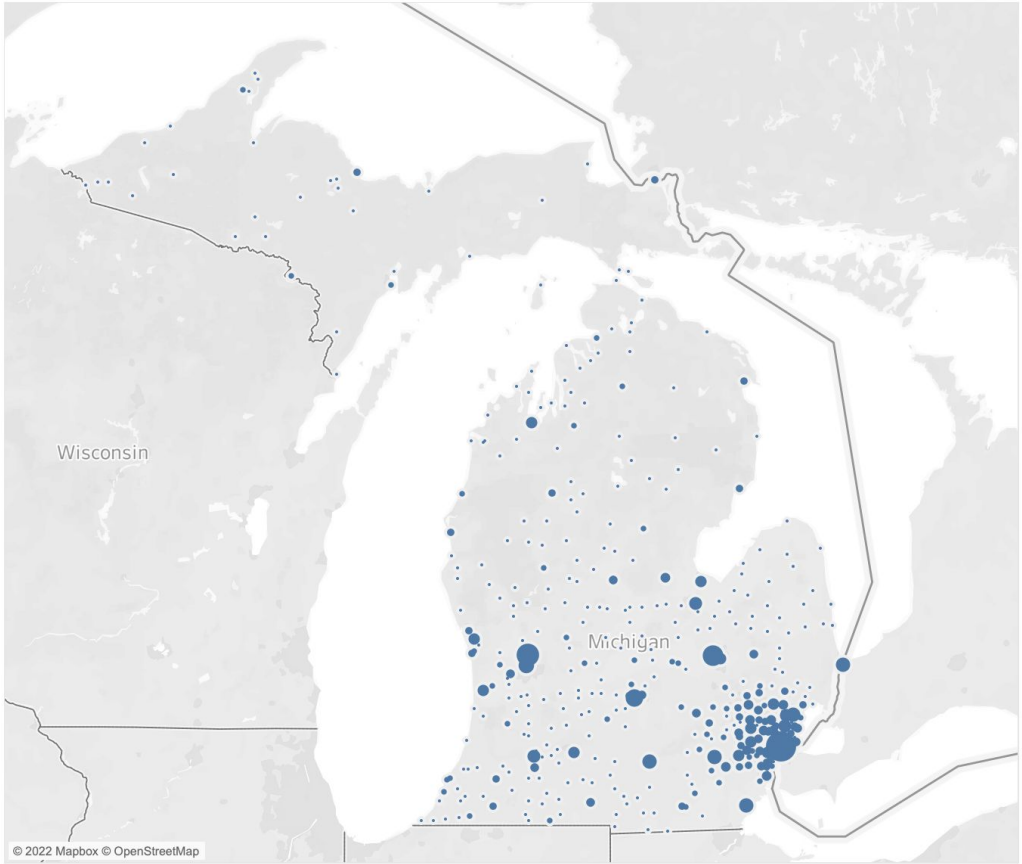
QMSS Group Project

Kate Criswell, William Lee, Alexis Hancz and Sofia Zarazaga Del Saz

Maps

Populations Surrounding Established Library Systems



Summary

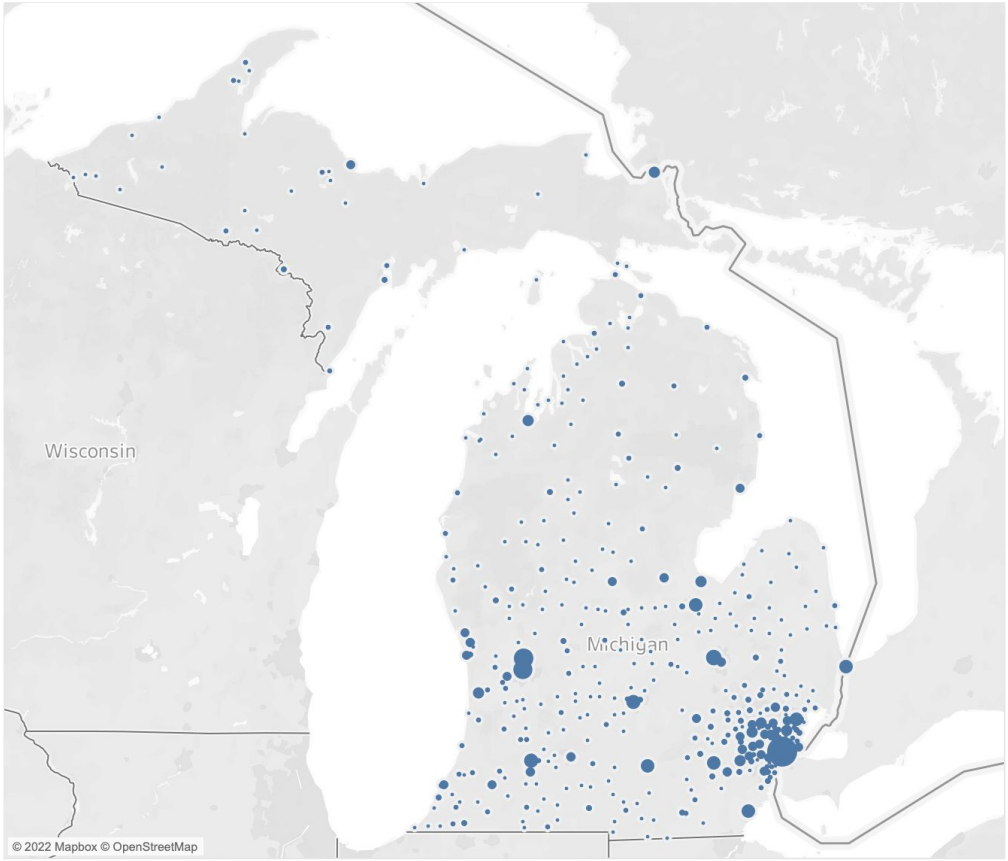
Count:	396
SUM(Popu Lsa)	
Average:	24,892.92
Median:	9,705.50
Standard deviation:	52,951

Population per Established Library System

- 492
- 200,000
- 400,000
- 600,000
- 713,777

Population	
Mean	24892.92172
Standard Error	2660.874859
Median	9705.5
Mode	3150
Standard Deviation	52950.74112
Sample Variance	2803780985
Kurtosis	81.50195739
Skewness	7.586846961
Range	713285
Minimum	492
Maximum	713777
Sum	9857597
Count	396

Book Volume of Libraries Across Michigan



Summary

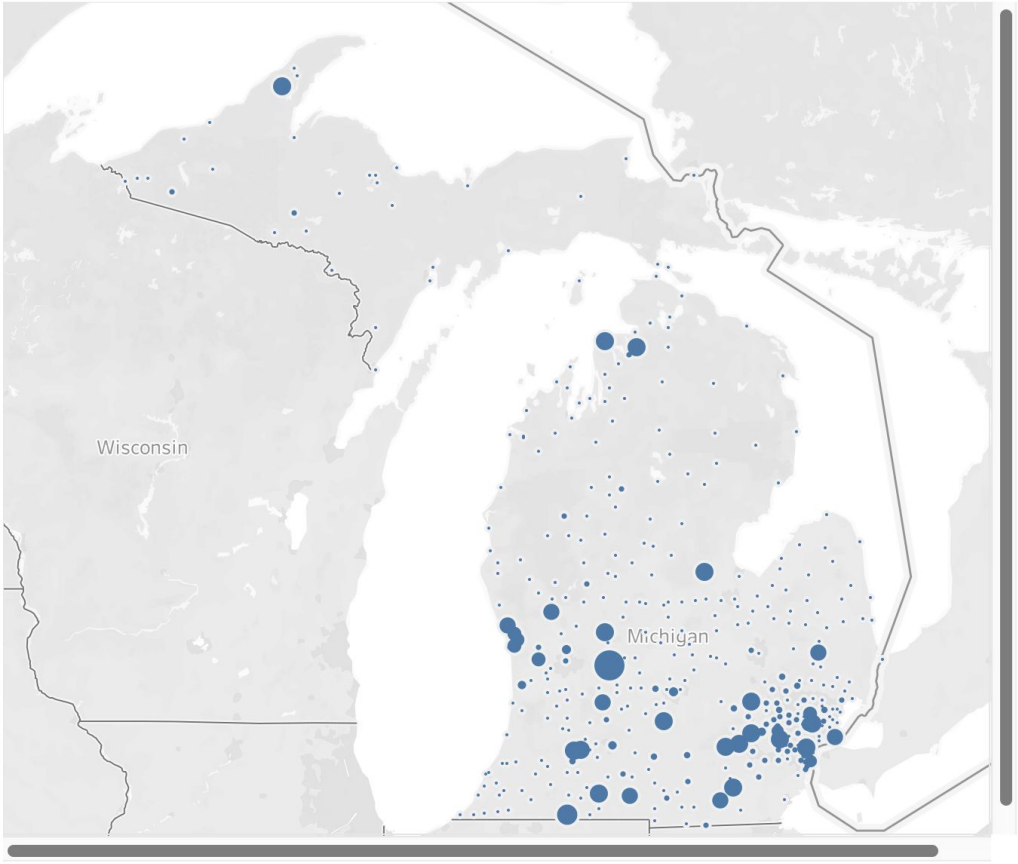
Count:	396
SUM(Bkvol)	
Average:	63,944.41
Median:	33,260.50
Standard deviation:	117,454

