

Mapping Revitalization in Buffalo, NY, through Income, Vacancy and Demographic Makeup Data from 2013 to 2015

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Introduction

In 2010, Buffalo Mayor Byron Brown announced revitalization plan for City of Buffalo, including Demolition plan in 2007, Regional Action Plan for Downtown, Commercial Area Revitalization Effort (CARE) Program revitalization plans, the Local Waterfront Revitalization Program, the Buffalo Niagara Medical Campus Master Plan, plans created through the Good Neighbors Planning Alliance and others. (Buffalo Comprehensive Plan). Mapping the social variables provides us a quantitative way to measure and understand the revitalization progress and its spatial and temporal characteristics. The changes are visible in recent years. New medical center is built up in downtown, and more than 4,000 vacant houses have been demolished since 2007. Since these policies are pushed and implemented, it is very interesting to explore the feedback of social variables in local society. This project explores the feedback at a very start stage from economic, housing and demographic makeup aspects. The change in income, housing vacancy and race from 2013 to 2015 represent how the implementation of policies affects local society in the beginning.

The objective of this project is to map the changes of these demographical variables in Buffalo, Erie County from block-group-level census data from 2013 to 2015.

Data

The geometry data are block-group-level shapfile for Erie County in 2015, which is downloaded from TIGER 029 at the block group level for Erie County using tigris package. A similar research has been done at the census tract level to explore the relationship between vacancy and other social variables in Buffalo on 2008-2010, before revitalization (Silverman et al. 2012).

Data availability

The demographic data, vacancy status, median household income and total population in race data in 2013, 2014 and 2015 are downloaded from census website. The CensusAPI has been tried. But block-group-level occupancy data is not accessible. Thus, we have to download these data from census wibsite manually. In addition, occupancy status data, which is estimated by the American Community Survey program, are only available from 2013 to 2015.

```
shpfile<-block_groups('NY',county='Erie',year='2015')
#plot(shpfile,col=1:100)
```

```
Income2013=read.csv(file = 'Data/Income2013.csv')

Income2014=read.csv(file = 'Data/Income2014.csv')

Income2015=read.csv(file = 'Data/Income2015.csv')

VR2013=read.csv(file = 'Data/VacancyRate2013.csv')

VR2014=read.csv(file = 'Data/VacancyRate2014.csv')

VR2015=read.csv(file = 'Data/VacancyRate2015.csv')

Race2013=read.csv(file = 'Data/RaceRatio2013.csv')

Race2014=read.csv(file = 'Data/RaceRatio2014.csv')

Race2015=read.csv(file = 'Data/RaceRatio2015.csv')
```

Method

1. Variable calculation

Vacancy rate=#Vacant house/#Total house

Race ratio=#White population/#Total population

Income=Median household income

2. Change calculation

Calculate the difference between individual years by joining tables and subtracting previous year value.

```

Income1=merge(Income2013,Income2014,by.x = 'GEO.id2',by.y = 'GEO.id2')

Income1$Change1=as.numeric(Income1$HD01_VD01.y)-as.numeric(Income1$HD01_VD01.x)

Income2=merge(Income2014,Income2015,by.x = 'GEO.id2',by.y = 'GEO.id2')

Income2$Change2=as.numeric(Income2$HD01_VD01.y)-as.numeric(Income2$HD01_VD01.x)

VR1=merge(VR2013,VR2014,by.x = 'GEO.id2',by.y = 'GEO.id2')

VR1$Change1=as.numeric(VR1$HD01_VD03.y)/as.numeric(VR1$HD01_VD01.y)-as.numeric(VR1$HD01_VD03.x)/as.numeric(VR1$HD01_VD01.x)

VR2=merge(VR2014,VR2015,by.x = 'GEO.id2',by.y = 'GEO.id2')

VR2$Change2=as.numeric(VR2$HD01_VD03.y)/as.numeric(VR2$HD01_VD01.y)-as.numeric(VR2$HD01_VD03.x)/as.numeric(VR2$HD01_VD01.x)

Race1=merge(Race2013,Race2014,by.x = 'GEO.id2',by.y = 'GEO.id2')

Race1$Change1=as.numeric(Race1$HD01_VD02.y)/as.numeric(Race1$HD01_VD01.y)-as.numeric(Race1$HD01_VD02.x)/as.numeric(Race1$HD01_VD01.x)

Race2=merge(Race2014,Race2015,by.x = 'GEO.id2',by.y = 'GEO.id2')

Race2$Change2=as.numeric(Race2$HD01_VD02.y)/as.numeric(Race2$HD01_VD01.y)-as.numeric(Race2$HD01_VD02.x)/as.numeric(Race2$HD01_VD01.x)

```

Results and Visualization

Join the geometry and data based on their GEOID. Some simple classified changes, only positive and negative, are plotted. Red represents positive change, and blue represents negative change.

```

Income1_Join=geo_join(shpfile,Income1,'GEOID','GEO.id2',how='inner')
Income2_Join=geo_join(shpfile,Income2,'GEOID','GEO.id2',how='inner')
VR1_Join=geo_join(shpfile,VR1,'GEOID','GEO.id2',how='inner')
VR2_Join=geo_join(shpfile,VR2,'GEOID','GEO.id2',how='inner')
Race1_Join=geo_join(shpfile,Race1,'GEOID','GEO.id2',how='inner')
Race2_Join=geo_join(shpfile,Race2,'GEOID','GEO.id2',how='inner')

```

```
#Visualize the change in house vacancy, income and demographic made up
```

```
#Income change from 2013-2014
```

```
summary(Income1_Join$Change1)
```

```
##      Min.    1st Qu.   Median     Mean    3rd Qu.    Max. 
## -735.0000 -22.0000   5.0000  -0.2157  31.0000  729.0000
```

```
Income1_Join$color=NULL
```

```
Income1_Join$color[Income1_Join$Change1< -22]='red'
```

