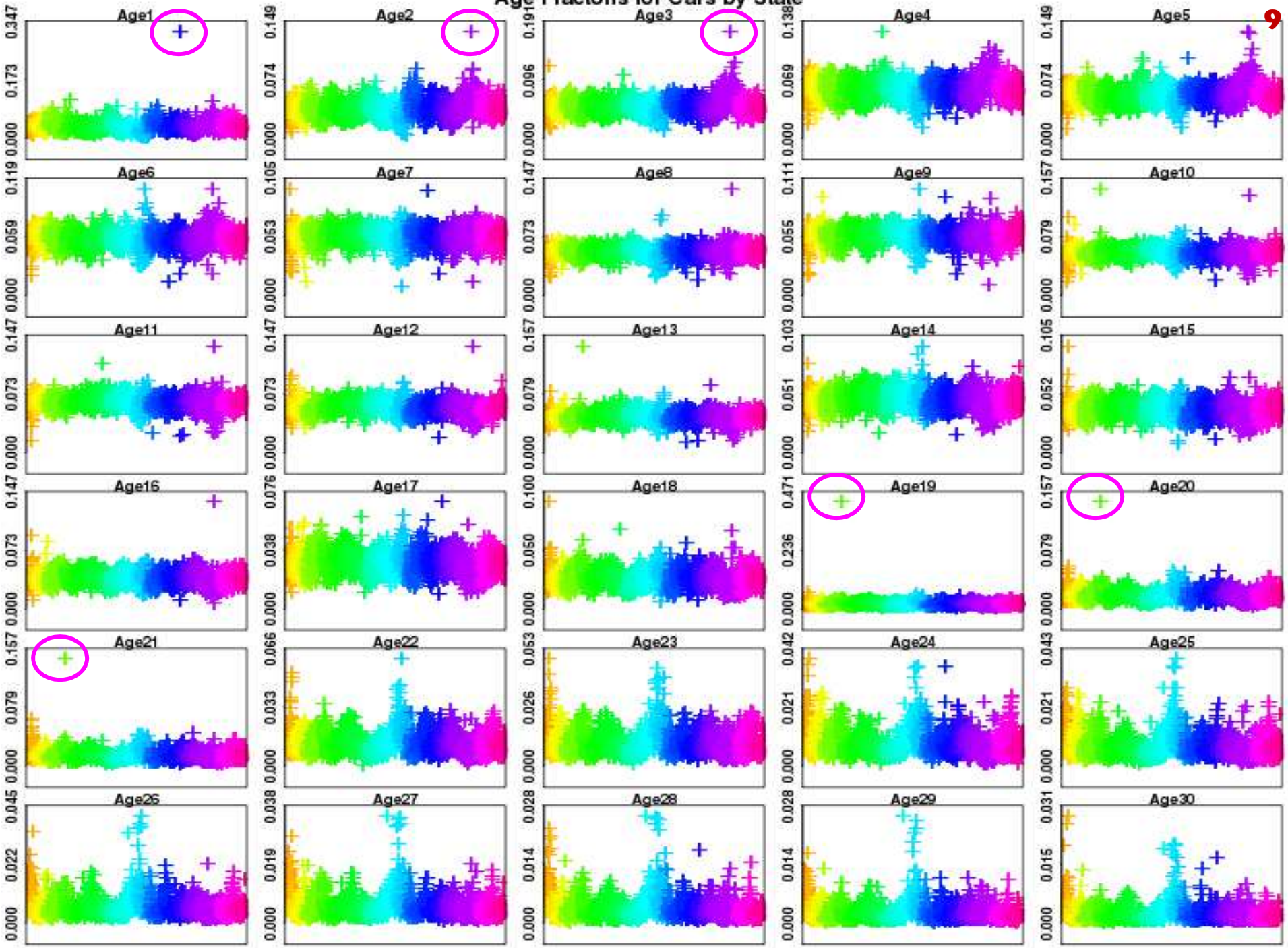
Overall newer vehicles in TX, NY, NH, VT, NJ and FL, but not in CA??