Book Volume per Library

- 6,006
- 500,000
- 1,000,000
- 1,500,000
- 1,760,316

Book Volume	
Mean	63944.41414
Standard Error	5902.269787
Median	33260.5
Mode	44295
Standard Deviation	117453.6858
Sample Variance	13795368300
Kurtosis	115.2520521
Skewness	9.033771803
Range	1754310
Minimum	6006
Maximum	1760316
Sum	25321988
Count	396

Electronic Book Volume of Libraries Across Michigan



Summary

Count:	396
SUM(Ebook)	
Average:	59,130.19
Median:	18,430.00
Standard deviation:	139,349

Electronic Book Volume per Library

- 0
- 500,000
- 1,000,000
- 1,494,387

Ebook Volume	
Mean	59130.18687
Standard Error	7002.547724
Median	18430
Mode	0
Standard Deviation	139348.9403
Sample Variance	19418127150
Kurtosis	32.02882291
Skewness	4.689244215
Range	1494387
Minimum	0
Maximum	1494387
Sum	23415554
Count	396

Basic Univariate Summary Statistics

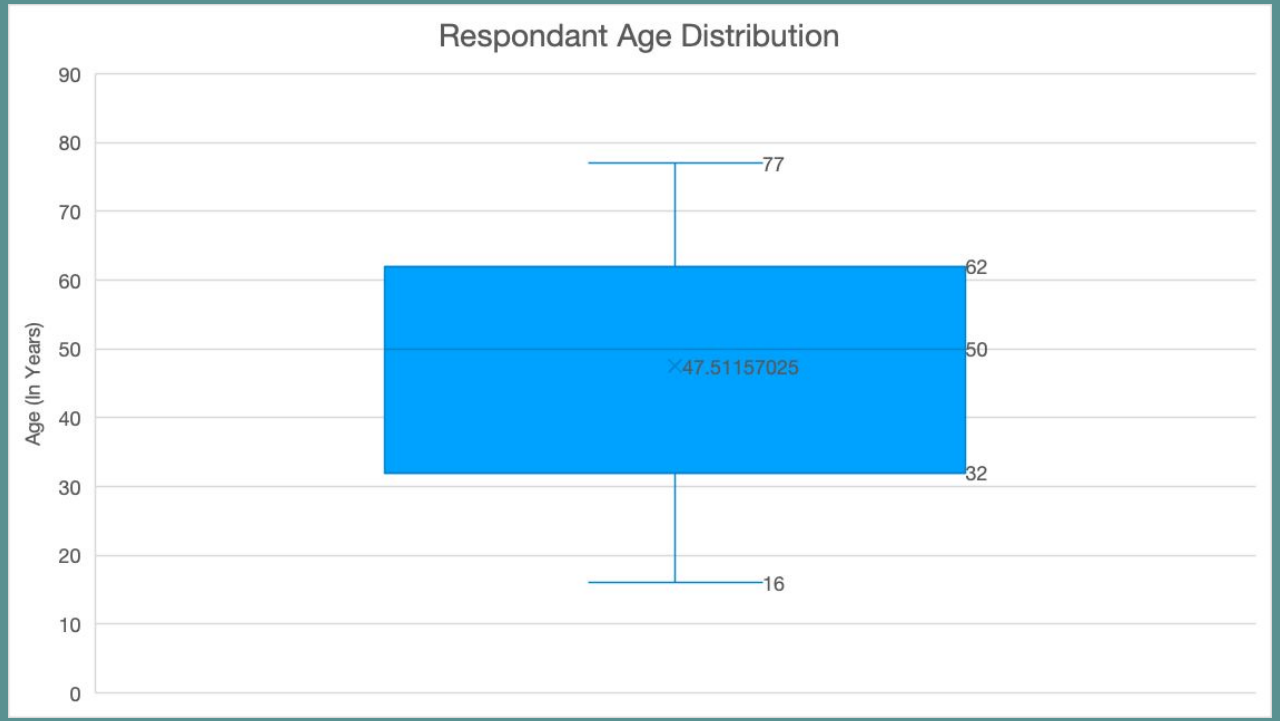
		Use of public library or bookmobile in person over the past 12 months		
		Y	N	TOTAL
Use of public library website over the past 12 months	Y	389	403	792
	N	66	743	809
	TOTAL	455	1146	1601

Row Labels	Count of Respondent Sex	Percent of Total
Female	768	47.97%
Male	833	52.03%
Grand Total	**1601**	**100.00%**

Sex Descriptive Statistics

Mean	1.479700187
Standard Error	0.012489694
Median	1
Mode	1
Standard Deviation	0.499743844
Sample Variance	0.24974391
Kurtosis	-1.995878253
Skewness	0.081342486
Range	1
Minimum	1
Maximum	2
Sum	2369
Count	1601

Male: 1
Female: 2



Age Descriptive Statistics	
Mean	47.5115702
Standard Error	0.49868569
Median	50
Mode	62
Standard Deviation	17.3468088
Sample Variance	300.911777
Kurtosis	-1.149327
Skewness	-0.2072809
Range	61
Minimum	16
Maximum	77
Sum	57489
Count	1210

Row Labels	Count of Respondent Parental Status	Percent of Total
No	1210	75.58%
Yes	391	24.42%
Grand Total	**1601**	**100.00%**

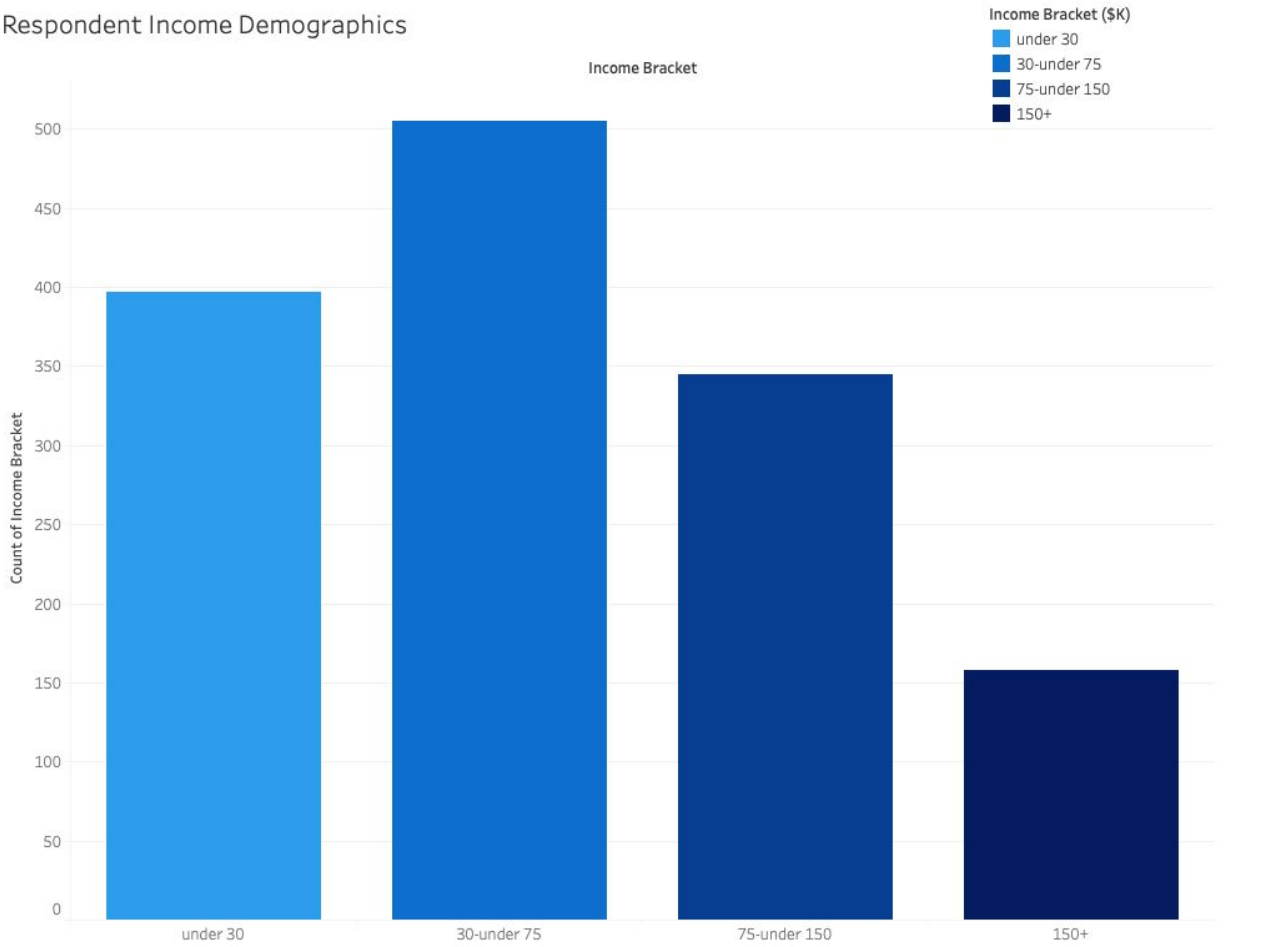
Parental Status Descriptive Statistics	
Mean	1.755012531
Standard Error	0.010768834
Median	2
Mode	2
Standard Deviation	0.43021457
Sample Variance	0.185084577
Kurtosis	-0.591772494
Skewness	-1.187000694
Range	1
Minimum	1
Maximum	2
Sum	2801
Count	1596