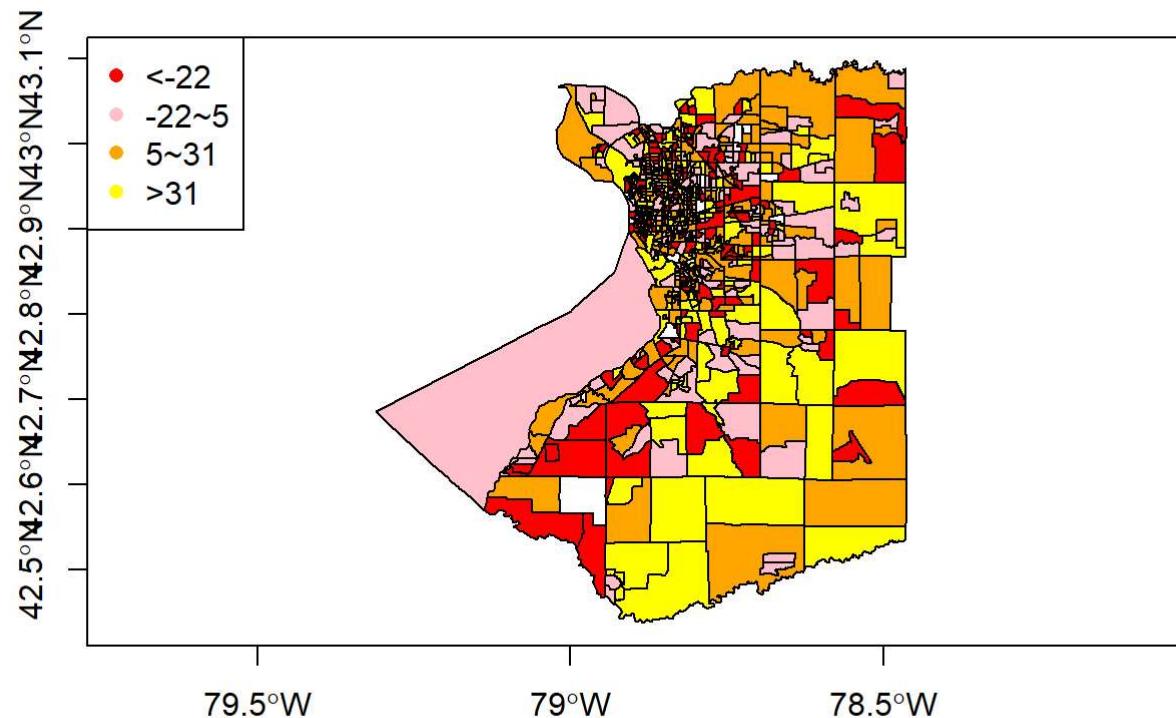
```
Income1_Join$color[Income1_Join$Change1>-22&Income1_Join$Change1<5]='pink'
```

```
Income1_Join$color[Income1_Join$Change1>5&Income1_Join$Change1<31]='orange'
```

```
Income1_Join$color[Income1_Join$Change1>31]='yellow'
```

```
plot(Income1_Join,axes=TRUE,col=Income1_Join$color)
```

```
legend(x='topleft', legend=c("<-22", "-22~5", "5~31", ">31"), col=c("red","pink","orange","yellow"),pch=16)
```



```
#Income change from 2014-2015  
summary(Income2_Join$Change2)
```

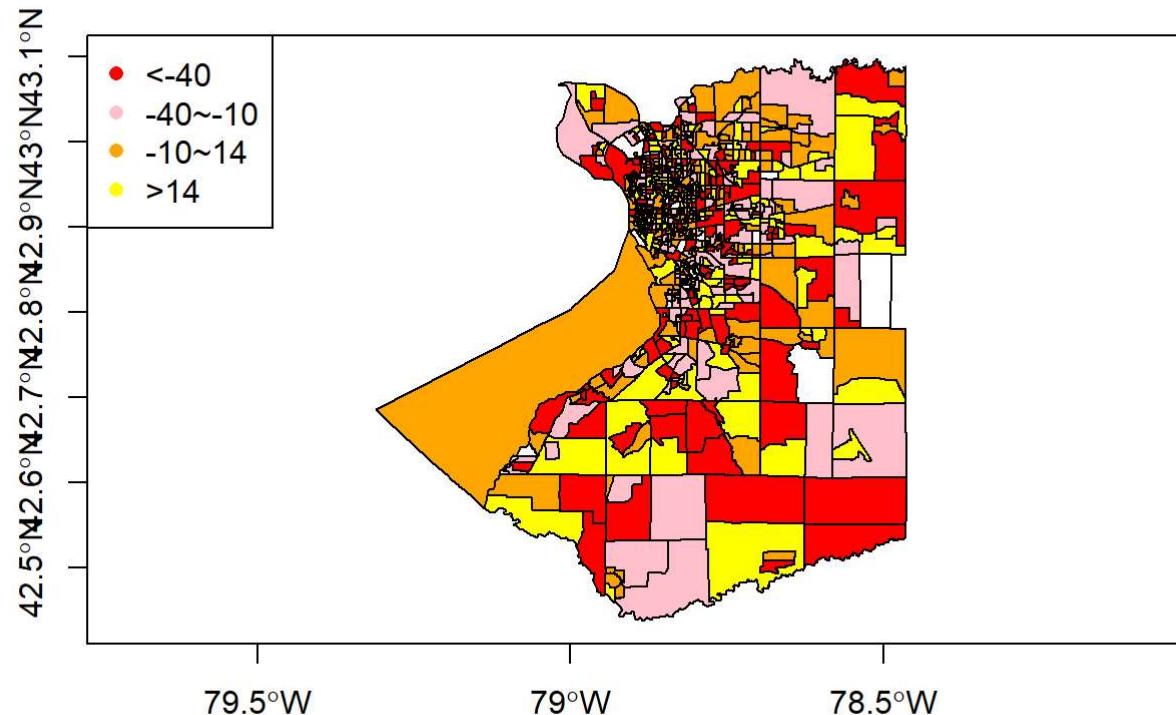
```
##      Min. 1st Qu. Median     Mean 3rd Qu.    Max.  
## -742.000 -40.000 -10.000 -8.681 14.000 722.000
```

```

Income2_Join$color=NULL
Income2_Join$color[Income2_Join$Change2< -40]='red'
Income2_Join$color[Income2_Join$Change2>-40&Income2_Join$Change2< -10]='pink'
Income2_Join$color[Income2_Join$Change2>-10&Income2_Join$Change2<14]='orange'
Income2_Join$color[Income2_Join$Change2>14]='yellow'

plot(Income2_Join,axes=TRUE,col=Income2_Join$color)
legend(x='topleft', legend=c("<-40", "-40~-10", "-10~14", ">14"), col=c("red","pink","orange","yellow"),pch=16)

