Output

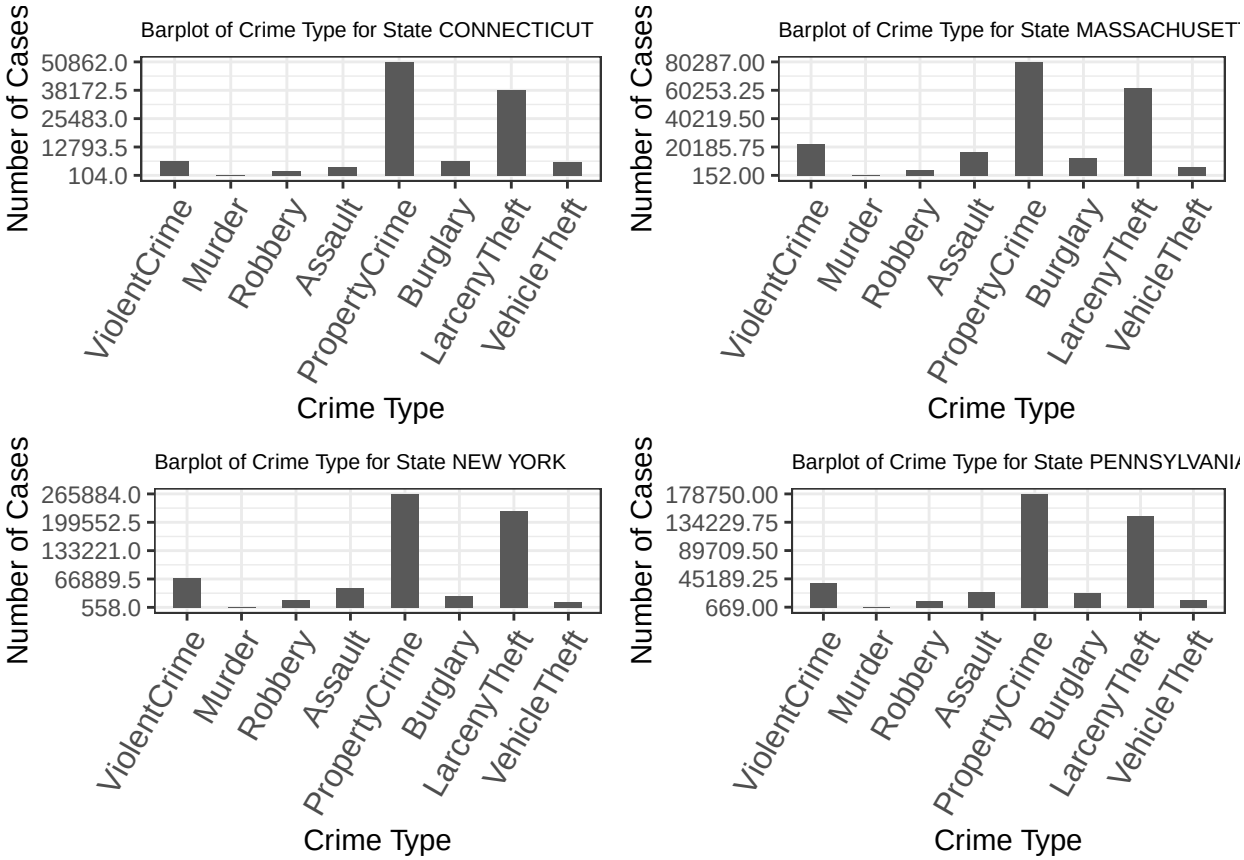
Bar Plots And Spine Plots in 2019 for 4 States in New England Area

In this session of the report, we are looking at the bar plots and spine plots for each geographical areas, including metropolitan area (M), cities outside of metropolitan area (O), and rural area (R). There are 3 types of graphs that are generated.