Row Labels	Count of Respondent Income Bracket	Percent of Total
30-under 75	505	35.94%
under 30	397	28.26%
75-under 150	345	24.56%
150+	158	11.25%
Grand Total	**1405**	**100.00%**

Income Descriptive Statistics

Mean	5.306761566
Standard Error	0.066352584
Median	6
Mode	6
Standard Deviation	2.487115769
Sample Variance	6.185744847
Kurtosis	-1.113121028
Skewness	-0.200286038
Range	8
Minimum	1
Maximum	9
Sum	7456
Count	1405

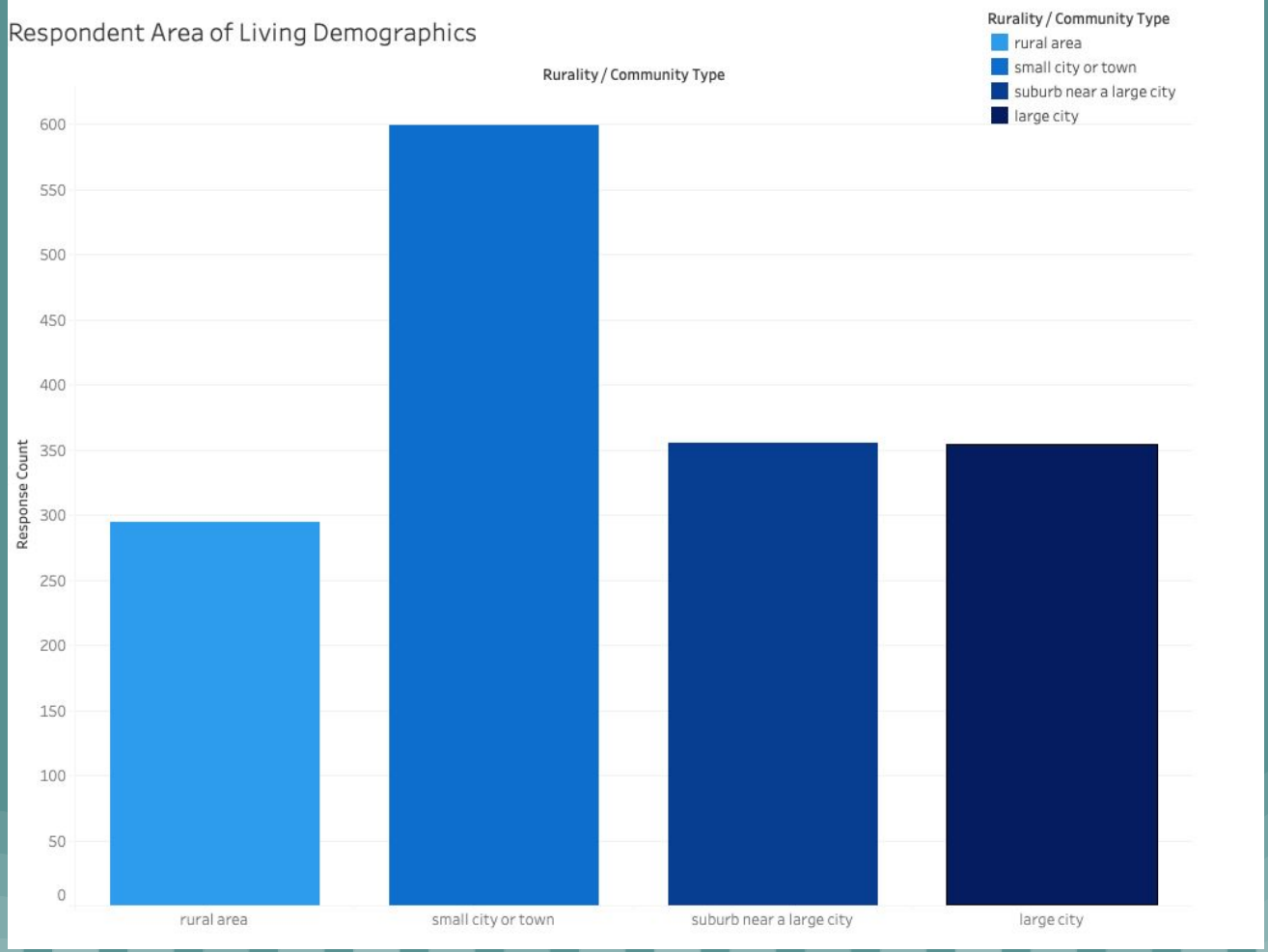
Respondent Income Demographics

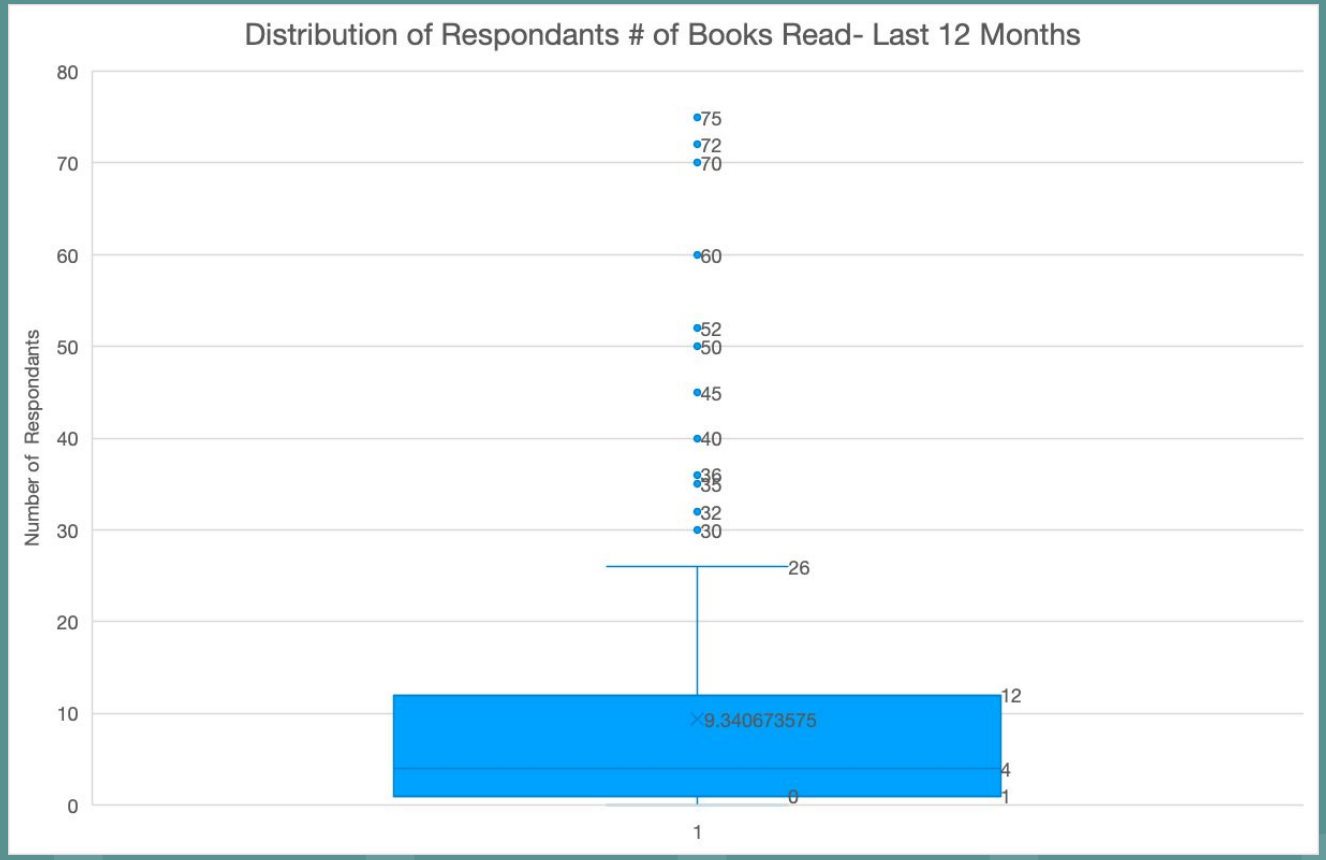


Row Labels	Count of Respondent Rurality / Community Type	Percent of Total
Small city or town	599	37.41%
Suburb near large city	355	22.17%
Large city	353	22.05%
Rural area	294	18.36%
Grand Total	**1601**	**100.00%**

Rurality Descriptive Statistics	
Mean	2.558400999
Standard Error	0.028827747
Median	3
Mode	3
Standard Deviation	1.153470174
Sample Variance	1.330493442
Kurtosis	3.729163339
Skewness	0.886095746
Range	8
Minimum	1
Maximum	9
Sum	4096