```



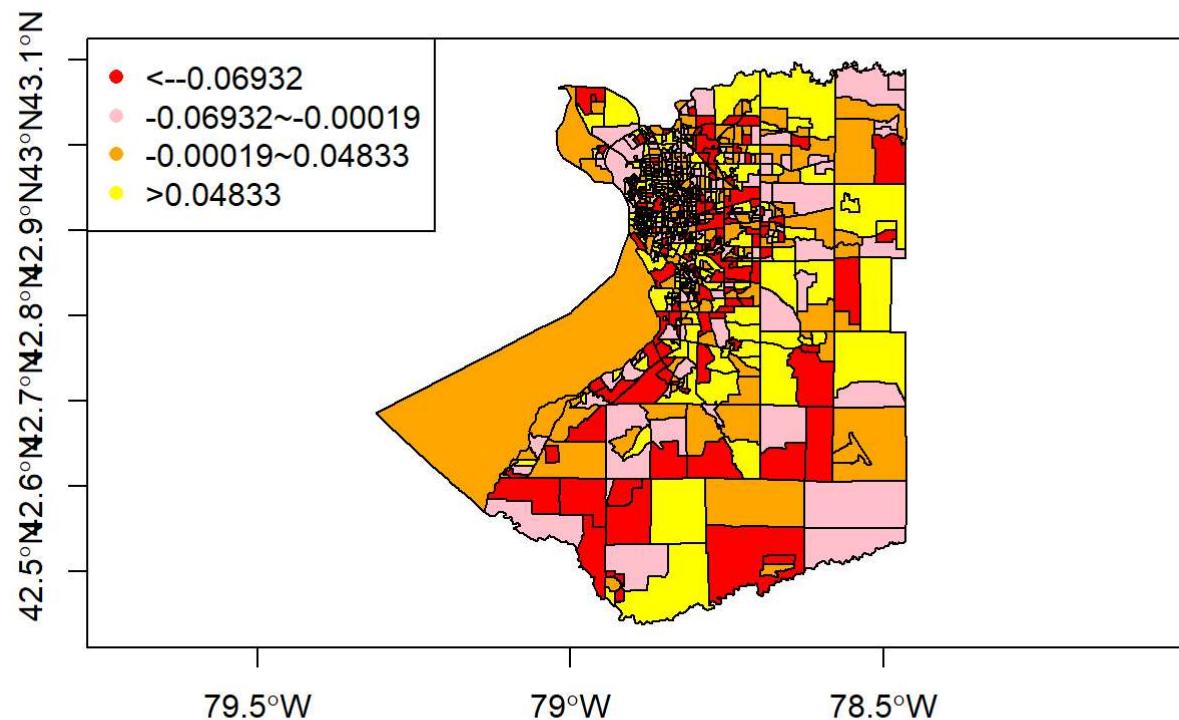
#Vacancy rate change from 2013-2014

```
summary(VR1_Join$Change1)
```

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -50.32633 -0.06932 -0.00019 -0.02685  0.04833 68.05556
```

```
VR1_Join$color=NULL
VR1_Join$color[VR1_Join$Change1< -0.06932]='red'
VR1_Join$color[VR1_Join$Change1>-0.06932&VR1_Join$Change1< -0.00019]='pink'
VR1_Join$color[VR1_Join$Change1>-0.00019&VR1_Join$Change1<0.04833]='orange'
VR1_Join$color[VR1_Join$Change1>0.04833]='yellow'

plot(VR1_Join,axes=TRUE,col=VR1_Join$color)
legend(x='topleft', legend=c("<-0.06932","-0.06932~-0.00019","-0.00019~0.04833",>0.04833"), col=c("red","pink","orange","yellow"),pch=16)
```



```
#Vacancy rate change from 2014-2015
```

```
summary(VR2_Join$Change2)
```

```
##      Min.    1st Qu.   Median     Mean    3rd Qu.    Max. 
## -48.83333 -0.07938 -0.00128 -0.02393  0.03035 71.33333
```

```
VR2_Join$color=NULL
```

```
VR2_Join$color[VR2_Join$Change2< -0.07938]='red'
```

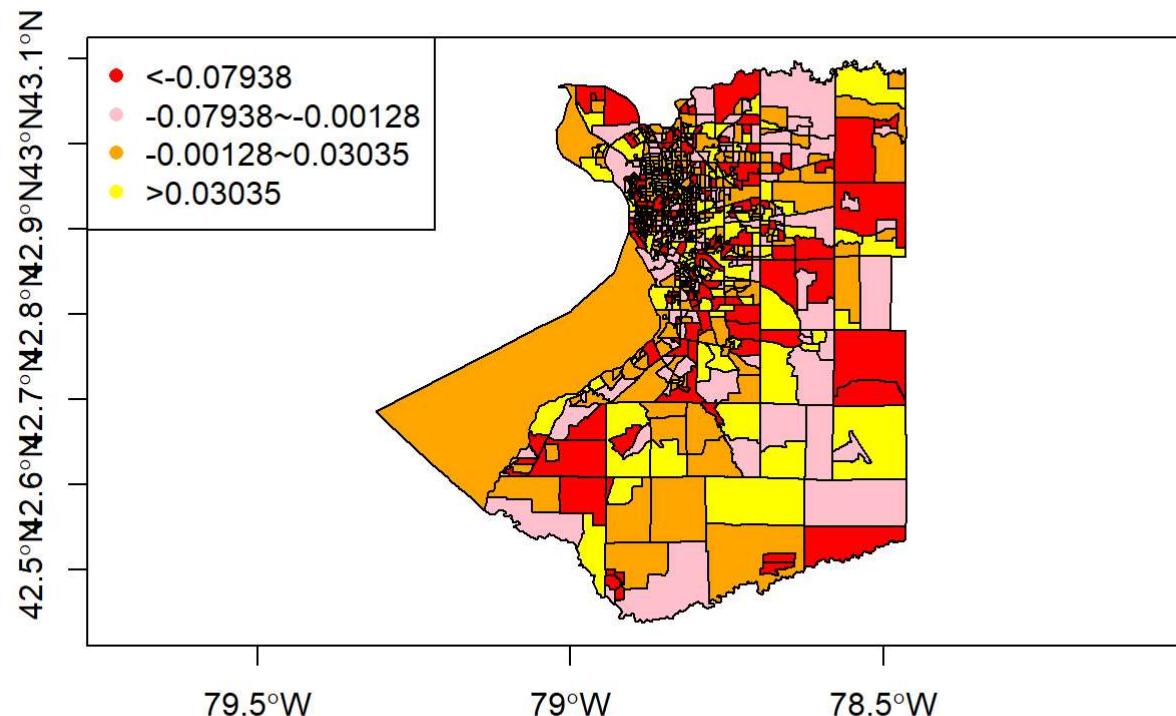
```
VR2_Join$color[VR2_Join$Change2>-0.07938&VR2_Join$Change2< -0.00128]='pink'
```

```
VR2_Join$color[VR2_Join$Change2>-0.00128&VR2_Join$Change2<0.03035]='orange'
```