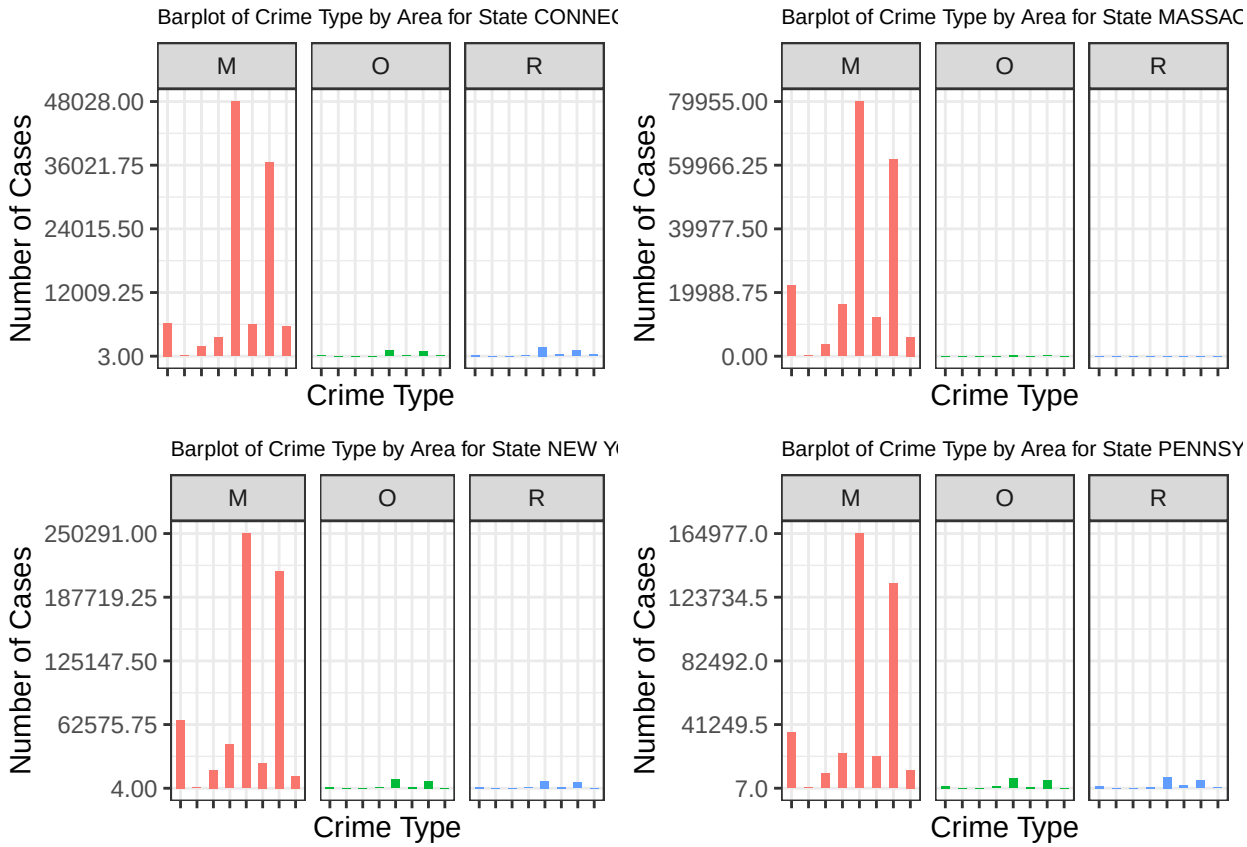
- The first graph is called "Barplot.by.type". This is an overview of the total number of each crime cases in certain state and year. On the x-axis is the label of each crime type, and on the y-axis is the number of cases.
- The second type is called "Barplot.by.area". This graph is used to show the number of cases for each crime type by region, in certain year and state. The three blocks represent three different regions mentioned above (M,O,R). On the x-axis is the name of each crime, and on the y-axis is the number of cases.
- The third graph is called "spineplot". It is used to show the proportion of number of cases for each region in certain state. That is, for each crime type, the contribution of each region to each crime type.