Respondent Area of Living Demographics



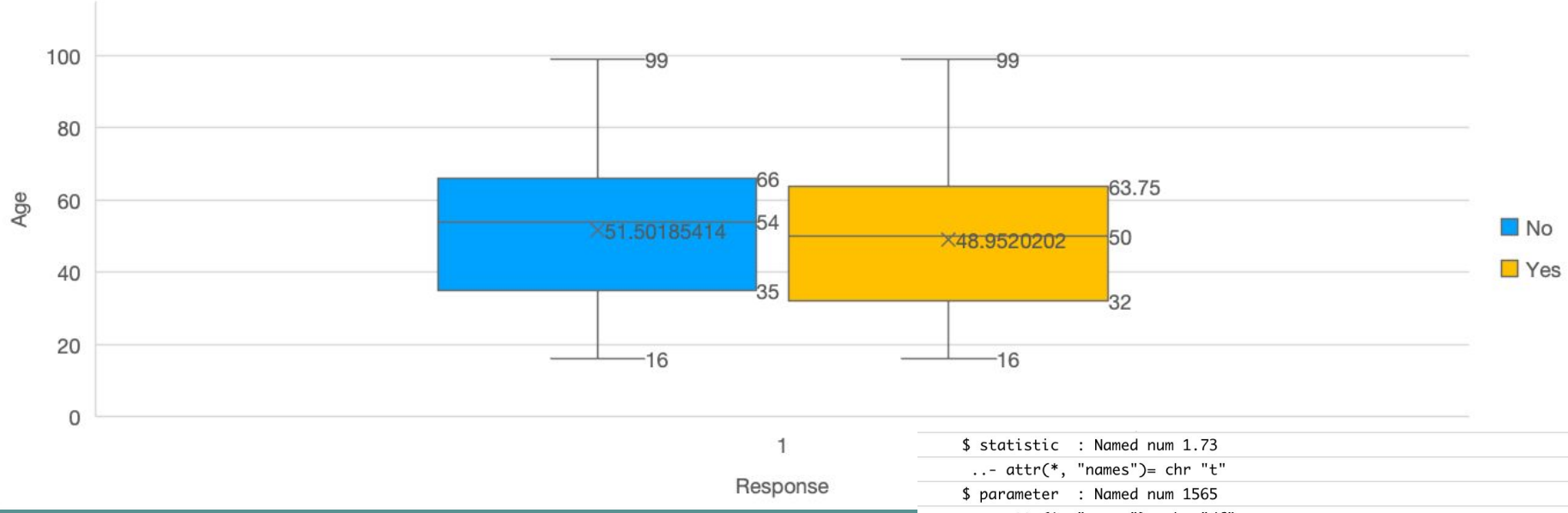


Number of Books Read in the Last 12 Months Descriptive Stats

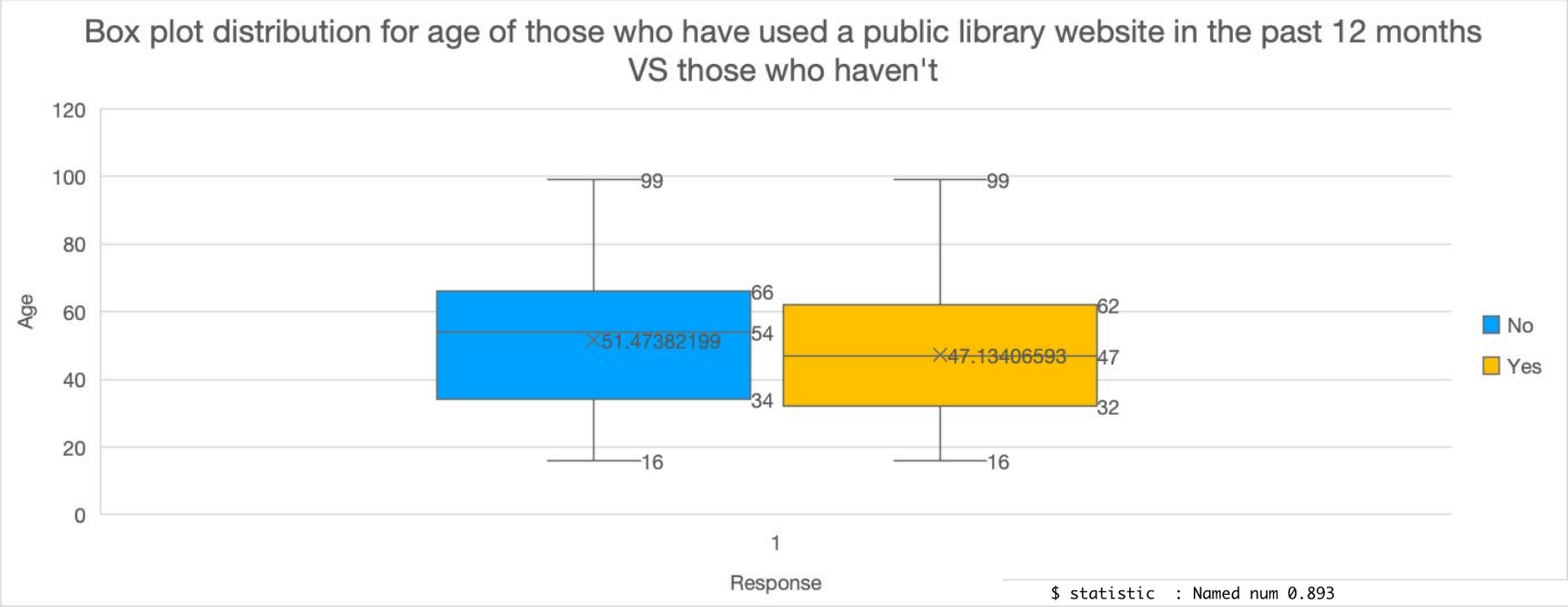
Mean	9.34067358
Standard Error	0.34594077
Median	4
Mode	0
Standard Deviation	13.5933156
Sample Variance	184.778228
Kurtosis	4.84635879
Skewness	2.22607083
Range	75
Minimum	0
Maximum	75
Sum	14422
Count	1544

Bivariate Relationship Analysis

Box plot distribution for age of those who have used a public library/bookmobile in the past 12 months VS those who haven't

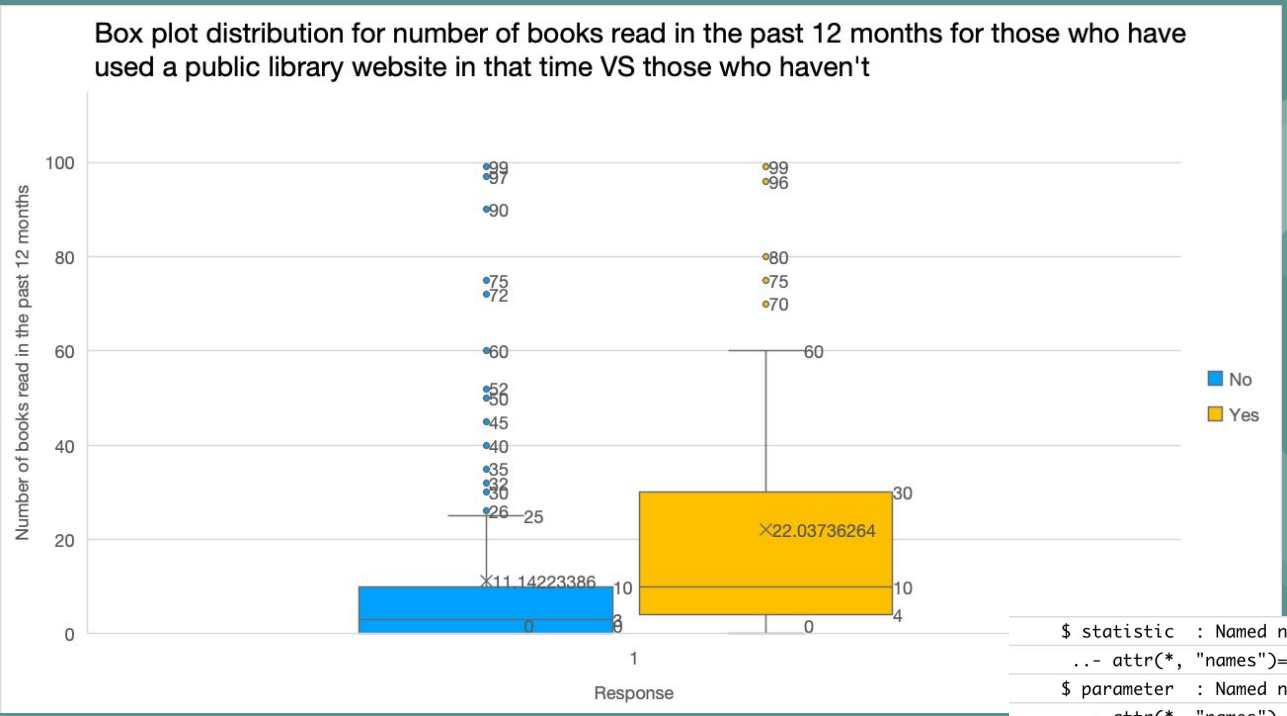



```
$ statistic  : Named num 1.73
 ..- attr(*, "names")= chr "t"
$ parameter  : Named num 1565
 ..- attr(*, "names")= chr "df"
$ p.value    : num 0.0835
$ conf.int   : num [1:2] -0.277 4.449
 ..- attr(*, "conf.level")= num 0.95
$ estimate   : Named num [1:2] 38.6 36.5
 ..- attr(*, "names")= chr [1:2] "mean in group N" "mean in group Y"
$ null.value : Named num 0
 ..- attr(*, "names")= chr "difference in means between group N and group Y"
$ stderr     : num 1.2
$ alternative: chr "two.sided"
$ method     : chr "Welch Two Sample t-test"
$ data.name  : chr "library.data$age by library.data$libusea.clean"
- attr(*, "class")= chr "htest"
```




```
$ statistic  : Named num 0.893
 ..- attr(*, "names")= chr "t"
$ parameter  : Named num 866
 ..- attr(*, "names")= chr "df"
$ p.value    : num 0.372
$ conf.int   : num [1:2] -1.39 3.72
 ..- attr(*, "conf.level")= num 0.95
$ estimate   : Named num [1:2] 37.9 36.7
 ..- attr(*, "names")= chr [1:2] "mean in group N" "mean in group Y"
$ null.value : Named num 0
 ..- attr(*, "names")= chr "difference in means between group N and group Y"
$ stderr     : num 1.3
$ alternative: chr "two.sided"
$ method     : chr "Welch Two Sample t-test"
$ data.name  : chr "library.data$age by library.data$libuseb.clean"
- attr(*, "class")= chr "htest"
```