```
VR2_Join$color[VR2_Join$Change2>0.03035]='yellow'
```

```
plot(VR2_Join,axes=TRUE,col=VR2_Join$color)
```

```
legend(x='topleft', legend=c("<-0.07938","-0.07938~-0.00128","-0.00128~0.03035",">0.03035"), col=c("red","pink","orange","yellow"),pch=16)
```

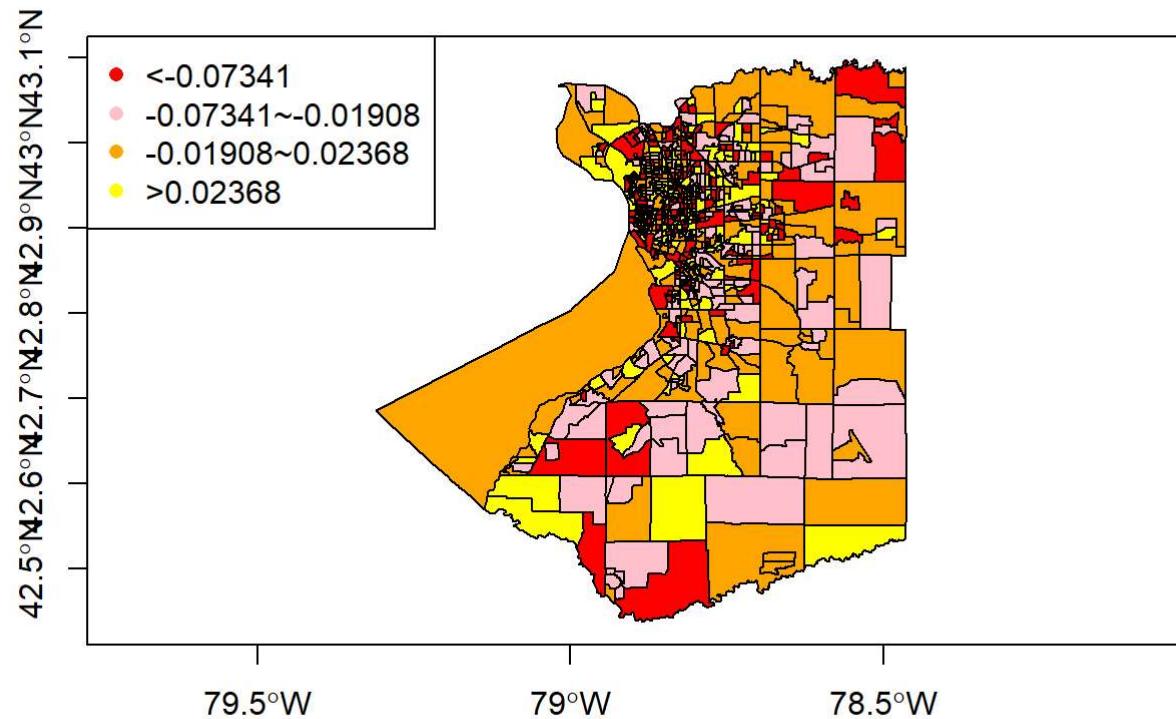


```
#Race ratio change from 2013-2014  
summary(Race1_Join$Change1)
```

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.  
## -204.56364   -0.07341   -0.01908   -0.34814    0.02368  190.67568
```

```
Race1_Join$color=NULL
Race1_Join$color[Race1_Join$Change1< -0.07341]='red'
Race1_Join$color[Race1_Join$Change1>-0.07341&Race1_Join$Change1< -0.01908]='pink'
Race1_Join$color[Race1_Join$Change1>-0.01908&Race1_Join$Change1<0.02368]='orange'
Race1_Join$color[Race1_Join$Change1>0.02368]='yellow'

plot(Race1_Join,axes=TRUE,col=Race1_Join$color)
legend(x='topleft', legend=c("<-0.07341", "-0.07341~-0.01908", "-0.01908~0.02368", ">0.02368"), col=c("red", "pink", "orange", "yellow"), pch=16)
```

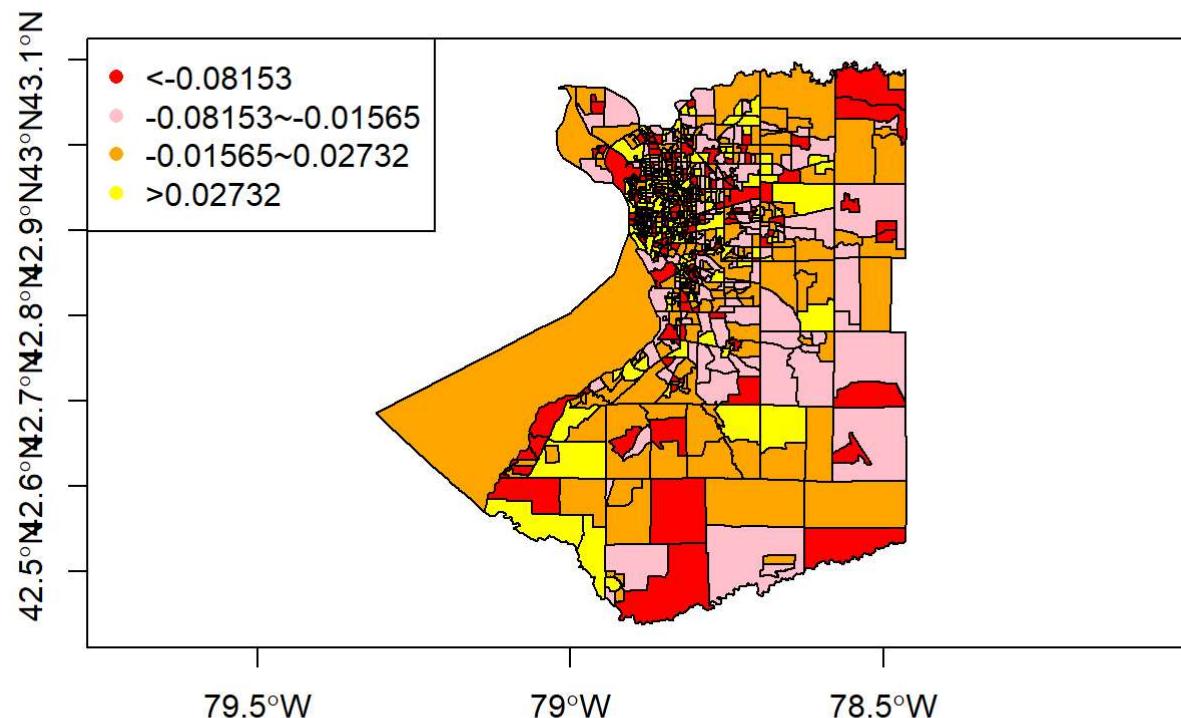


```
# Race ratio change from 2014-2015
summary(Race2_Join$Change2)
```

```
##      Min.    1st Qu.     Median      Mean    3rd Qu.      Max.
## -190.11129 -0.08153 -0.01565  0.77929  0.02732 313.05333
```

```
Race2_Join$color=NULL
Race2_Join$color[Race2_Join$Change2< -0.08153]='red'
Race2_Join$color[Race2_Join$Change2>-0.08153&Race2_Join$Change2< -0.01565]='pink'
Race2_Join$color[Race2_Join$Change2>-0.01565&Race2_Join$Change2<0.02732]='orange'
Race2_Join$color[Race2_Join$Change2>0.02732]='yellow'

plot(Race2_Join,axes=TRUE,col=Race2_Join$color)
legend(x='topleft', legend=c("<-0.08153","-0.08153~-0.01565","-0.01565~0.02732",">0.02732"), col=c("red","pink","orange","yellow"),pch=16)
```