Let's look at the examples below. The year 2019 is used as our example for illustration purpose. All the relevant plots of other years can be obtained easily by adjusting function parameters. In 2019, we select "MASSACHUSETTS", "CONNECTICUT", "NEW YORK" and "PENNSYLVANIA" as our first observation points, as these are the largest New England states. The results are pretty consistent among these states.

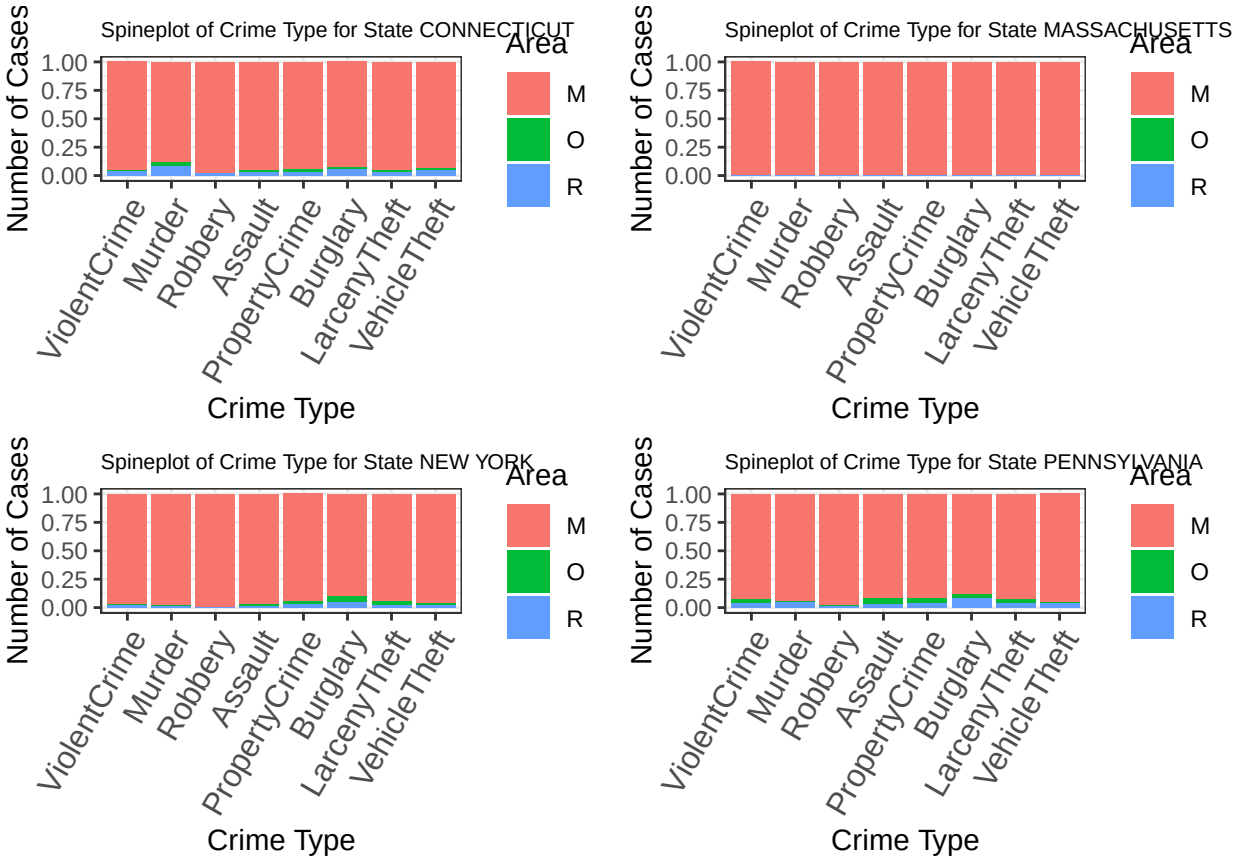
```
fig_CT <- visual.fun(year = 2019, state = "CONNECTICUT")
fig_MA <- visual.fun(year = 2019, state = "MASSACHUSETTS")
fig_NY <- visual.fun(year = 2019, state = "NEW YORK")
fig_PA <- visual.fun(year = 2019, state = "PENNSYLVANIA")

# The three Barplot.by.type plots show that in all of the states, "property crime"
# occurred way more frequent than "violent crime", because it is obviously "easier"
# to conduct property crimes. And in the property crime category, "larceny theft"
# is the most dominant one. This observation holds true in almost all
# of the cases.

p1<-fig_CT$Barplot.by.type
p2<-fig_MA$Barplot.by.type
p3<-fig_NY$Barplot.by.type
p4<-fig_PA$Barplot.by.type

plot_grid(p1,p2,p3,p4,ncol=2)
```




```
# After dividing the crimes by regions, we can see that most crimes in these 3
# states occurred in metropolitan area, which makes sense as this area is the
# most populated region, so the crime cases were not surprisingly higher.


p5 <- fig_CT$Barplot.by.area
p6 <- fig_MA$Barplot.by.area
p7 <-fig_NY$Barplot.by.area
p8 <- fig_PA$Barplot.by.area
plot_grid(p5,p6,p7,p8,ncol=2)
```