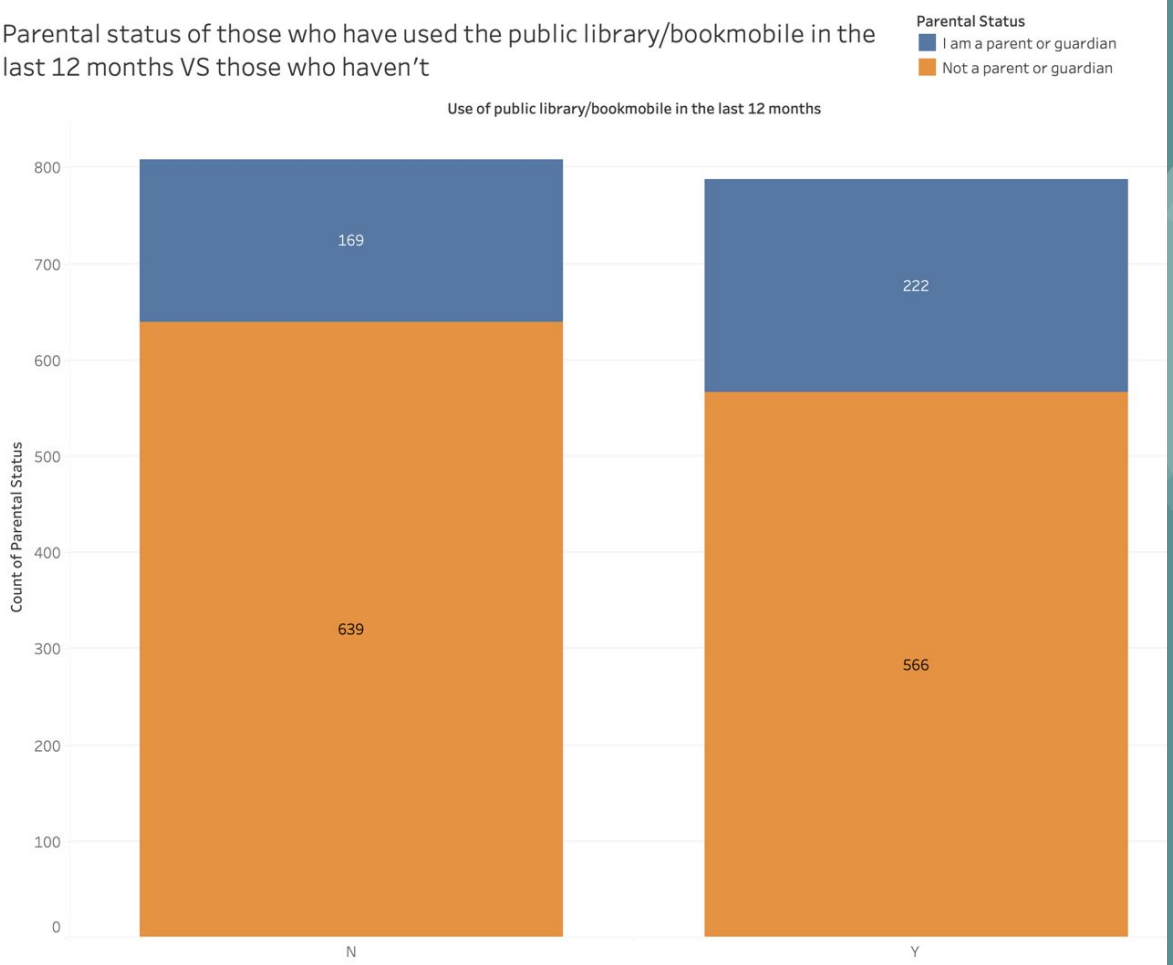

```
$ statistic  : Named num -11.2
 ..- attr(*, "names")= chr "t"
$ parameter  : Named num 1277
 ..- attr(*, "names")= chr "df"
$ p.value    : num 6.86e-28
$ conf.int   : num [1:2] -8.84 -6.21
 ..- attr(*, "conf.level")= num 0.95
$ estimate   : Named num [1:2] 5.66 13.19
 ..- attr(*, "names")= chr [1:2] "mean in group N" "mean in group Y"
$ null.value : Named num 0
 ..- attr(*, "names")= chr "difference in means between group N and group Y"
$ stderr     : num 0.671
$ alternative: chr "two.sided"
$ method     : chr "Welch Two Sample t-test"
$ data.name  : chr "library.data$NumbersofBooksRead by library.data$libusea.cle…
- attr(*, "class")= chr "htest"
```




```
$ statistic  : Named num -8.75
 ..- attr(*, "names")= chr "t"
$ parameter  : Named num 631
 ..- attr(*, "names")= chr "df"
$ p.value    : num 1.96e-17
$ conf.int   : num [1:2] -9.08 -5.75
 ..- attr(*, "conf.level")= num 0.95
$ estimate   : Named num [1:2] 7.25 14.66
 ..- attr(*, "names")= chr [1:2] "mean in group N" "mean in group Y"
$ null.value : Named num 0
 ..- attr(*, "names")= chr "difference in means between group N and group Y"
$ stderr     : num 0.847
$ alternative: chr "two.sided"
$ method     : chr "Welch Two Sample t-test"
$ data.name  : chr "library.data$NumbersofBooksRead by library.data$libuseb.clean"
- attr(*, "class")= chr "htest"
```

Bivariate Analysis Visualizations

Parental status of those who have used the public library/bookmobile in the last 12 months VS those who haven't