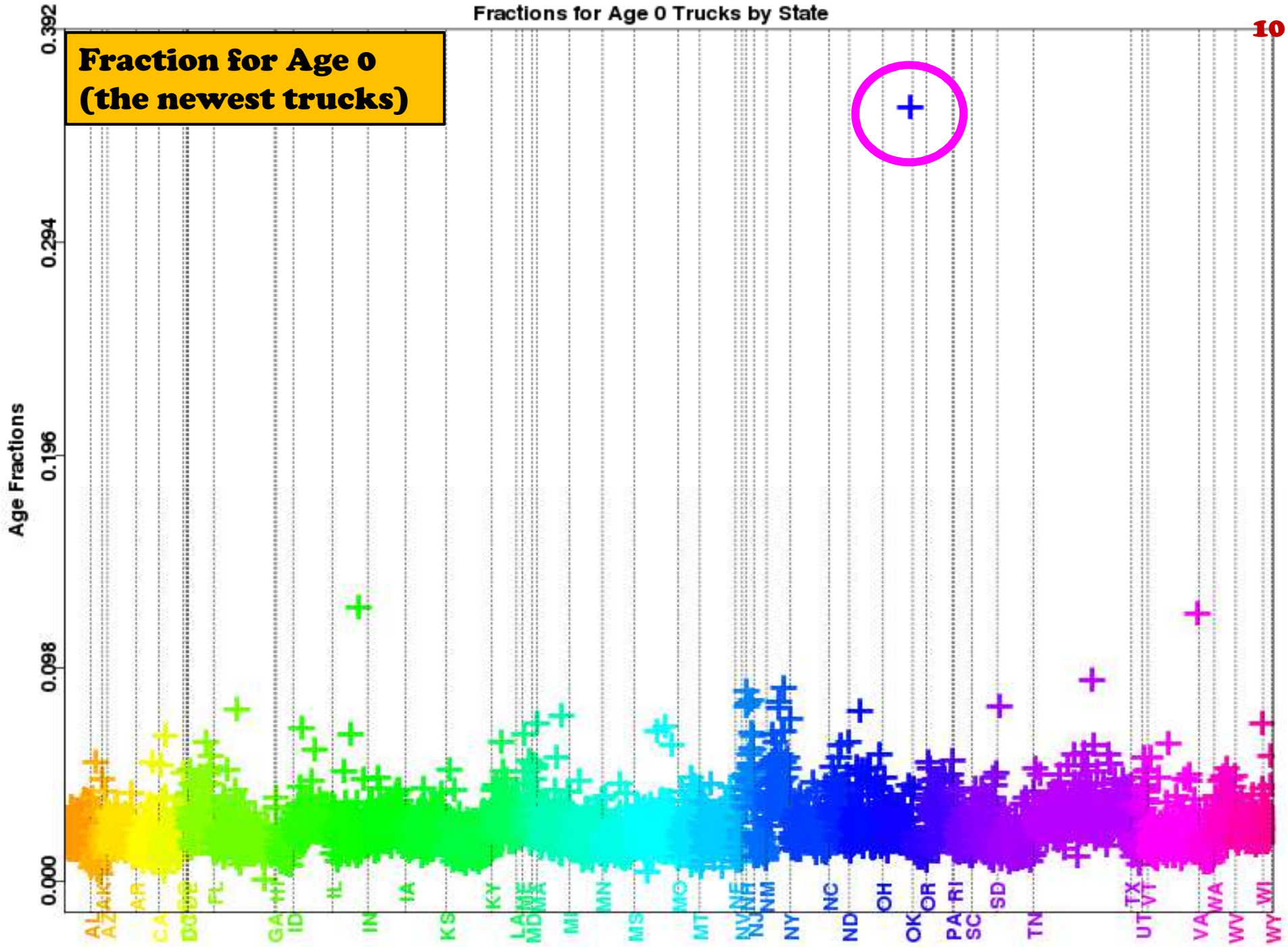


Average age is too coarse of a resolution which may not give an accurate picture

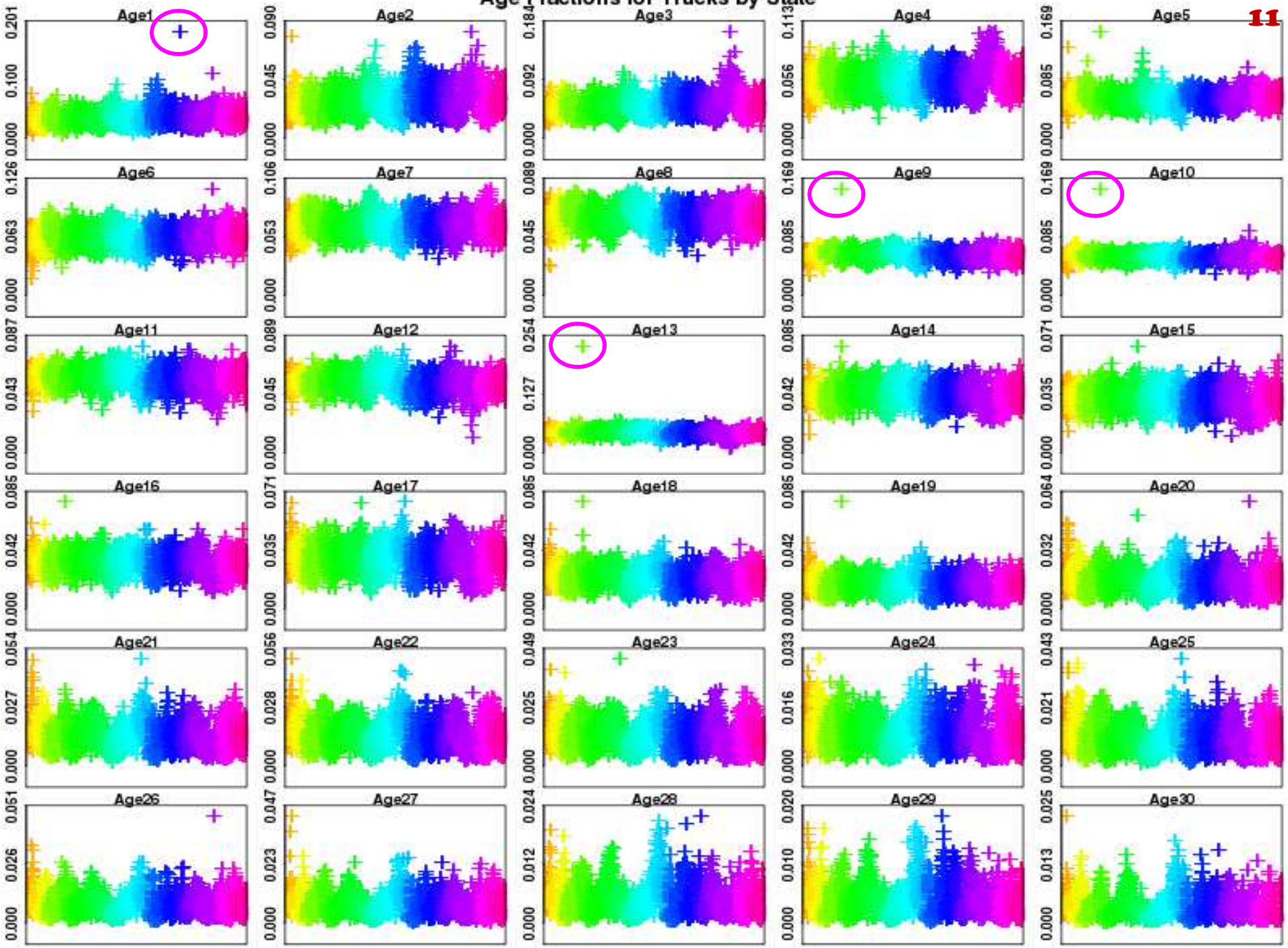

Fraction for Age 0
(the newest cars)
Fractions for Age 0 Cars by State
Age Fractions
0.000
0.097
0.194
0.291
0.388
AL
AZ
AK
AR
CA
DC
DE
FL
GA
HI
ID
IL
IN
IA
KS
KY
LA
ME
MD
MA
MI
MN
MS
MO
MT
NV
NE
NJ
NH
NM
NY
NC
ND
OH
OK
OR
PA
RI
SC
SD
TN
TX
UT
VT
VA
WA
WV
WI
WY

Age Fractons for Cars by State




Fraction for Age 0
(the newest trucks)
Fractions for Age 0 Trucks by State
Age Fractions
0.000
0.098
0.196
0.294
0.392
AL
AZ
AR
CA
DE
FL
GA
ID
IL
IN
IA
KS
KY
LA
ME
MD
MA
MI
MN
MS
MO
MT
NV
NE
NH
NJ
NM
NY
NC
ND
OH
OK
OR
PA
RI
SC
SD
TN
TX
UT
VT
VA
WA
WV
WI
WY

Age Fractions for Trucks by State



Comparison between VA/NY County-Specific Data and CRC Data

NY data was provided by Eric Zalewsky of NYSDEC

2011 NY and VA State Inputs (submitted to 2011 NEI)

- Data Sources: Vehicle registration data from State Department of Motor Vehicles (DMV)
- VA
  - State grants funding VIN decoding (outputs in MOBILE6 vehicle types)
  - EPA developed fractions were used to translate MOBILE6 source types to MOVES source types
- NY
  - Used its own codes to process registration data directly into MOVES source types

MOVES Source Vehicle Types:

21, Passenger Car

31, Passenger Truck

32, Light Commercial Truck

For trucks, age fractions for 31 and 32 of state data were averaged prior to comparisons with CRC data (of type 30)

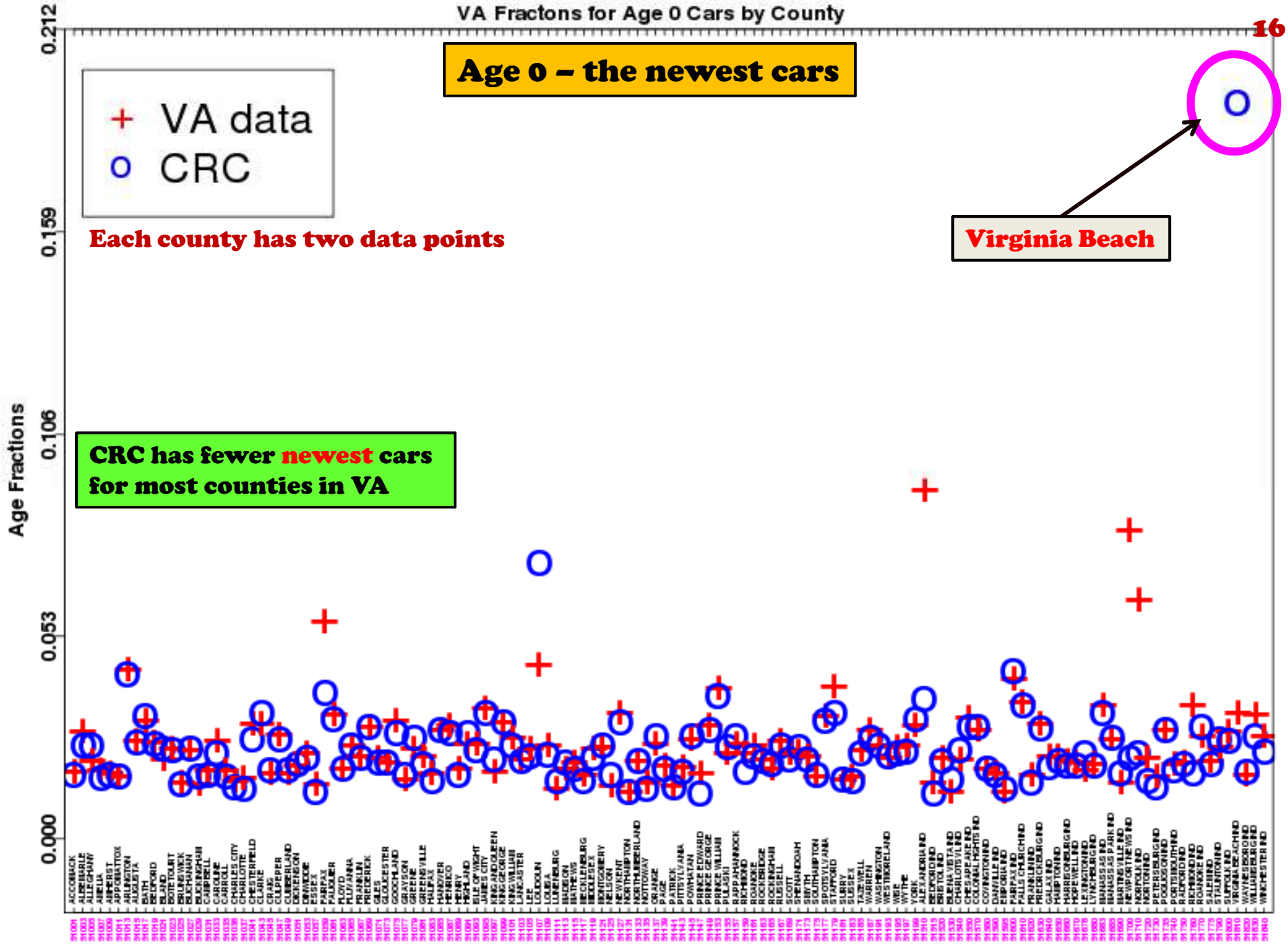
Graphical Settings

- Data are plotted by county (on x axis)
- Percent differences:

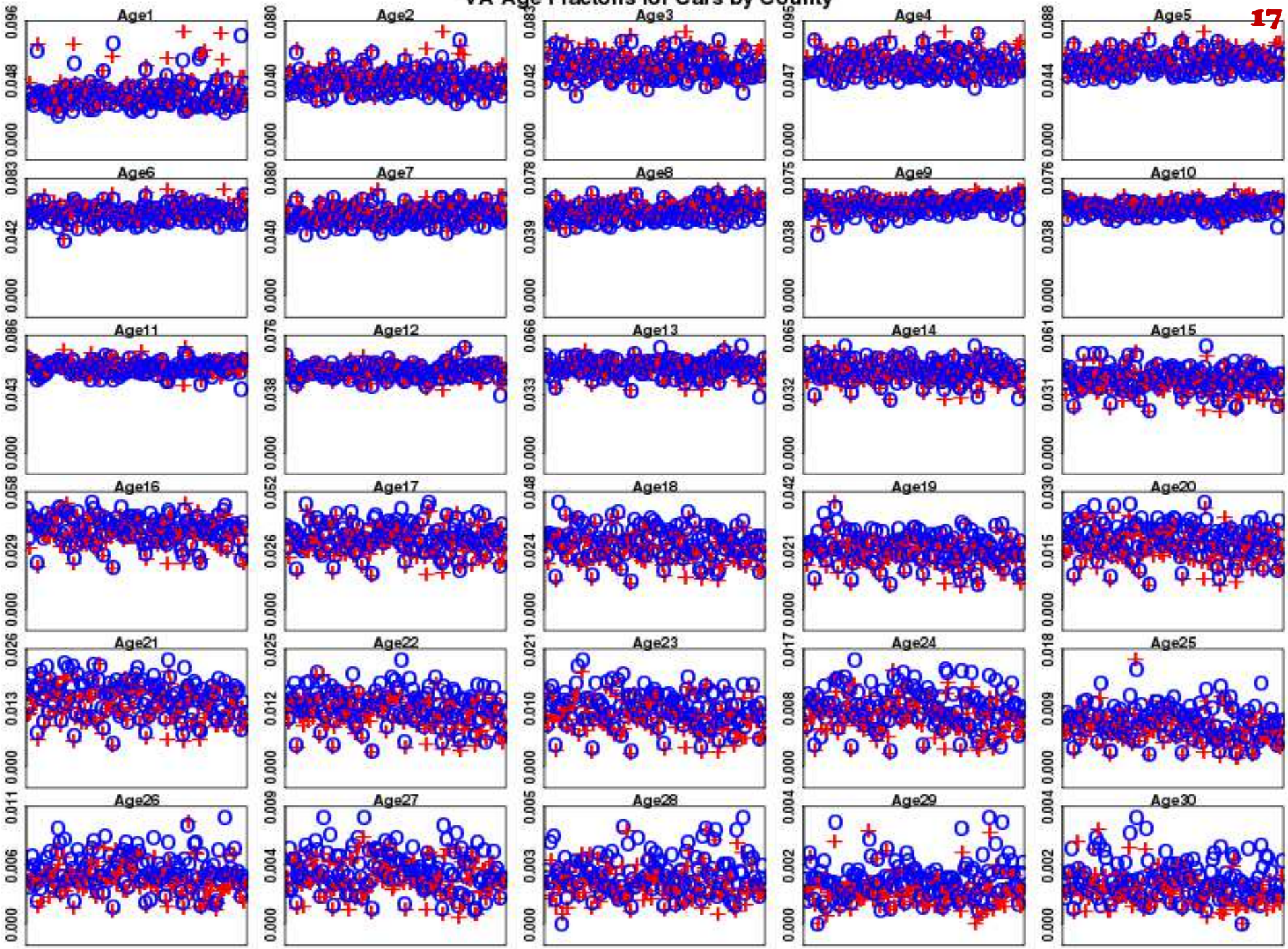
$$\text{Diff (\%)} = \frac{\text{NY/VA data} - \text{CRC data}}{\text{CRC data}} * 100$$

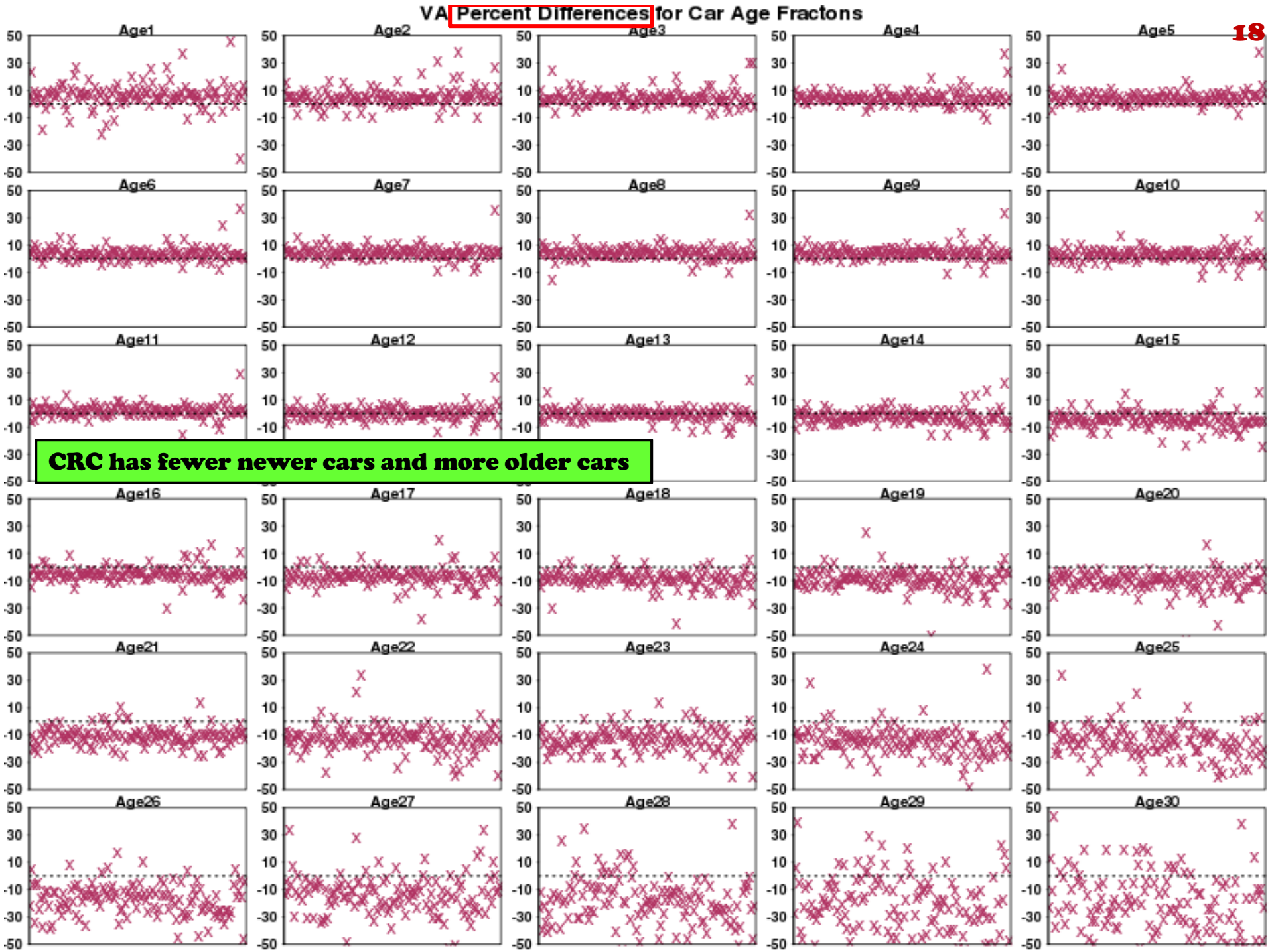
- Suspicious data points are circled in magenta