Merge two years change and summarize

```
Income_Total=inner_join(Income1,Income2,by="GEO.id2")
Income_Total$ChangeInTwoYears<-Income_Total$Change1+Income_Total$Change2
summary(Income_Total$ChangeInTwoYears)
```

```
##      Min. 1st Qu.   Median     Mean 3rd Qu.    Max.
## -739.000 -49.250  -3.000  -8.615  38.000 721.000
```

```
VR_Total=inner_join(VR1,VR2,by="GEO.id2")
VR_Total$ChangeInTwoYears<-VR_Total$Change1+VR_Total$Change2
summary(VR_Total$ChangeInTwoYears)
```

```
##      Min. 1st Qu.   Median     Mean 3rd Qu.    Max.
## -50.38641 -0.15818 -0.00109 -0.05073  0.08696 71.42857
```

```
Race_Total=inner_join(Race1,Race2,by="GEO.id2")
Race_Total$ChangeInTwoYears<-Race_Total$Change1+Race_Total$Change2
summary(Race_Total$ChangeInTwoYears)
```

```
##      Min. 1st Qu.   Median     Mean 3rd Qu.    Max.
## -160.96528 -0.13716 -0.03448  0.43058  0.03833 312.98869
```

Correlation analysis

```
#Pearson's Correlation coefficient
#Join all 2year change

Change_Join=merge(Income_Total,VR_Total,by="GEO.id2")
Change_Join_All=merge(Change_Join,Race_Total,by="GEO.id2")
head(Change_Join_All)
```

```

##           GEO.id2      GEO.id.x.x.x
## 1 360290001101 1500000US360290001101
## 2 360290001102 1500000US360290001102
## 3 360290001103 1500000US360290001103
## 4 360290001104 1500000US360290001104
## 5 360290002001 1500000US360290002001
## 6 360290002002 1500000US360290002002
##           GEO.display.label.x.x.x HD01_VD01.x.x.x
## 1 Block Group 1, Census Tract 1.10, Erie County, New York      41976
## 2 Block Group 2, Census Tract 1.10, Erie County, New York      -
## 3 Block Group 3, Census Tract 1.10, Erie County, New York     17000
## 4 Block Group 4, Census Tract 1.10, Erie County, New York     38295
## 5   Block Group 1, Census Tract 2, Erie County, New York     38199
## 6   Block Group 2, Census Tract 2, Erie County, New York     31298
##           GEO.id.y.x.x
## 1 1500000US360290001101
## 2 1500000US360290001102
## 3 1500000US360290001103
## 4 1500000US360290001104
## 5 1500000US360290002001
## 6 1500000US360290002002
##           GEO.display.label.y.x.x HD01_VD01.y.x.x
## 1 Block Group 1, Census Tract 1.10, Erie County, New York      43477
## 2 Block Group 2, Census Tract 1.10, Erie County, New York      -
## 3 Block Group 3, Census Tract 1.10, Erie County, New York     35250
## 4 Block Group 4, Census Tract 1.10, Erie County, New York     35833
## 5   Block Group 1, Census Tract 2, Erie County, New York     36172
## 6   Block Group 2, Census Tract 2, Erie County, New York     22302
##   HD02_VD01 Change1.x      GEO.id.x.y.x
## 1    11471      15 1500000US360290001101
## 2     **       0 1500000US360290001102
## 3    36301      181 1500000US360290001103
## 4    12902      -13 1500000US360290001104
## 5    10565      -9 1500000US360290002001
## 6    15784      -97 1500000US360290002002
##           GEO.display.label.x.y.x HD01_VD01.x.y.x
## 1 Block Group 1, Census Tract 1.10, Erie County, New York      43477
## 2 Block Group 2, Census Tract 1.10, Erie County, New York      -
## 3 Block Group 3, Census Tract 1.10, Erie County, New York     35250
## 4 Block Group 4, Census Tract 1.10, Erie County, New York     35833

```

```

## 5   Block Group 1, Census Tract 2, Erie County, New York          36172
## 6   Block Group 2, Census Tract 2, Erie County, New York          22302
## HD02_VD01.x           GEO.id.y.y.x
## 1     11471 1500000US360290001101
## 2     ** 1500000US360290001102
## 3     36301 1500000US360290001103
## 4     12902 1500000US360290001104
## 5     10565 1500000US360290002001
## 6     15784 1500000US360290002002
##                           GEO.display.label.y.y.x HD01_VD01.y.y.x
## 1 Block Group 1, Census Tract 1.10, Erie County, New York        44087
## 2 Block Group 2, Census Tract 1.10, Erie County, New York          -
## 3 Block Group 3, Census Tract 1.10, Erie County, New York        48542
## 4 Block Group 4, Census Tract 1.10, Erie County, New York        34342
## 5 Block Group 1, Census Tract 2, Erie County, New York          35515
## 6 Block Group 2, Census Tract 2, Erie County, New York          30302
## HD02_VD01.y Change2.x ChangeInTwoYears.x           GEO.id.x.x.y
## 1     20248      -7      8 1500000US360290001101
## 2     **       0      0 1500000US360290001102
## 3     13796     125     306 1500000US360290001103
## 4     10102     -31     -44 1500000US360290001104
## 5     10698     -25     -34 1500000US360290002001
## 6     9844      74     -23 1500000US360290002002
##                           GEO.display.label.x.x.y HD01_VD01.x.x.y
## 1 Block Group 1, Census Tract 1.10, Erie County, New York        352
## 2 Block Group 2, Census Tract 1.10, Erie County, New York          0
## 3 Block Group 3, Census Tract 1.10, Erie County, New York        310
## 4 Block Group 4, Census Tract 1.10, Erie County, New York        540
## 5 Block Group 1, Census Tract 2, Erie County, New York          465
## 6 Block Group 2, Census Tract 2, Erie County, New York          302
## HD01_VD02.x.x.x HD01_VD03.x.x VacancyRate.x.x           GEO.id.y.x.y
## 1     291       61    0.173295455 1500000US360290001101
## 2       0       0      #DIV/0! 1500000US360290001102
## 3     258       52    0.167741935 1500000US360290001103
## 4     485       55    0.101851852 1500000US360290001104
## 5     465       0      0 1500000US360290002001
## 6     271       31    0.102649007 1500000US360290002002
##                           GEO.display.label.y.x.y HD01_VD01.y.x.y
## 1 Block Group 1, Census Tract 1.10, Erie County, New York        289
## 2 Block Group 2, Census Tract 1.10, Erie County, New York          0
## 3 Block Group 3, Census Tract 1.10, Erie County, New York        364