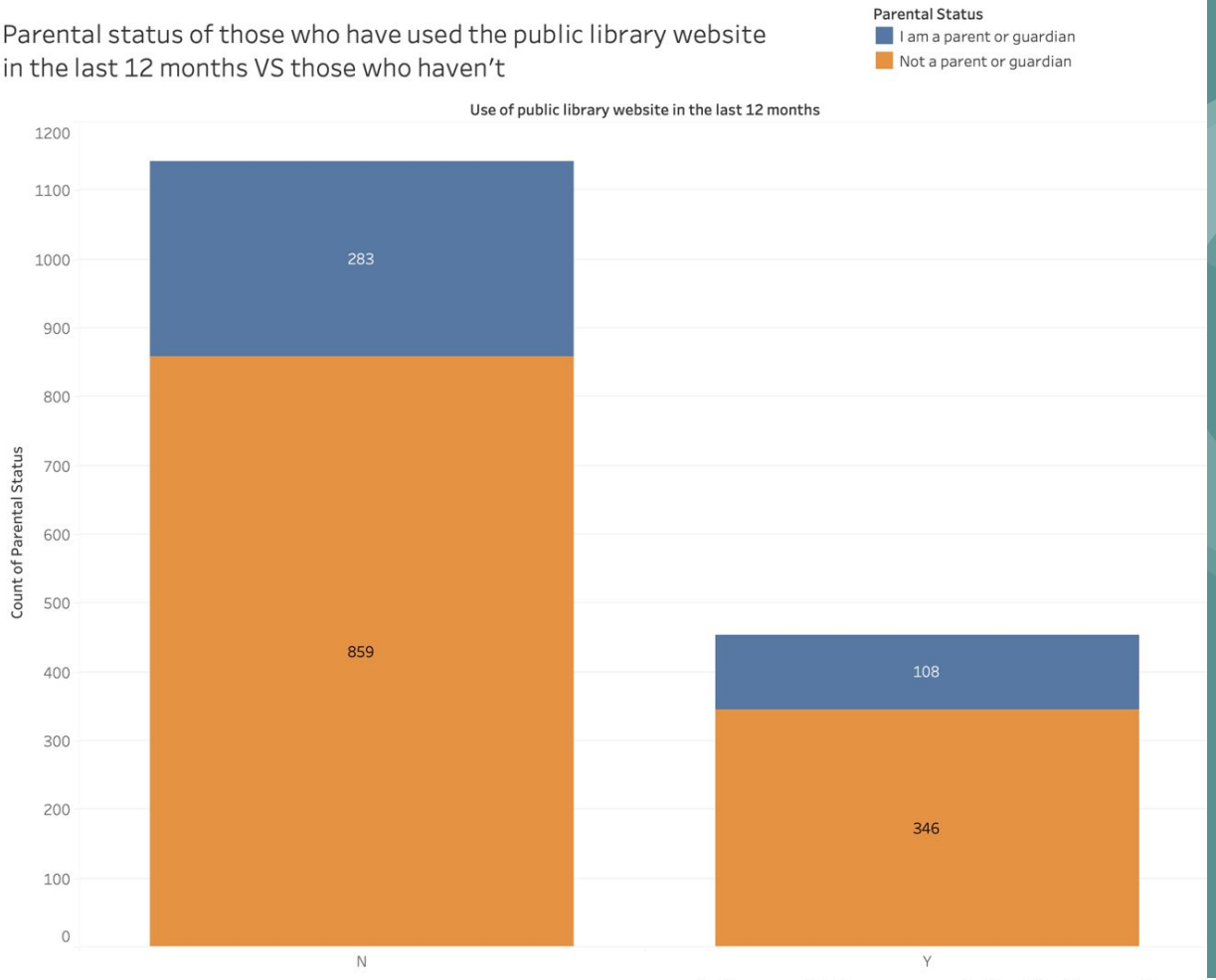


ParentalStatus	No	Yes
libusea.clean		
N	53.03	43.22
Y	46.97	56.78
Sum	100.00	100.00

	No	Yes
N	639	169
Y	566	222

```
data:  library.data$libusea.clean and library.data$ParentalStatus
X-squared = 10.969, df = 1, p-value = 0.0009266
```

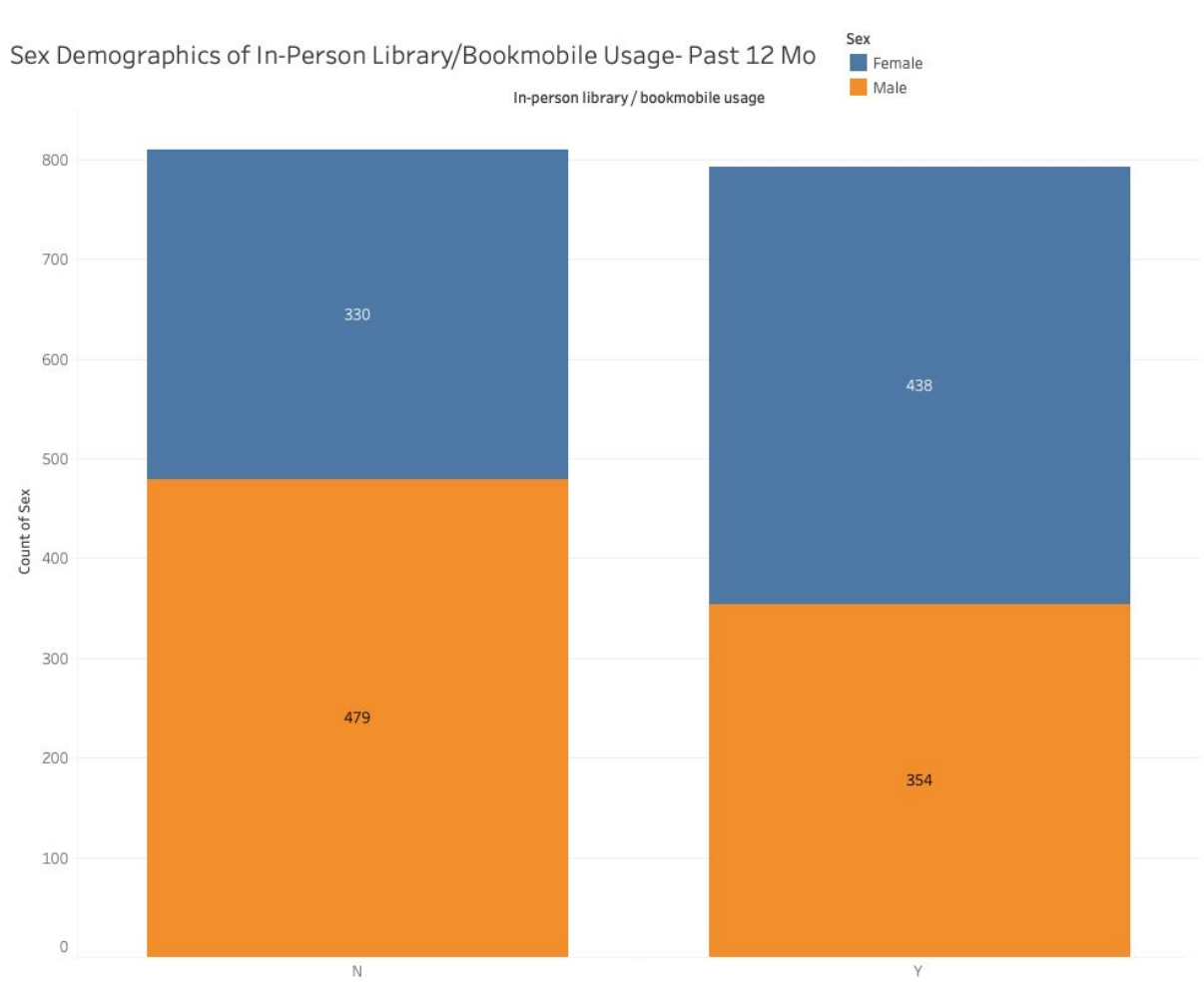
Parental status of those who have used the public library website in the last 12 months VS those who haven't



ParentalStatus	No	Yes
libuseb.clean		
N	73.61	65.47
Y	26.39	34.53
Sum	100.00	100.00

	No	Yes
N	887	256
Y	318	135

data: library.data$libuseb.clean and library.data$ParentalStatus
X-squared = 9.2191, df = 1, p-value = 0.002395