Comparison for Passenger Cars

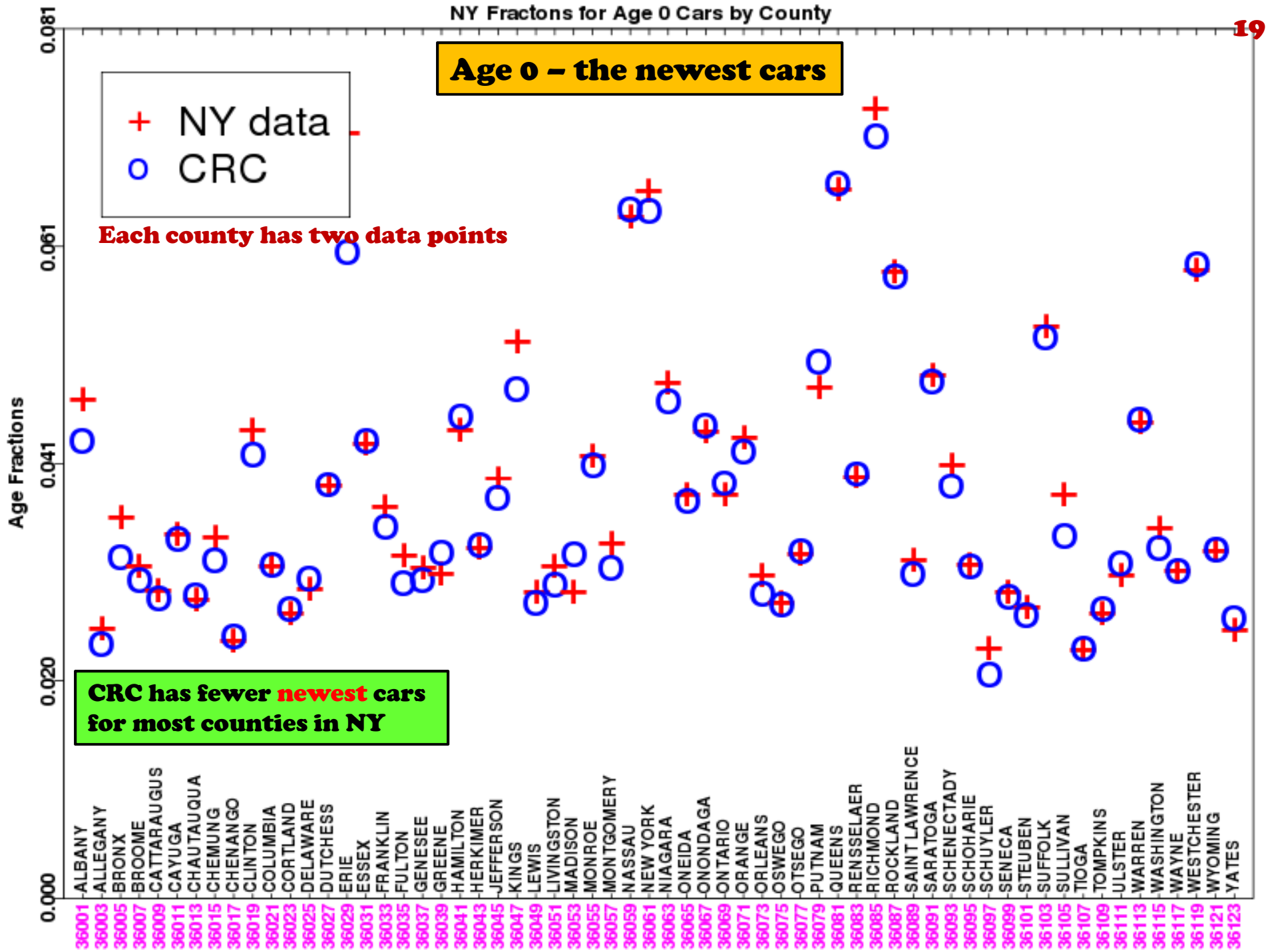

VA Fractons for Age 0 Cars by County
Age 0 – the newest cars
VA data
CRC
Each county has two data points
Virginia Beach
CRC has fewer newest cars for most counties in VA
Age Fractions
0.000
0.053
0.106
0.159
0.212