```

```

## 4 Block Group 4, Census Tract 1.10, Erie County, New York      552
## 5   Block Group 1, Census Tract 2, Erie County, New York      477
## 6   Block Group 2, Census Tract 2, Erie County, New York      374
##   HD01_VD02.y.x.x HD01_VD03.y.x VacancyRate.y.x     Change1.y
## 1          233        56    0.193771626  0.3133333333
## 2            0        0      #DIV/0!  0.0000000000
## 3          311        53    0.145604396 -0.3055167055
## 4          464        88    0.15942029  0.0893458393
## 5          477        0      0 -0.0001680362
## 6          308        66    0.176470588 -0.1060845724
##   GEO.id.x.y.y
## 1 15000000US360290001101
## 2 15000000US360290001102
## 3 15000000US360290001103
## 4 15000000US360290001104
## 5 15000000US360290002001
## 6 15000000US360290002002
##   GEO.display.label.x.y.y HD01_VD01.x.y.y
## 1 Block Group 1, Census Tract 1.10, Erie County, New York      289
## 2 Block Group 2, Census Tract 1.10, Erie County, New York      0
## 3 Block Group 3, Census Tract 1.10, Erie County, New York      364
## 4 Block Group 4, Census Tract 1.10, Erie County, New York      552
## 5   Block Group 1, Census Tract 2, Erie County, New York      477
## 6   Block Group 2, Census Tract 2, Erie County, New York      374
##   HD01_VD02.x.y.x HD01_VD03.x.y VacancyRate.x.y     GEO.id.y.y.y
## 1          233        56    0.193771626 15000000US360290001101
## 2            0        0      #DIV/0! 15000000US360290001102
## 3          311        53    0.145604396 15000000US360290001103
## 4          464        88    0.15942029 15000000US360290001104
## 5          477        0      0 15000000US360290002001
## 6          308        66    0.176470588 15000000US360290002002
##   GEO.display.label.y.y.y HD01_VD01.y.y.y
## 1 Block Group 1, Census Tract 1.10, Erie County, New York      227
## 2 Block Group 2, Census Tract 1.10, Erie County, New York      0
## 3 Block Group 3, Census Tract 1.10, Erie County, New York      390
## 4 Block Group 4, Census Tract 1.10, Erie County, New York      582
## 5   Block Group 1, Census Tract 2, Erie County, New York      555
## 6   Block Group 2, Census Tract 2, Erie County, New York      318
##   HD01_VD02.y.y.x HD01_VD03.y.y VacancyRate.y.y     Change2.y
## 1          175        52    0.22907489  0.4656862745
## 2            0        0      #DIV/0!  0.0000000000

```

```

## 3      329      61    0.156410256 -0.0681096681
## 4      536      46    0.079037801 -0.1835002347
## 5      555      0     0 -0.0008313509
## 6      279      39    0.122641509  0.0166530908
##   ChangeInTwoYears.y      GEO.id.x.x HD01_VD01.x.x HD01_VD02.x.x.y
## 1      0.779019608 1500000US360290001101      647      631
## 2      0.000000000 1500000US360290001102      0       0
## 3      -0.373626374 1500000US360290001103     879      473
## 4      -0.094154395 1500000US360290001104     1098     911
## 5      -0.000999387 1500000US360290002001     935      856
## 6      -0.089431482 1500000US360290002002     699      528
##   WhiteRate      GEO.id.y.x HD01_VD01.y.x HD01_VD02.y.x.y
## 1 0.975270479 1500000US360290001101      542      526
## 2 #DIV/0! 1500000US360290001102      0       0
## 3 0.53811149 1500000US360290001103     1108     490
## 4 0.829690346 1500000US360290001104     1204     1030
## 5 0.915508021 1500000US360290002001     1131     1011
## 6 0.755364807 1500000US360290002002     714      478
##   WhiteRatio.x      Change1      GEO.id.x.y HD01_VD01.x.y
## 1 0.970479705 -0.01996329 1500000US360290001101      542
## 2 #DIV/0! 0.0000000 1500000US360290001102      0
## 3 0.442238267 7.56468531 1500000US360290001103     1108
## 4 0.855481728 -14.07066052 1500000US360290001104     1204
## 5 0.893899204 -0.78168013 1500000US360290002001     1131
## 6 0.669467787 -0.08852994 1500000US360290002002     714
##   HD01_VD02.x.y.y WhiteRatio.y      GEO.id.y.y
## 1      526 0.970479705 1500000US360290001101
## 2      0 #DIV/0! 1500000US360290001102
## 3      490 0.442238267 1500000US360290001103
## 4      1030 0.855481728 1500000US360290001104
## 5      1011 0.893899204 1500000US360290002001
## 6      478 0.669467787 1500000US360290002002
##   GEO.display.label HD01_VD01.y.y
## 1 Block Group 1, Census Tract 1.10, Erie County, New York      446
## 2 Block Group 2, Census Tract 1.10, Erie County, New York      0
## 3 Block Group 3, Census Tract 1.10, Erie County, New York     1091
## 4 Block Group 4, Census Tract 1.10, Erie County, New York     1317
## 5 Block Group 1, Census Tract 2, Erie County, New York     1358
## 6 Block Group 2, Census Tract 2, Erie County, New York     664
##   HD01_VD02.y.y.y      Change2 ChangeInTwoYears
## 1      432 -0.04265189 -0.06261518