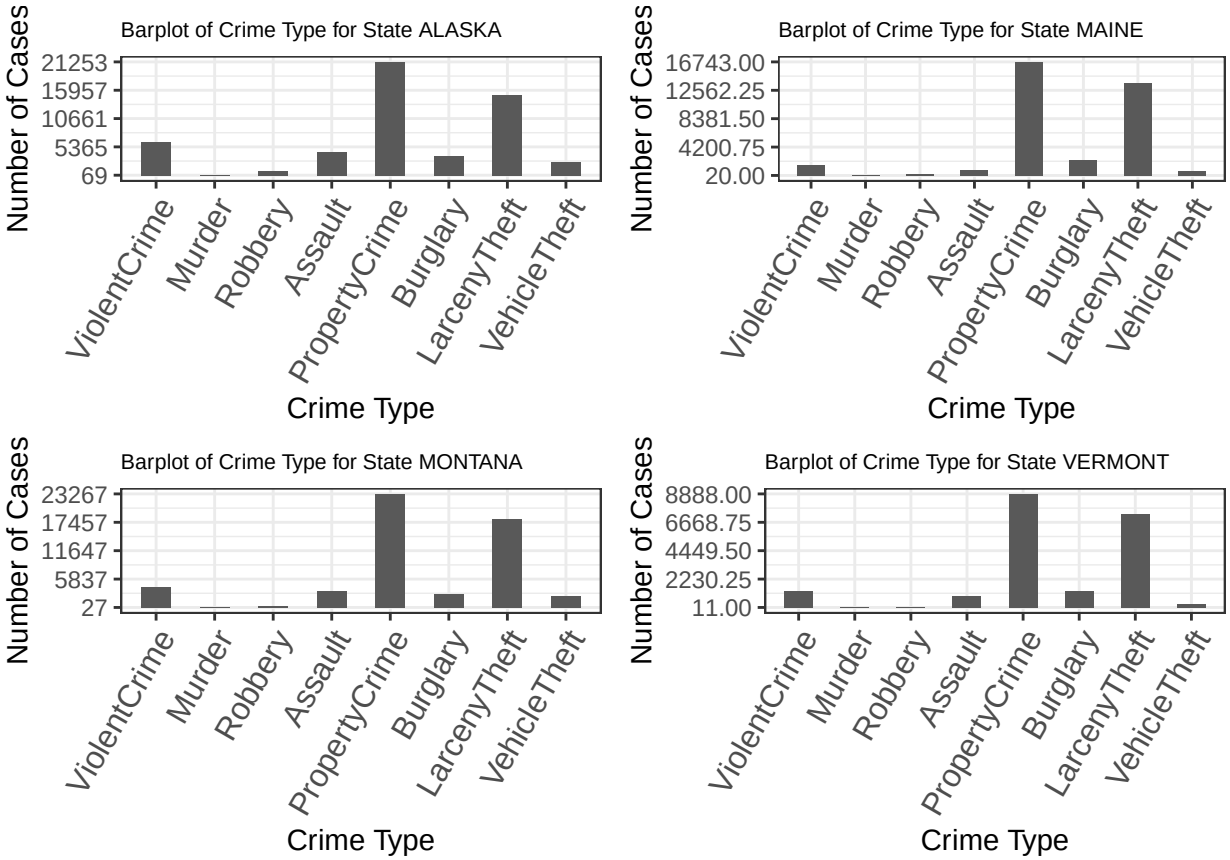

```
# It is shown more clearly here that, in the mega New England States, most of the
# crimes occur in metropolitan area. However, the cases of "murder" and "burglary"
# occurred a little bit more frequently in outside of metropolitan and rural
# areas. This result may draw attention to potential policy changes on the
# arrangement of armed police officers and weapon distribution.
p9 <- fig_CT$spineplot
p10 <- fig_MA$spineplot
p11 <- fig_NY$spineplot
p12 <- fig_PA$spineplot
plot_grid(p9,p10,p11,p12,ncol=2)
```