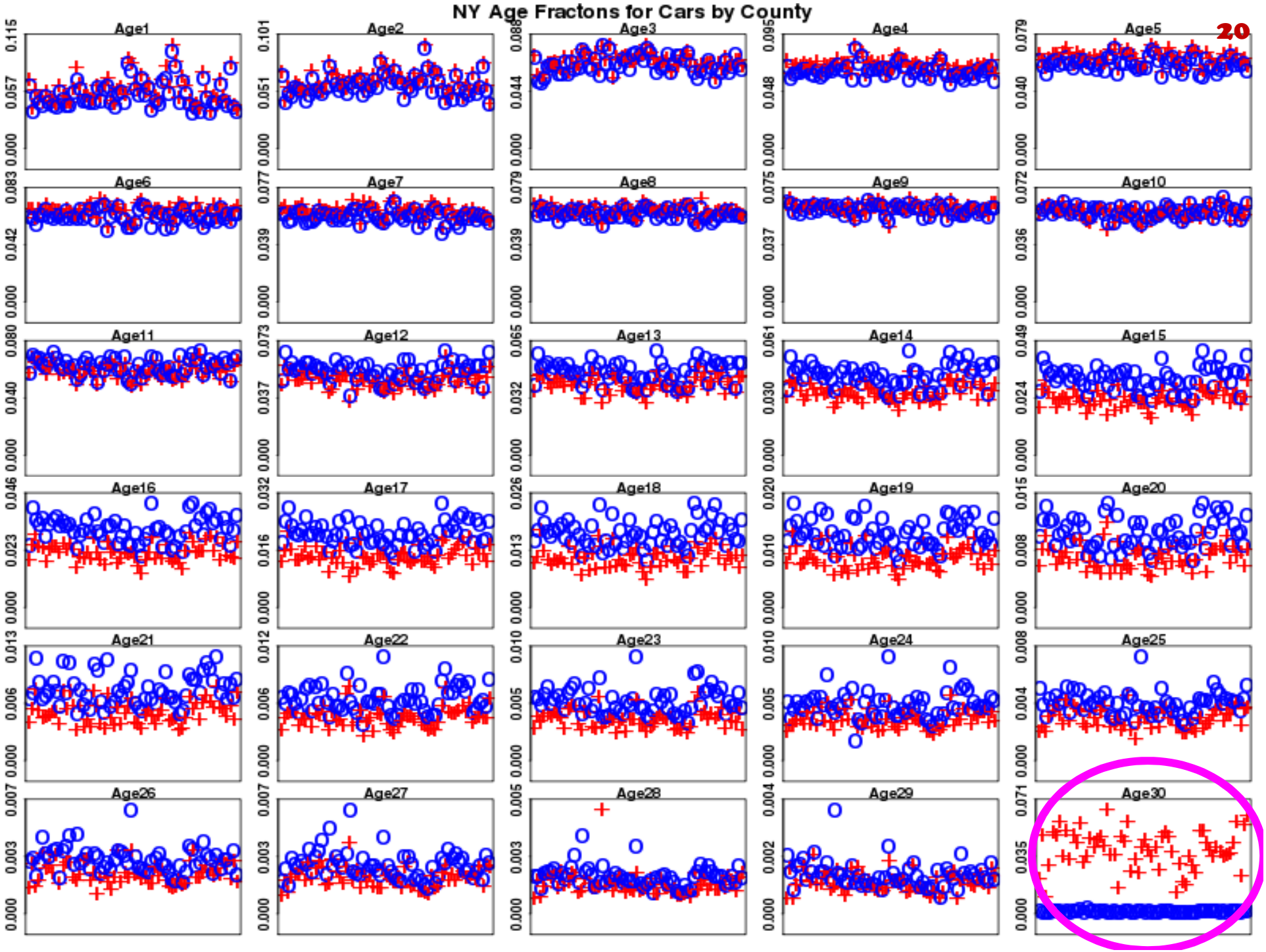
VA Age Fractons for Cars by County

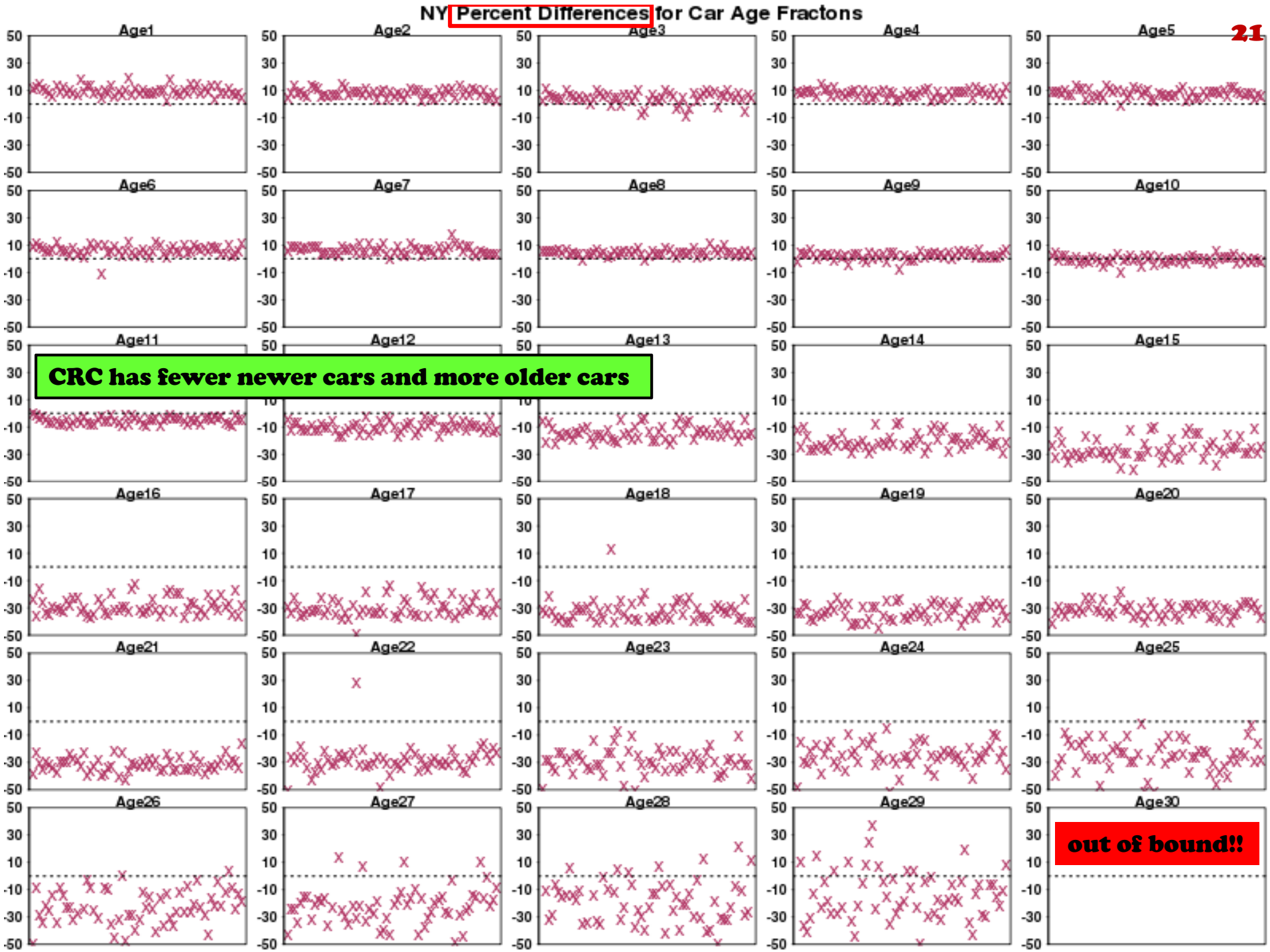




CRC has fewer newer cars and more older cars


NY Fractons for Age 0 Cars by County
Age 0 – the newest cars
NY data
CRC
Each county has two data points
CRC has fewer newest cars for most counties in NY
Age Fractions
0.000
0.020
0.041
0.061
0.081
36001 ALBANY
36003 ALLEGANY
36005 BRONX
36007 BROOME
36009 CATTARAUGUS
36011 CAYUGA
36013 CHAUTAUQUA
36015 CHEMUNG
36017 CHENANGO
36019 CLINTON
36021 COLUMBIA
36023 CORTLAND
36025 DELAWARE
36027 DUTCHESS
36029 ERIE
36031 ESSEX
36033 FRANKLIN
36035 FULTON
36037 GENESEE
36039 GREENE
36041 HAMILTON
36043 HERKIMER
36045 JEFFERSON
36047 KINGS
36049 LEWIS
36051 LIVINGSTON
36053 MADISON
36055 MONROE
36057 MONTGOMERY
36059 NASSAU
36061 NEW YORK
36063 NIAGARA
36065 ONEIDA
36067 ONONDAGA
36069 ONTARIO
36071 ORANGE
36073 ORLEANS
36075 OSWEGO
36077 OTSEGO
36079 PUTNAM
36081 QUEENS
36083 RENSSELAER
36085 RICHMOND
36087 ROCKLAND
36089 SAINT LAWRENCE
36091 SARATOGA
36093 SCHENECTADY
36095 SCHOHARIE
36097 SCHUYLER
36099 SENECA
36101 STEUBEN
36103 SUFFOLK
36105 SULLIVAN
36107 TIOGA
36109 TOMPKINS
36111 ULSTER
36113 WARREN
36115 WASHINGTON
36117 WAYNE
36119 WESTCHESTER
36121 WYOMING
36123 YATES

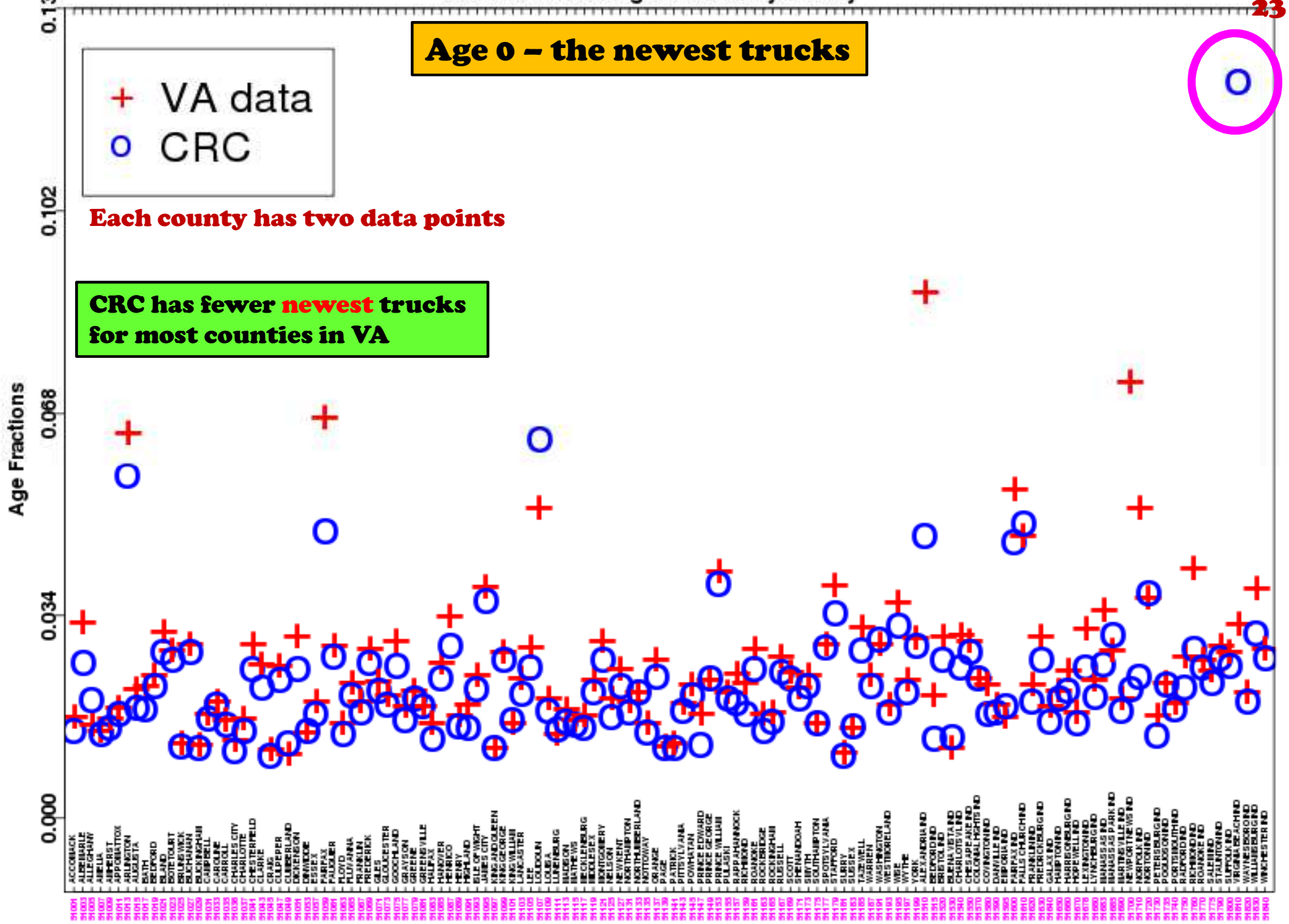

NY Age Fractons for Cars by County
Age1
Age2
Age3
Age4
Age5
Age6
Age7
Age8
Age9
Age10
Age11
Age12
Age13
Age14
Age15
Age16
Age17
Age18
Age19
Age20
Age21
Age22
Age23
Age24
Age25
Age26
Age27
Age28
Age29
Age30


NY Percent Differences for Car Age Fractons
Age1
Age2
Age3
Age4
Age5
Age6
Age7
Age8
Age9
Age10
Age11
Age12
Age13
Age14
Age15
Age16
Age17
Age18
Age19
Age20
Age21
Age22
Age23
Age24
Age25
Age26
Age27
Age28
Age29
Age30
50
30
10
-10
-30
-50
CRC has fewer newer cars and more older cars
out of bound!!