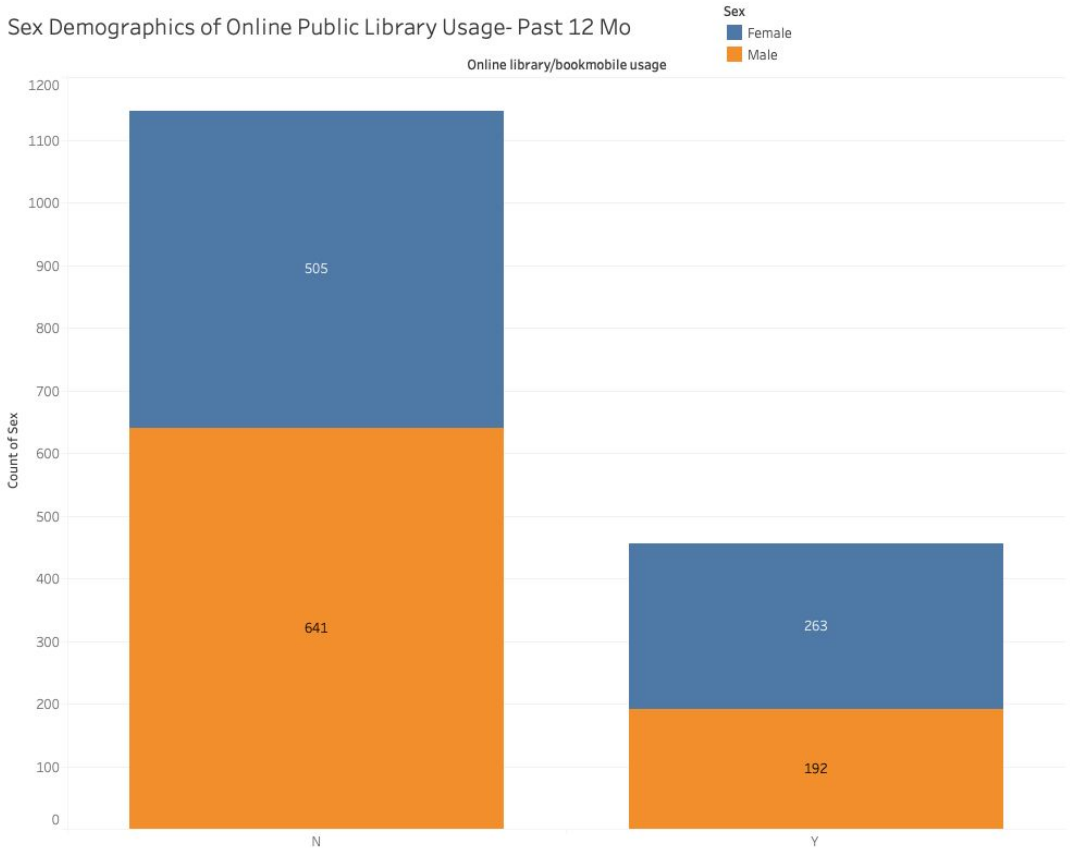


Gender	Female	Male
libusea.clean		
N	42.97	57.50
Y	57.03	42.50
Sum	100.00	100.00

	Female	Male
N	330	479
Y	438	354

Pearson's Chi-squared test with Yates' continuity correction

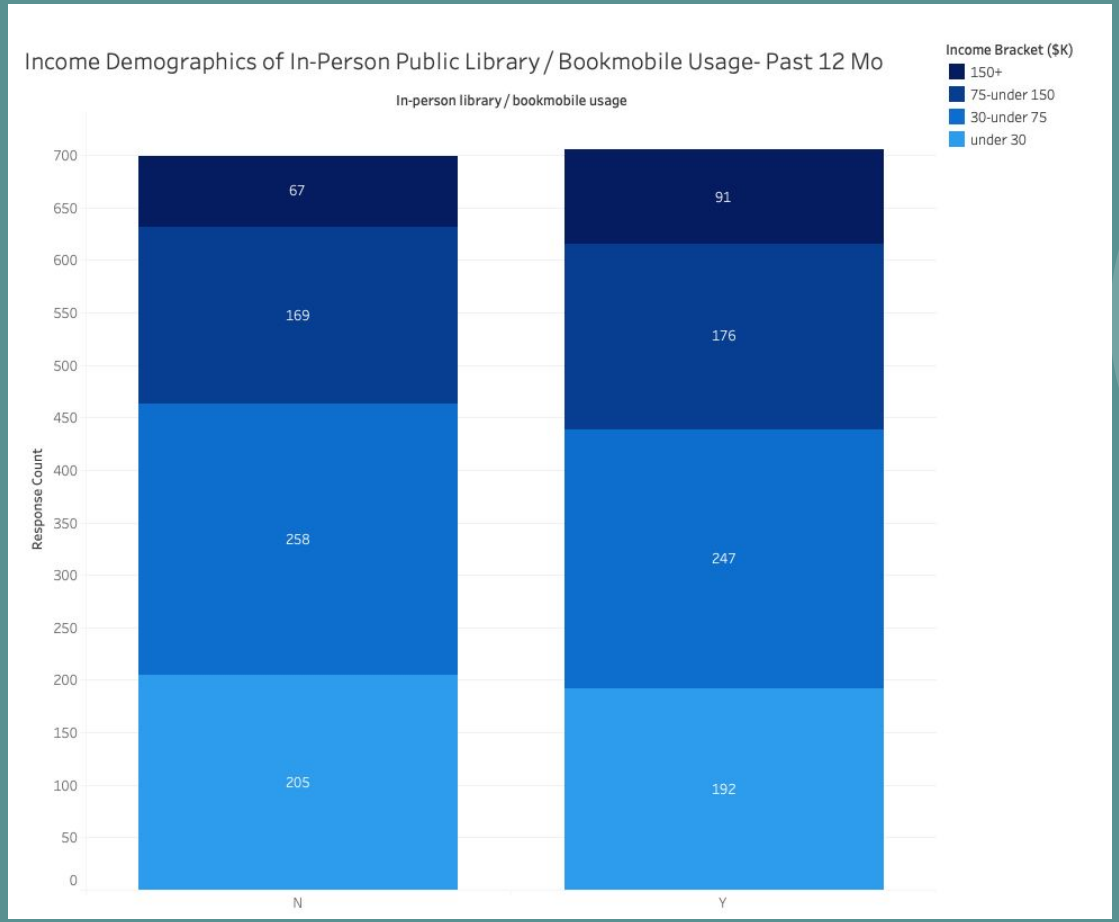
data: library.data$libusea.clean and library.data$Gender
X-squared = 33.189, df = 1, p-value = 8.361e-09



	Gender Female	Male
libuseb.clean		
N	65.76	76.95
Y	34.24	23.05
Sum	100.00	100.00

	Female	Male
N	505	641
Y	263	192

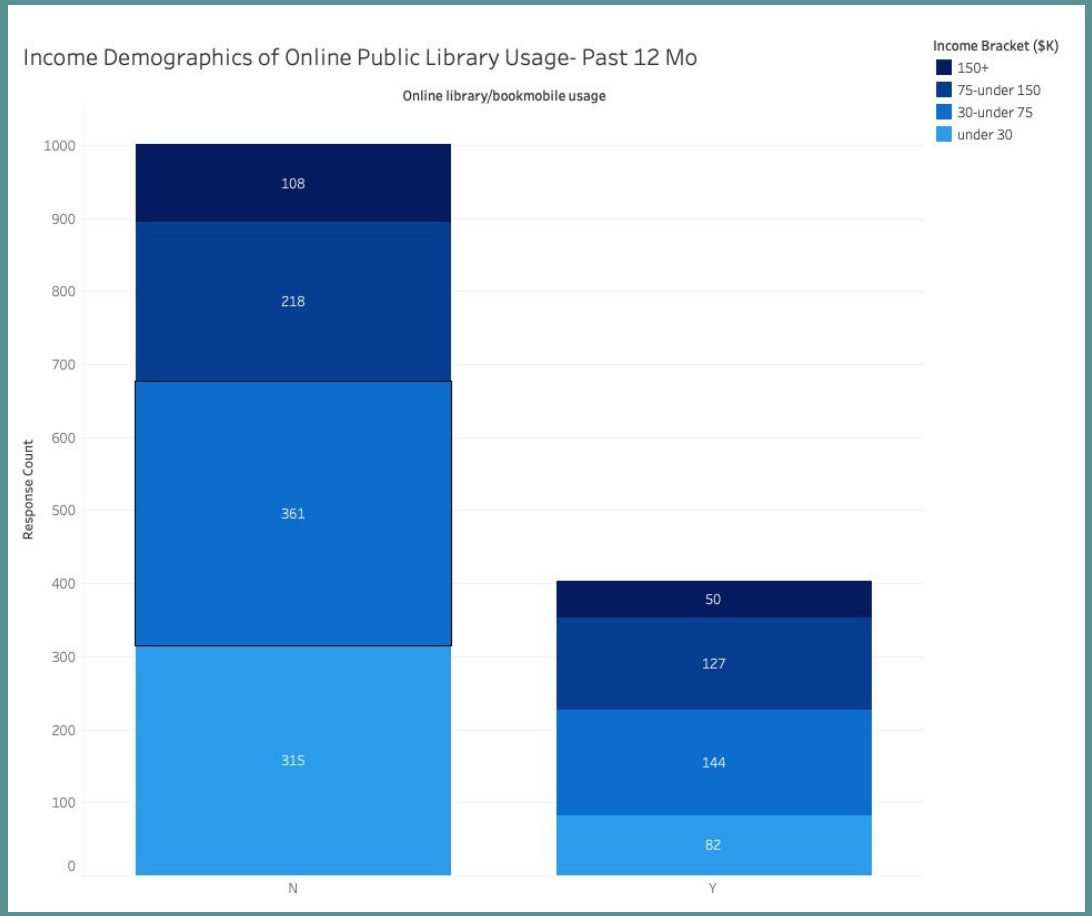
data: library.data$libuseb.clean and library.data$Gender
X-squared = 24.073, df = 1, p-value = 9.275e-07



Income		150+	30-under 75	75-under 150	under 30
libusea.clean					
N		NaN	42.41	51.09	48.99	51.64
Y		NaN	57.59	48.91	51.01	48.36
Sum		NaN	100.00	100.00	100.00	100.00

		150+	30-under 75	75-under 150	under 30
N	0	67	258	169	205
Y	0	91	247	176	192

```
data:  library.data$libusea.clean and library.data$Income
X-squared = 4.4181, df = 3, p-value = 0.2197
```

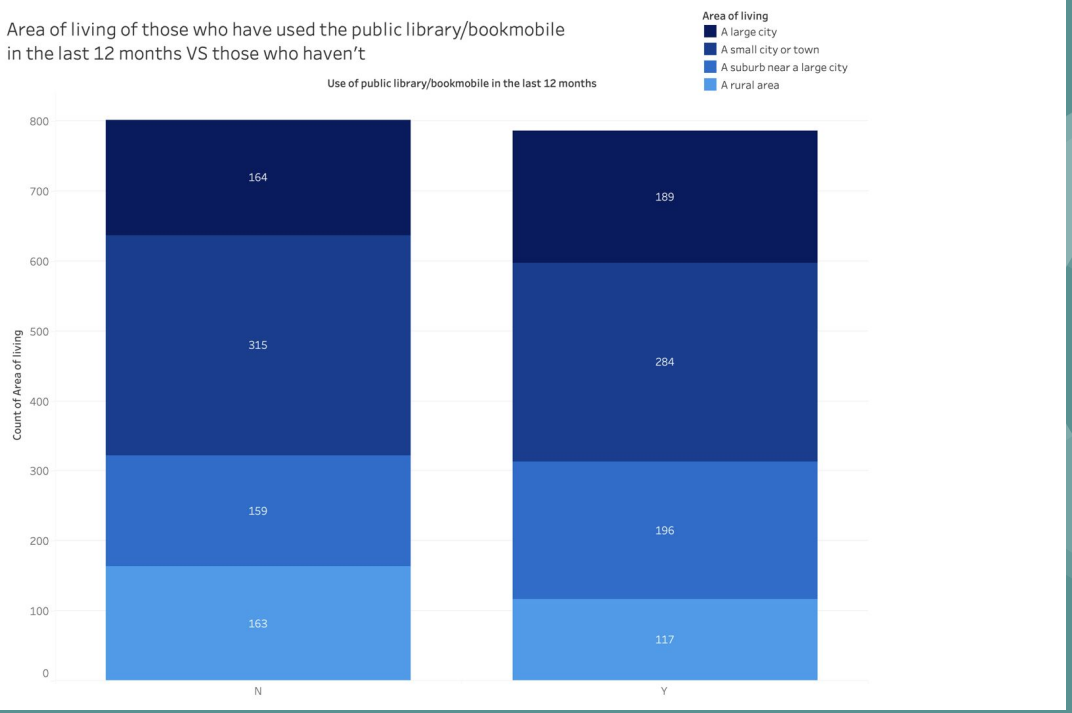


Income		150+	30-under 75	75-under 150	under 30
libuseb.clean					
N	NaN	68.35	71.49	63.19	79.35
Y	NaN	31.65	28.51	36.81	20.65
Sum	NaN	100.00	100.00	100.00	100.00