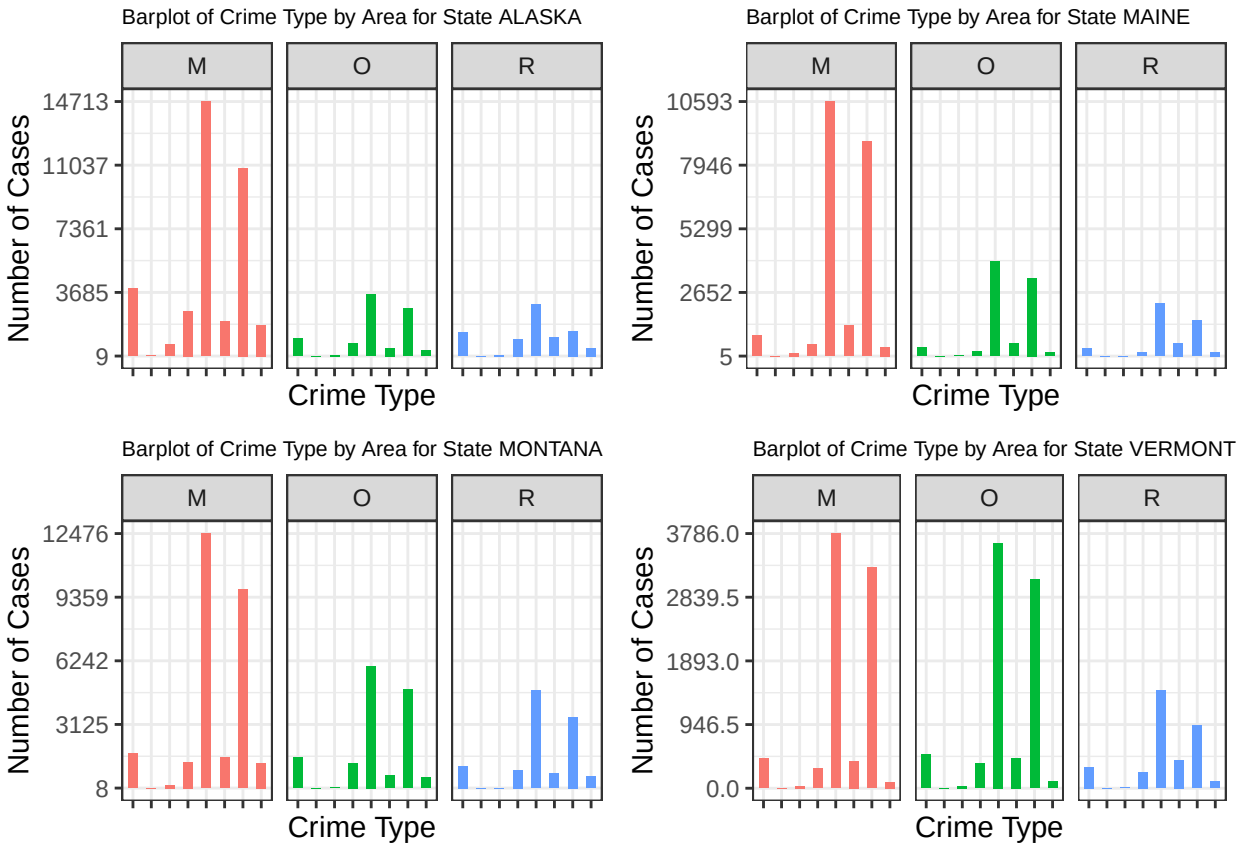
Bar Plots And Spine Plots in 2019 for ALASKA, MAINE, MONTANA and VERMONT