Comparison for Passenger Trucks and Light Commercial Trucks

VA Fractions for Age 0 Trucks by County

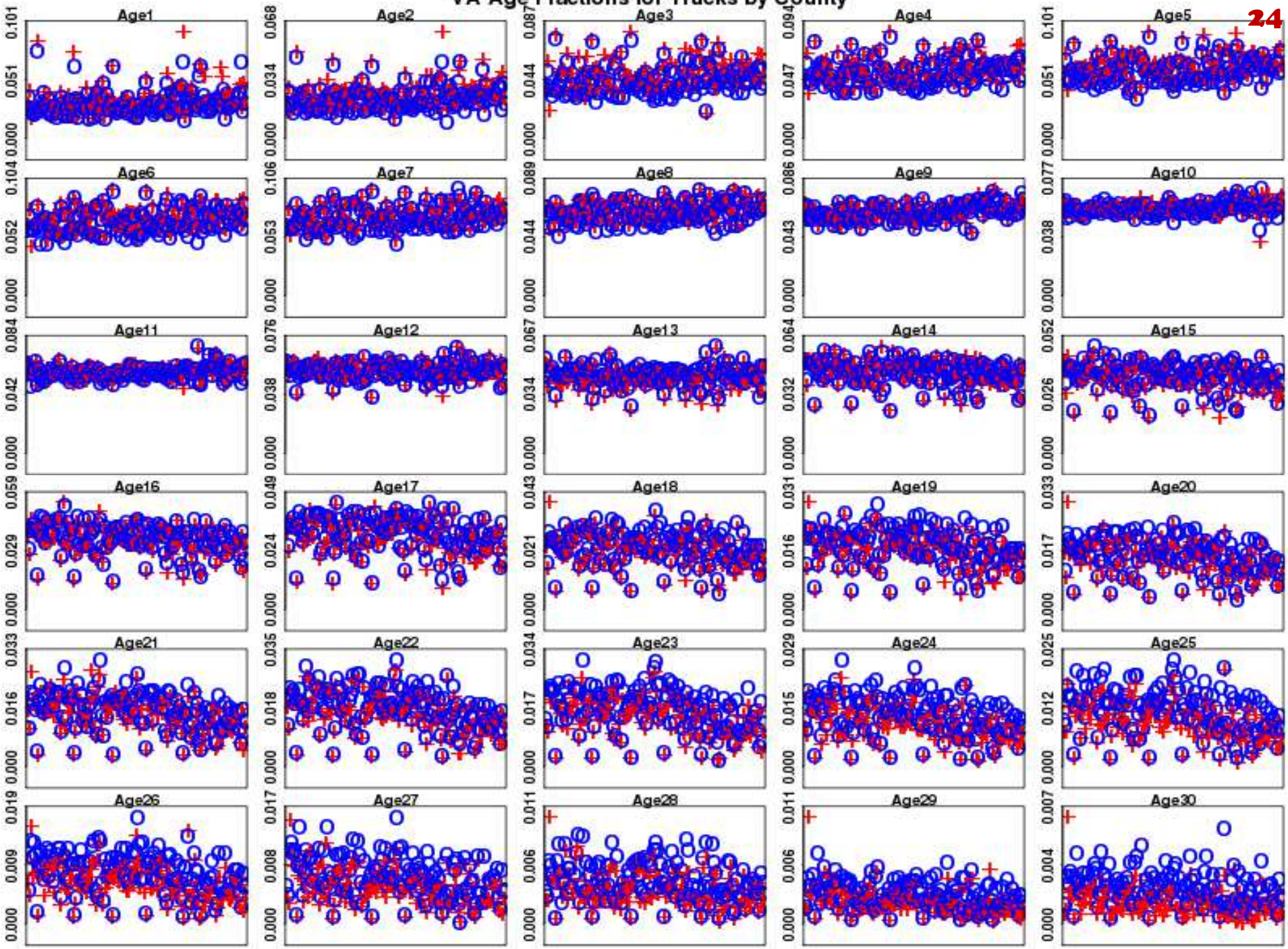
Age 0 – the newest trucks



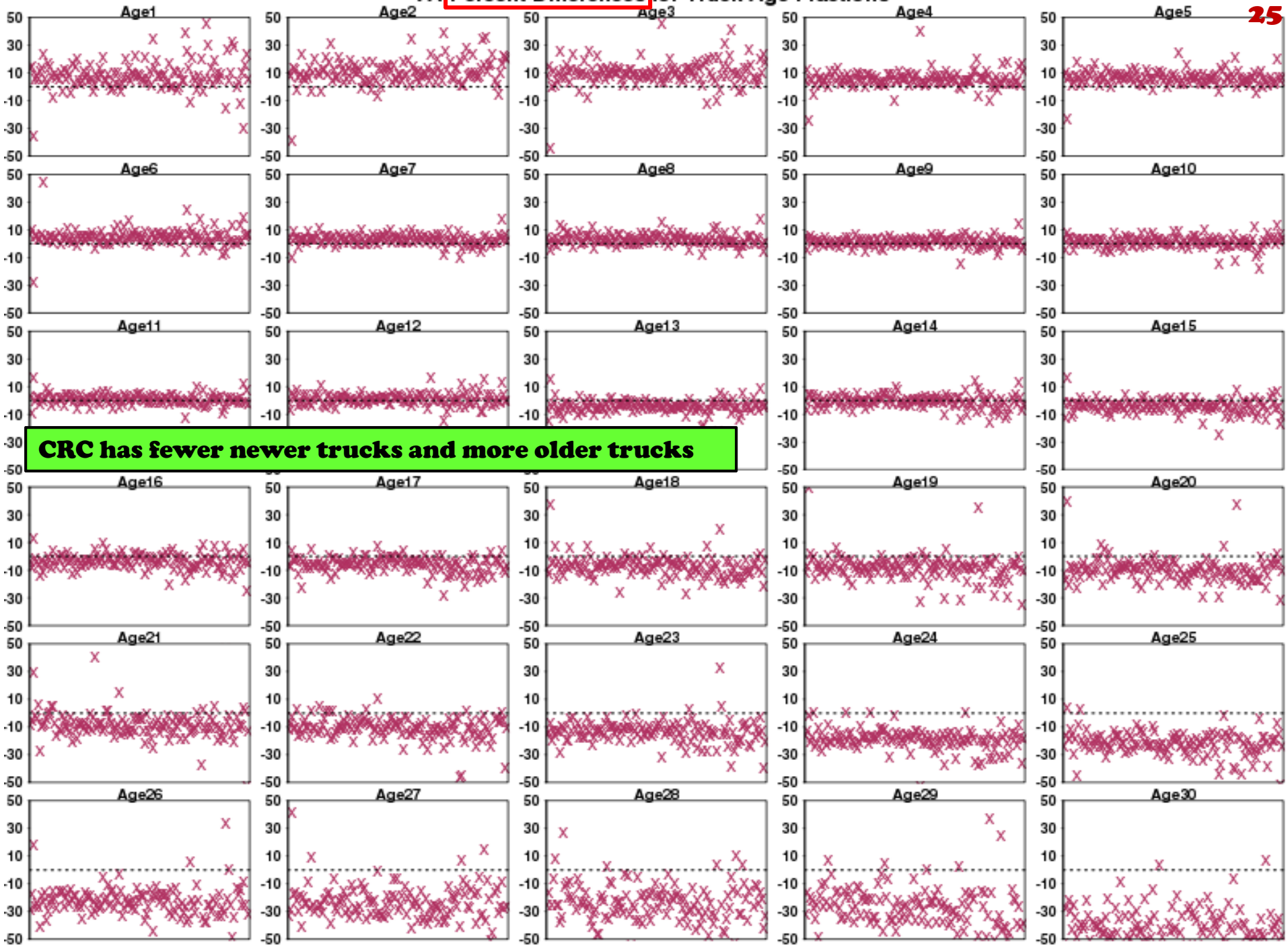
Each county has two data points

CRC has fewer newest trucks for most counties in VA