		150+	30-under 75	75-under 150	under 30
N	0	108	361	218	315
Y	0	50	144	127	82

```
data:  library.data$libuseb.clean and library.data$Income
X-squared = 24.337, df = 3, p-value = 2.125e-05
```

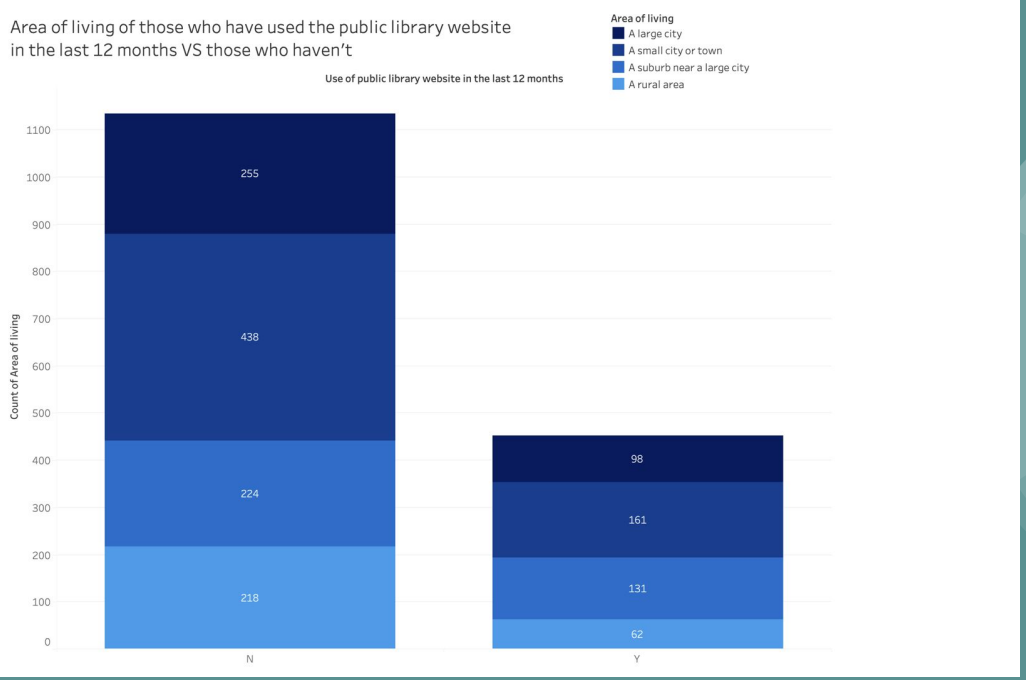
Area of living of those who have used the public library/bookmobile in the last 12 months VS those who haven't



	A Large City	A Rural Area	A Small City or Town, OR A Suburb Near A Large City	
N	164	163	315	159
Y	189	117	284	196

Rurality libusea.clean	A Large City	A Rural Area	A Small City or Town, OR A Suburb Near A Large City	
N	46.46	58.21	52.59	44.79
Y	53.54	41.79	47.41	55.21
Sum	100.00	100.00	100.00	100.00

```
data:  library.data$libusea.clean and library.data$Rurality
X-squared = 14.648, df = 3, p-value = 0.002144
```



	A Large City	A Rural Area	A Small City or Town, OR A Suburb Near A Large City
N	255	218	438	224
Y	98	62	161	131

Rurality	A Large City	A Rural Area	A Small City or Town, OR A Suburb Near A Large City
libuseb.clean			
N	72.24	77.86	73.12	63.10
Y	27.76	22.14	26.88	36.90
Sum	100.00	100.00	100.00	100.00

```
data:  library.data$libuseb.clean and library.data$Rurality
X-squared = 18.724, df = 3, p-value = 0.0003117
```

```
$ coefficients     : Named num [1:9] 0.0476 -0.0041 -0.2899 -0.2219 -0.105 ...
 ..- attr(*, "names")= chr [1:9] "(Intercept)" "library.data$age" "library.data$Income30-under 75" "library.data$Income75-under 150" ...
$ residuals        : Named num [1:1330] 2.8 -1.99 -2.52 -1.69 -2.33 ...
 ..- attr(*, "names")= chr [1:1330] "197" "198" "199" "200" ...
$ fitted.values    : Named num [1:1330] 0.357 0.497 0.603 0.407 0.57 ...
 ..- attr(*, "names")= chr [1:1330] "197" "198" "199" "200" ...
$ effects          : Named num [1:1330] 1.347 1.579 -0.858 -0.38 -1.532 ...
 ..- attr(*, "names")= chr [1:1330] "(Intercept)" "library.data$age" "library.data$Income30-under 75" "library.data$Income75-under 150" ...
$ R                : num [1:9, 1:9] -17.3 0 0 0 0 ...
 ..- attr(*, "dimnames")=List of 2
 .. ..$ : chr [1:9] "(Intercept)" "library.data$age" "library.data$Income30-under 75" "library.data$Income75-under 150" ...
 .. ..$ : chr [1:9] "(Intercept)" "library.data$age" "library.data$Income30-under 75" "library.data$Income75-under 150" ...
$ rank             : int 9
$ qr               :List of 5
 ..$ qr   : num [1:1330, 1:9] -17.3402 0.0288 0.0282 0.0283 0.0285 ...
 .. ..- attr(*, "dimnames")=List of 2
 .. .. ..$ : chr [1:1330] "197" "198" "199" "200" ...
```

```
Deviance Residuals:
    Min       1Q   Median       3Q      Max
-2.4792  -1.0469  -0.7942   1.1760   1.6383

Coefficients:
                                                Estimate Std. Error z value
(Intercept)                                    0.0475572  0.2328132   0.204
library.data$age                              -0.0040982  0.0024896  -1.646
library.data$Income30-under 75                -0.2898998  0.2026563  -1.431
library.data$Income75-under 150               -0.2219332  0.2117469  -1.048
library.data$Incomeunder 30                   -0.1050284  0.2093747  -0.502
library.data$RuralityA Rural Area             -0.4976755  0.1882377  -2.644
library.data$RuralityA Small City or Town, OR -0.2531561  0.1544244  -1.639
library.data$RuralityA Suburb Near A Large City -0.0008867  0.1731669  -0.005
library.data$NumbersofBooksRead                0.0537607  0.0057211   9.397
                                              Pr(>|z|)
(Intercept)                                     0.8381
library.data$age                                0.0997 .
library.data$Income30-under 75                  0.1526
library.data$Income75-under 150                 0.2946
library.data$Incomeunder 30                     0.6159
library.data$RuralityA Rural Area               0.0082 **
library.data$RuralityA Small City or Town, OR   0.1011
library.data$RuralityA Suburb Near A Large City 0.9959
library.data$NumbersofBooksRead                 <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```

```
                                                    OR     2.5 %    97.5 %
(Intercept)                                  1.0487062 0.6646807 1.6574902
library.data$age                             0.9959102 0.9910538 1.0007777
library.data$Income30-under 75               0.7483386 0.5021720 1.1125133
library.data$Income75-under 150              0.8009689 0.5280905 1.2122774
library.data$Incomeunder 30                  0.9002990 0.5965251 1.3567718
library.data$RuralityA Rural Area            0.6079422 0.4195788 0.8780239
library.data$RuralityA Small City or Town, OR 0.7763467 0.5732602 1.0504903
library.data$RuralityA Suburb Near A Large City 0.9991137 0.7113905 1.4030713
library.data$NumbersofBooksRead              1.0552320 1.0438600 1.0675649
```

```
                                              Pr(>|z|)
(Intercept)                                     0.8381
library.data$age                                0.0997 .
library.data$Income30-under 75                  0.1526
library.data$Income75-under 150                 0.2946
library.data$Incomeunder 30                     0.6159
library.data$RuralityA Rural Area               0.0082 **
library.data$RuralityA Small City or Town, OR   0.1011
library.data$RuralityA Suburb Near A Large City 0.9959
library.data$NumbersofBooksRead                 <2e-16 ***
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
```