```

```
## 2      0  0.00000000  0.00000000
## 3    472 -0.52450980  7.04017551
## 4   1121  0.17910682 -13.89155370
## 5   1087  0.07499723 -0.70668290
## 6    498  0.05414890 -0.03438103
```

```
Change_Income=Change_Join_All$ChangeInTwoYears.x
Change_VR=Change_Join_All$ChangeInTwoYears.y
Change_Race=Change_Join_All$ChangeInTwoYears
#cor between vr and income
cor.test(Change_Income,Change_VR)
```

```
##
## Pearson's product-moment correlation
##
## data: Change_Income and Change_VR
## t = 0.019741, df = 766, p-value = 0.9843
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## -0.07003455  0.07145393
## sample estimates:
##       cor
## 0.0007132599
```

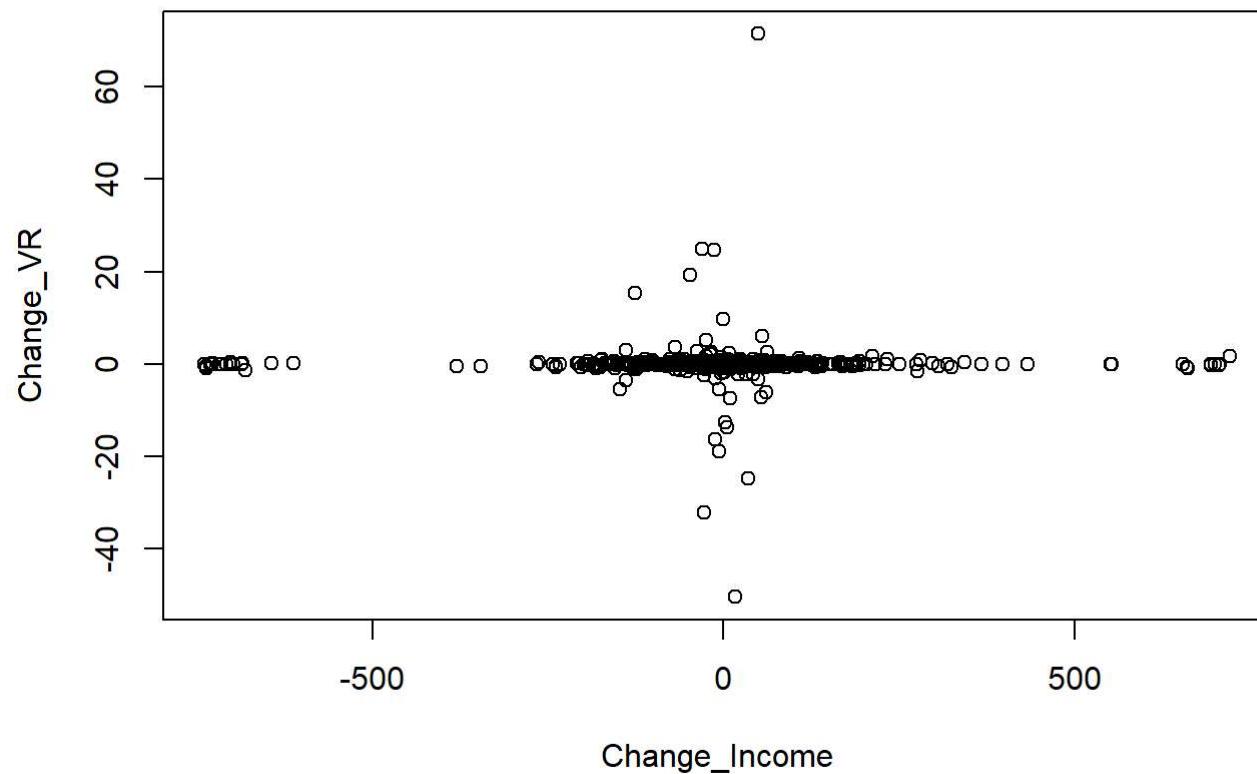
```
cor.test(Change_Income,Change_Race)
```

```
##
## Pearson's product-moment correlation
##
## data: Change_Income and Change_Race
## t = -1.1066, df = 766, p-value = 0.2688
## alternative hypothesis: true correlation is not equal to 0
## 95 percent confidence interval:
## -0.11038476  0.03087907
## sample estimates:
##       cor
## -0.03995248
```

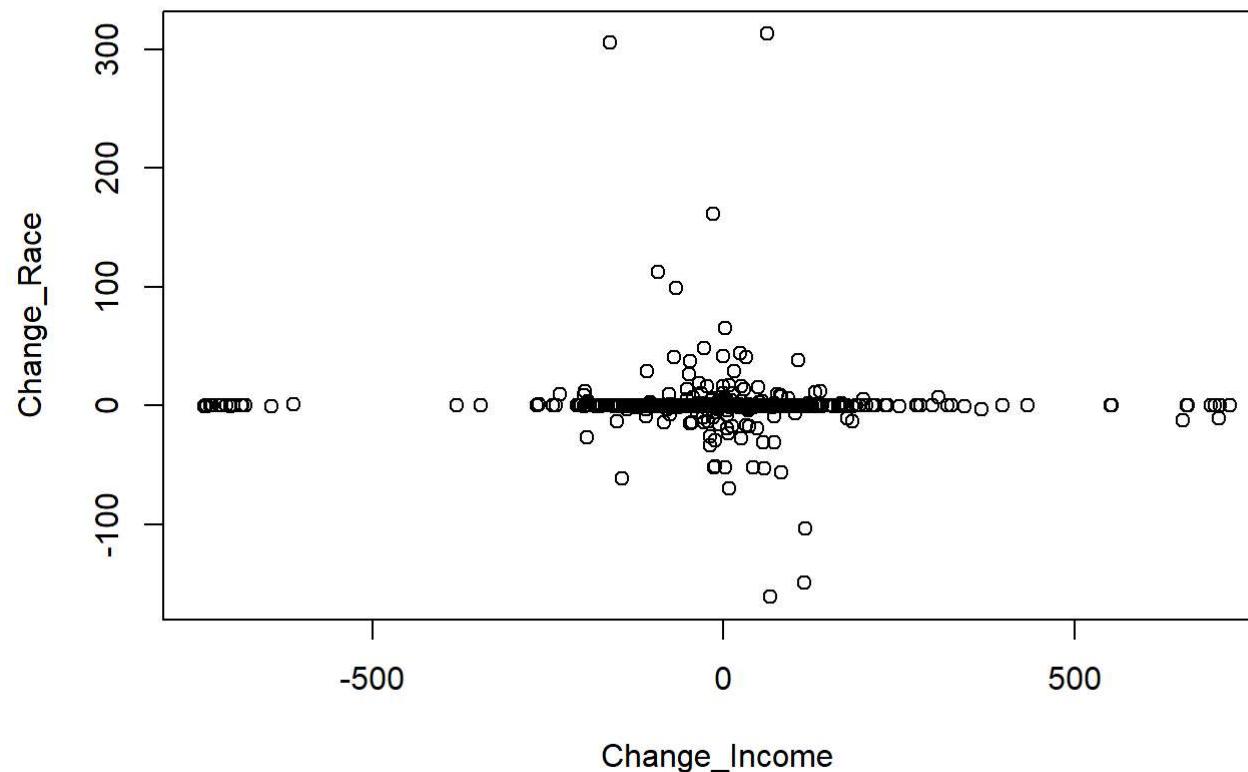
```
cor.test(Change_Race,Change_VR)
```

```
##  
## Pearson's product-moment correlation  
##  
## data: Change_Race and Change_VR  
## t = -0.081342, df = 766, p-value = 0.9352  
## alternative hypothesis: true correlation is not equal to 0  
## 95 percent confidence interval:  
## -0.07366796 0.06781937  
## sample estimates:  
## cor  
## -0.002939
```