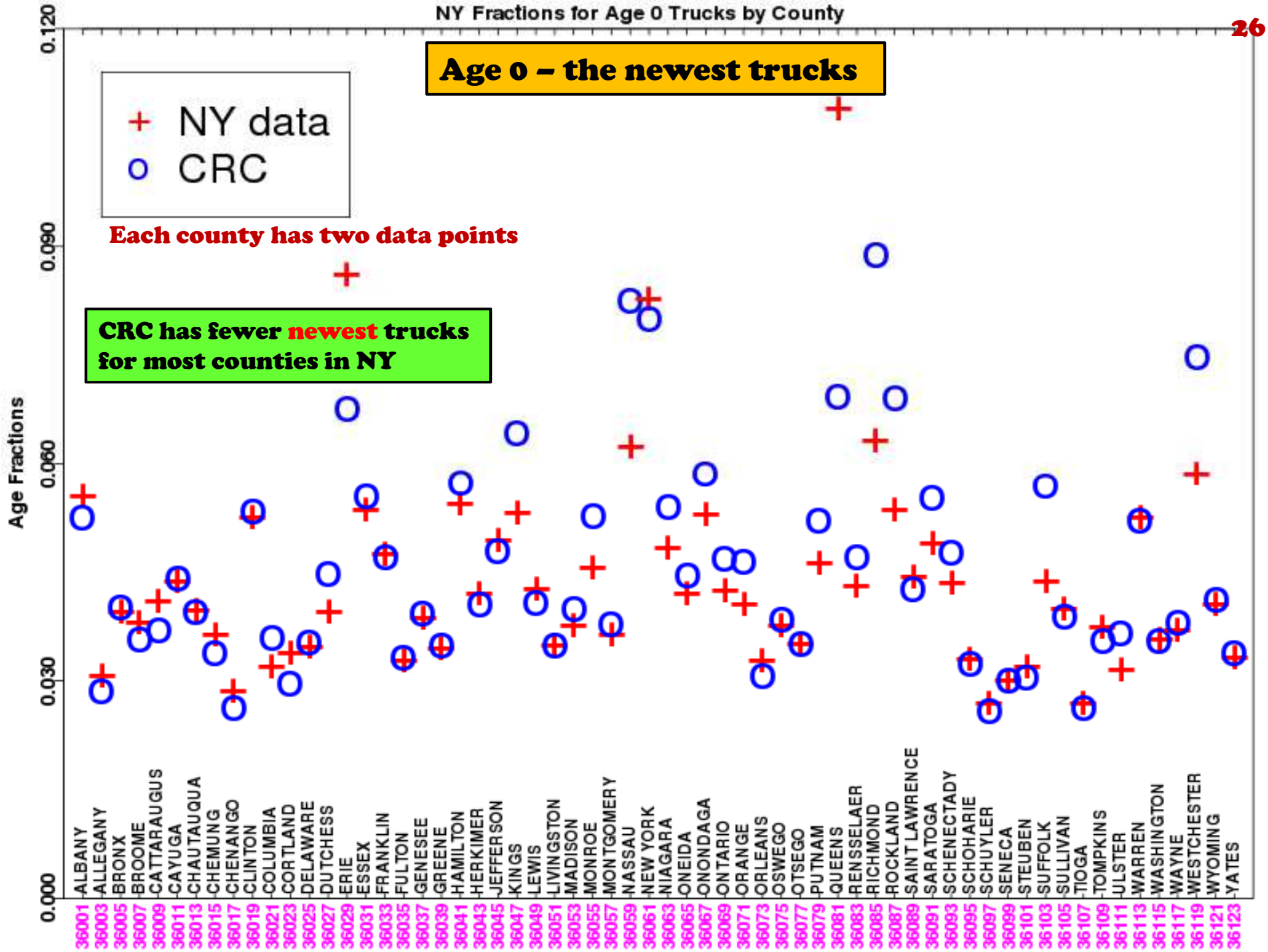
VA Age Fractions for Trucks by County



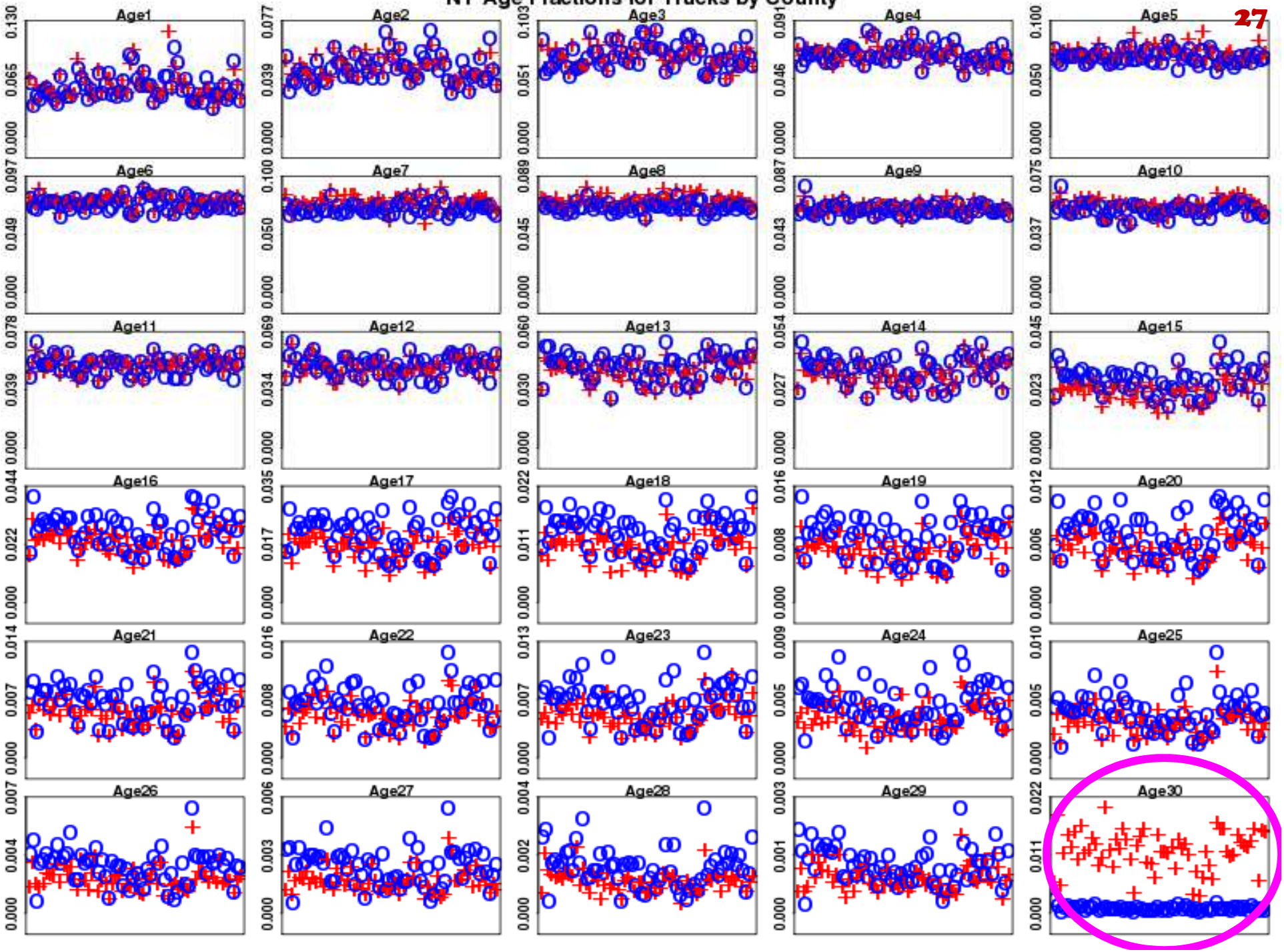
VA Percent Differences for Truck Age Fractions



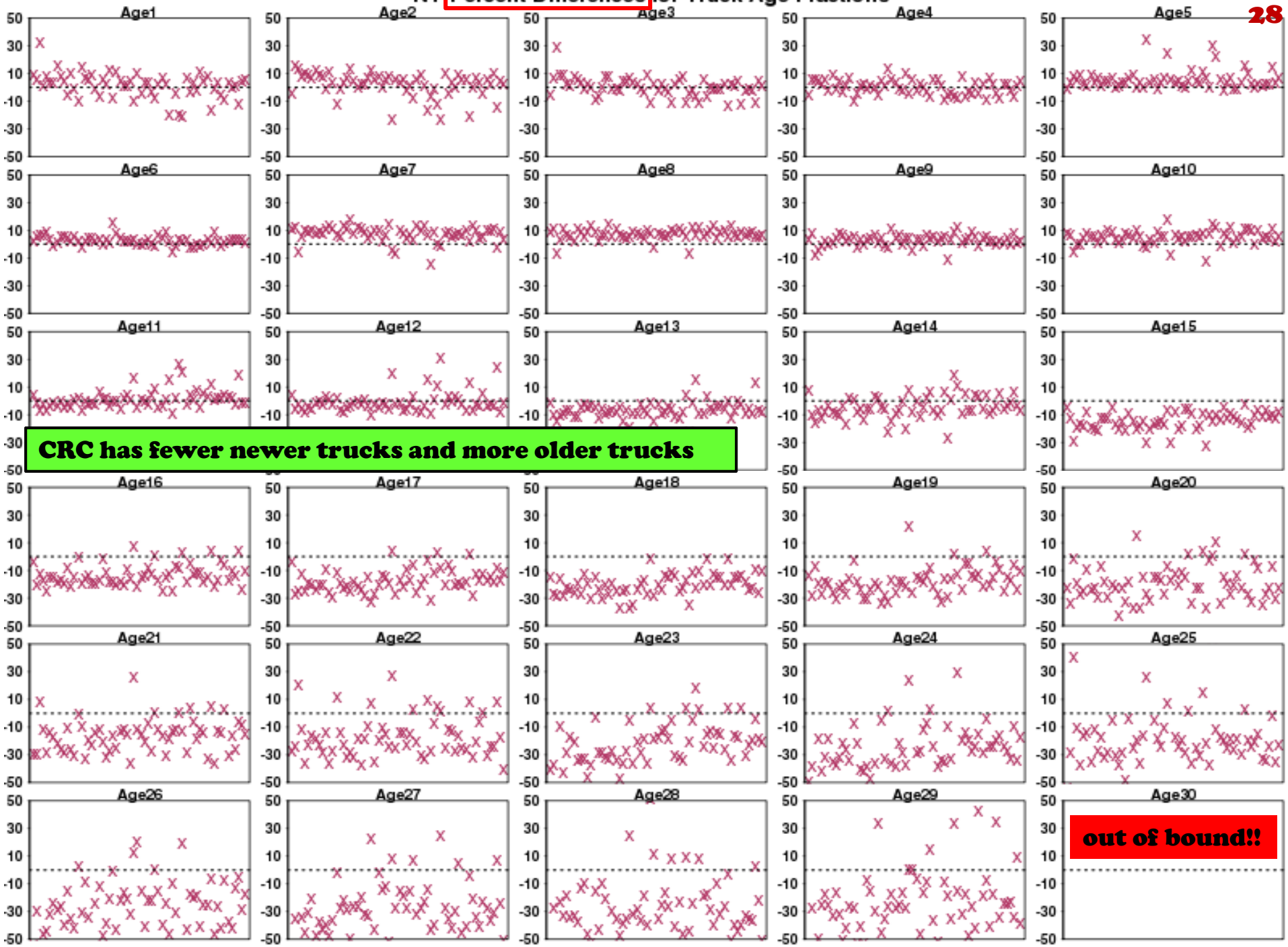
CRC has fewer newer trucks and more older trucks