We then explored the crime distributions for state ALASKA, MAINE, MONTANA and VERMONT. These are some colder states on the north boarder of the US. And we have some interesting reveals.

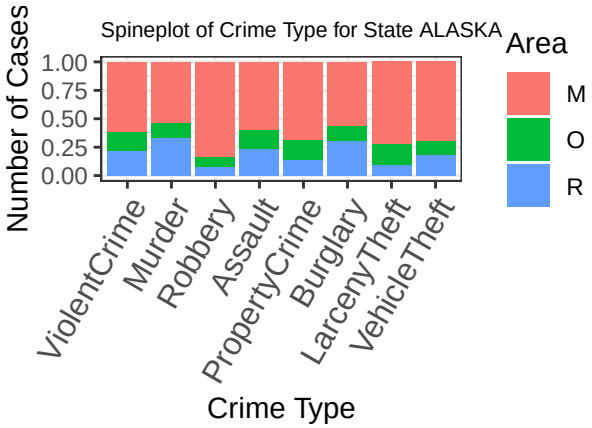
```
fig_AL <- visual.fun(year = 2019, state = "ALASKA")
fig_ME <- visual.fun(year = 2019, state = "MAINE")
fig_MT <- visual.fun(year = 2019, state = "MONTANA")
fig_VT <- visual.fun(year = 2019, state = "VERMONT")

# We can tell that in state ALASKA, MAINE, MONTANA and VERMONT, "property crime"
# is also the most frequently occurred crime, and among it, "larceny theft" is the
# most one. This is consistent with our conclusion before.

p13 <- fig_AL$Barplot.by.type
p14 <- fig_ME$Barplot.by.type
p15 <- fig_MT$Barplot.by.type
p16 <- fig_VT$Barplot.by.type
plot_grid(p13,p14,p15,p16,ncol=2)
```