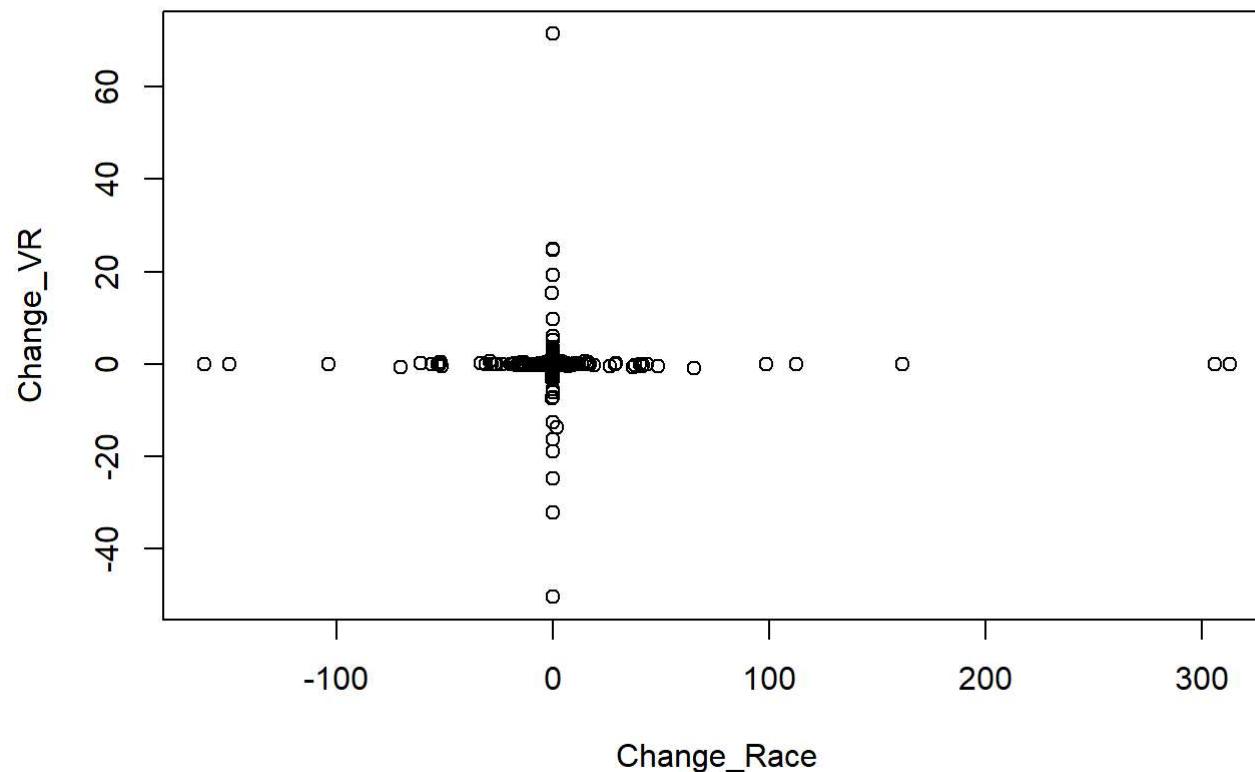
```
plot(Change_Income,Change_VR)
```



```
plot(Change_Income,Change_Race)
```



```
plot(Change_Race,Change_VR)
```



Conclusions

1. The result of income change show that most census block groups have slight and inconstant change. Even for a same census block group, the income could slightly rise up from 2013 to 2014, and slightly fall back from 2014 to 2015. In addition, there is no significant pattern for the change distribution.
2. The change in vacancy rate and race ratio are even smaller than the change of income. Furthermore, the spatial distribution is chaotic.
3. No significant linear relationship among these three variables based on Pearson's correlation test.
4. The results show no significant feedback in local society to the implementation of revitalization policy. The reason could be that the feedback need time to be present. Also, the reason could be that the data are collected from 5-year estimated ACS data, which is estimated based on previous five years survey data. The change could happen but not update in this dataset.

References

Silverman, R., Yin, L., & Patterson, K. L. (2013). Dawn of the dead city: An exploratory analysis of vacant addresses in Buffalo, NY 2008-2010. *Journal of Urban Affairs*, 35(2), 131-152.

R Packages

[\(https://cran.r-project.org/web/packages/tigris/tigris.pdf\)](https://cran.r-project.org/web/packages/tigris/tigris.pdf)

[\(https://cran.r-project.org/web/packages/censusapi/censusapi.pdf\)](https://cran.r-project.org/web/packages/censusapi/censusapi.pdf)

Data source website

[\(https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t\)](https://factfinder.census.gov/faces/nav/jsf/pages/searchresults.xhtml?refresh=t)

Buffalo's Comprehensive Plan

[\(https://www.ci.buffalo.ny.us/files/1_2_1/Mayor/COB_Comprehensive_Plan/index.html\)](https://www.ci.buffalo.ny.us/files/1_2_1/Mayor/COB_Comprehensive_Plan/index.html)

Buffalo's Demolition Plan [\(https://ppgbuffalo.org/files/documents/housing_neighborhoods/housing_conditions_and_repairs/housingneighborhoods-_buffalos_demolition_strategy.pdf\)](https://ppgbuffalo.org/files/documents/housing_neighborhoods/housing_conditions_and_repairs/housingneighborhoods-_buffalos_demolition_strategy.pdf)