NY Fractions for Age 0 Trucks by County
Age 0 – the newest trucks
NY data
CRC
Each county has two data points
CRC has fewer newest trucks for most counties in NY
Age Fractions
0.000
0.030
0.060
0.090
0.120
36001 ALBANY
36003 ALLEGANY
36005 BRONX
36007 BROOME
36009 CATTARAUGUS
36011 CAYUGA
36013 CHAUTAUQUA
36015 CHEMUNG
36017 CHENANGO
36019 CLINTON
36021 COLUMBIA
36023 CORTLAND
36025 DELAWARE
36027 DUTCHESS
36029 ERIE
36031 ESSEX
36033 FRANKLIN
36035 FULTON
36037 GENESEE
36039 GREENE
36041 HAMILTON
36043 HERKIMER
36045 JEFFERSON
36047 KINGS
36049 LEWIS
36051 LIVINGSTON
36053 MADISON
36055 MONROE
36057 MONTGOMERY
36059 NASSAU
36061 NEW YORK
36063 NIAGARA
36065 ONEIDA
36067 ONONDAGA
36069 ONTARIO
36071 ORANGE
36073 ORLEANS
36075 OSWEGO
36077 OTSEGO
36079 PUTNAM
36081 QUEENS
36083 RENSSELAER
36085 RICHMOND
36087 ROCKLAND
36089 SAINT LAWRENCE
36091 SARATOGA
36093 SCHENECTADY
36095 SCHOHARIE
36097 SCHUYLER
36099 SENECA
36101 STEUBEN
36103 SUFFOLK
36105 SULLIVAN
36107 TIOGA
36109 TOMPKINS
36111 ULSTER
36113 WARREN
36115 WASHINGTON
36117 WAYNE
36119 WESTCHESTER
36121 WYOMING
36123 YATES

NY Age Fractions for Trucks by County



NY Percent Differences for Truck Age Fractions



CRC has fewer newer trucks and more older trucks

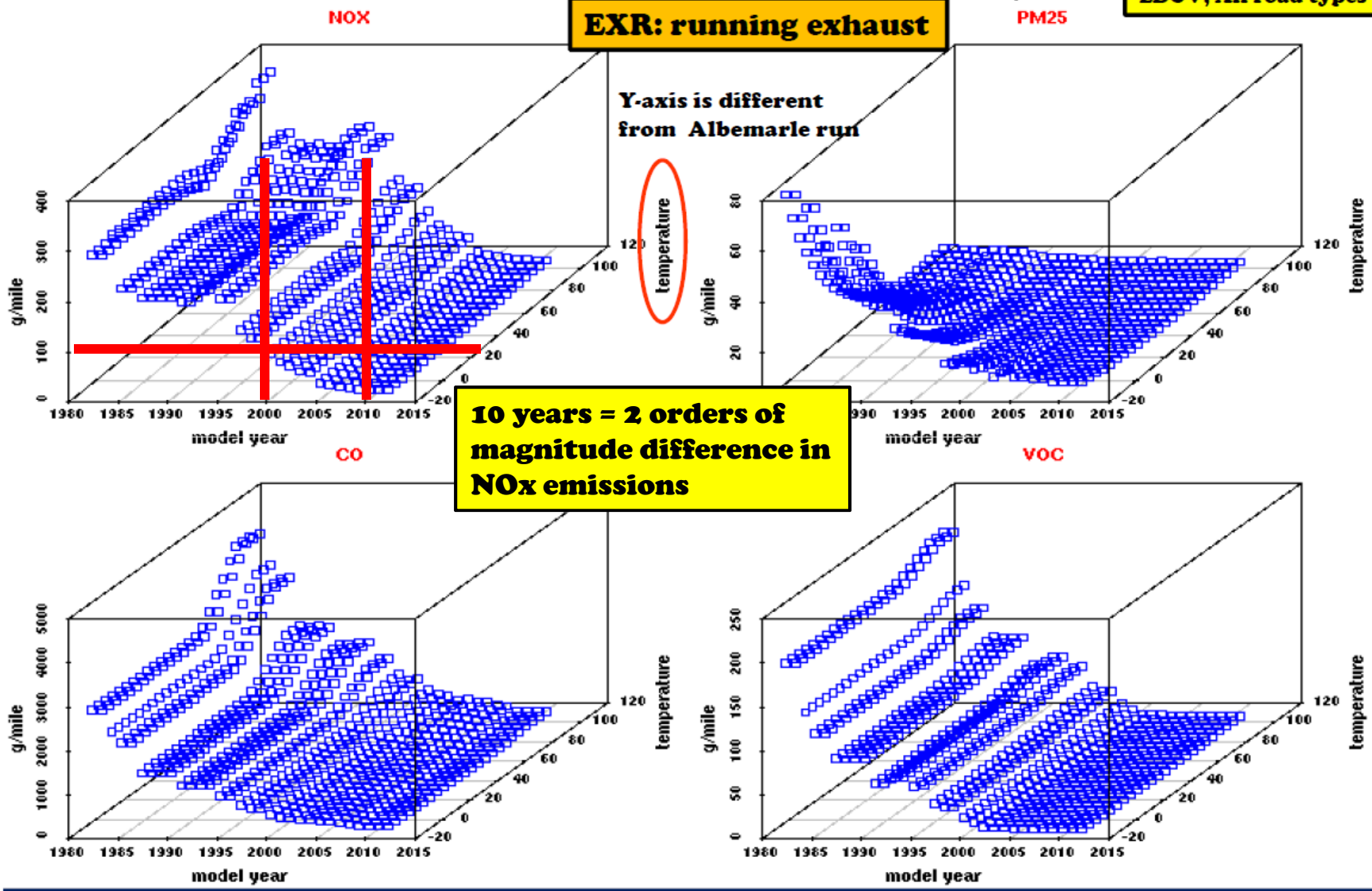
Implications and Conclusions

Effect of Fleet Age on EXR – Fairfax 2011 (control base case)

EXR Emission Rate for 2201001 at RH=60% (gram/mile)

LDGV, All road types

EXR: running exhaust



Y-axis is different from Albemarle run

10 years = 2 orders of magnitude difference in NOx emissions

-- Age of LDGV fleet spans 31 years from model year 1981 to model year 2011.
-- Emission rates are higher for older vehicles (i.e., older cars are dirtier.) Different counties (Fairfax vs Albemarle) show similar trends.

Summary on CRC dataset

- **Hidden anomalous data points**
- **Vehicle ages lean toward older vehicles which have higher emissions**
- **Questionable age 30 bin (counted only one year) (less emissions?)**
- **Compared to state-specific data from NY/VA DMV, CRC dataset has fewer newer vehicles and more older vehicles (more emissions?)**
- **CRC dataset includes only two source types (passenger cars/trucks). Are there any plans to update the MOVES defaults for the other source types?**

Conclusions

- **ANOMOLOUS DATA**
  - **Anomalous points should be evaluated closely**
- **SYSTEMATIC OVER ESTIMATION OF VEHICLE AGE**
  - **VA sensitivity study shows emissions by car model year increases by approximately 2 orders of magnitude between 2011 and 2001**
  - **CRC over estimates the age of vehicles in NY and VA, which may overestimate mobile emissions**
- **EFFECT ON REPRESENTATIVE COUNTY SCHEME**
  - **Counties with anomalous data should not be chosen as a representative county**
  - **Within states average vehicle age varies widely between counties**
  - **Care should be taken to ensure that the characteristics representing a given county grouping actually closely reflect all the counties in that group**