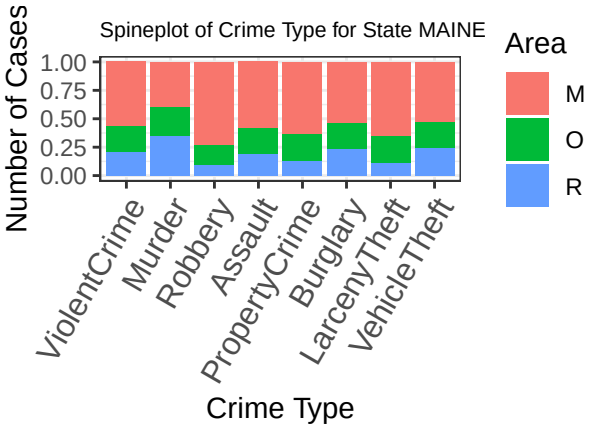


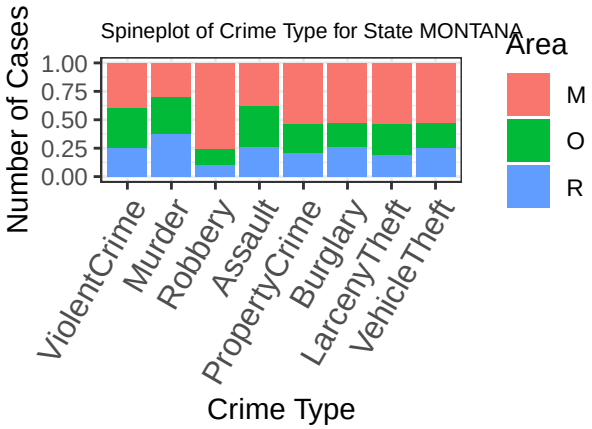

```
# However, it's quite obvious that in these states, in region "outside of
# metropolitan area" and "rural area", the number of crime cases appear to
# be a lot more. But because of the difference in scales, we need to look
# at the relative proportion graphs below.
p17 <- fig_AL$Barplot.by.area
p18 <- fig_ME$Barplot.by.area
p19 <- fig_MT$Barplot.by.area
p20 <- fig_VT$Barplot.by.area
plot_grid(p17,p18,p19,p20,ncol=2)
```

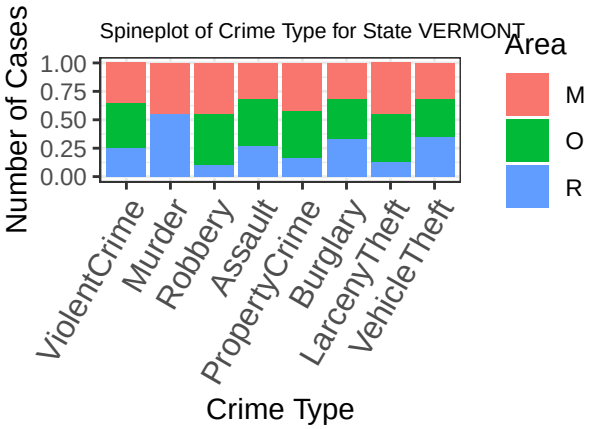



```
# The graph structure is very different from the ones in New England states.
# The proportion of each crimes in area "O" and "R" are visibly larger.
# Therefore, the distribution of crimes in each area is more even, and in
# state of MONTANA and VERMONT, some crimes such as murder and assault, the
# cases in "O" and "R" even exceed "M" area.

p21 <- fig_AL$spineplot
p22 <- fig_ME$spineplot
p23 <- fig_MT$spineplot
p24 <- fig_VT$spineplot
plot_grid(p21,p22,p23,p24,ncol=2)
```


Spineplot of Crime Type for State ALASKA
Number of Cases
1.00
0.75
0.50
0.25
0.00
ViolentCrime
Murder
Robbery
Assault
PropertyCrime
Burglary
LarcenyTheft
VehicleTheft
Crime Type
Area
M
O
R


Spineplot of Crime Type for State MAINE
Number of Cases
1.00
0.75
0.50
0.25
0.00
ViolentCrime
Murder
Robbery
Assault
PropertyCrime
Burglary
LarcenyTheft
VehicleTheft
Crime Type
Area
M
O
R


Spineplot of Crime Type for State MONTANA
Number of Cases
1.00
0.75
0.50
0.25
0.00
ViolentCrime
Murder
Robbery
Assault
PropertyCrime
Burglary
LarcenyTheft
VehicleTheft
Crime Type
Area
M
O
R


Spineplot of Crime Type for State VERMONT
Number of Cases
1.00
0.75
0.50
0.25
0.00
ViolentCrime
Murder
Robbery
Assault
PropertyCrime
Burglary
LarcenyTheft
VehicleTheft
Crime Type
Area
M
O
R