Exploring Factors Impacting COVID-related Deaths in Prison Facilities

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Our research question:
How does the facility type and location of a prison impact the proportion of COVID-related deaths among officers and inmates?

Our Dataset

- Data collected from NYT on COVID infections and deaths in prisons in the US
- Facility info on:
  - Types, locations, and populations
  - # of infected cases and deaths for inmates and officers
  - 2,805 facilities
  - March 2020-March 2021

Background context

- Federal COVID guidelines were initially generally stricter than State guidelines
- We wanted to explore if this trend also manifested in each level of government's prison facilities

Background context

- We thought inmate COVID fatality rate would prove to be a clear indicator of the respective facilities' COVID guideline protocols

1.

Comparing COVID Fatality Rates between Federal & State Facilities

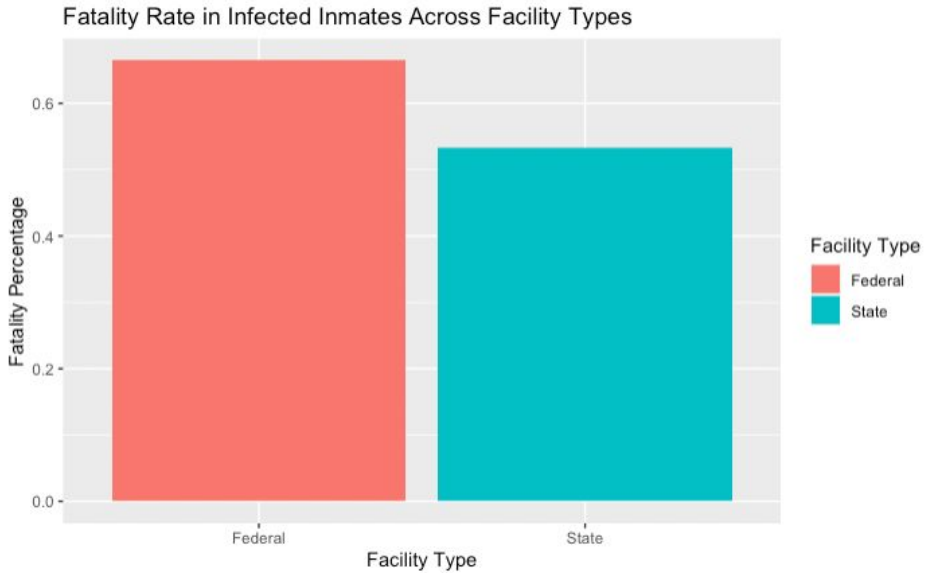
Our Process - Code


```
facilities1 <- facilities %>%
  mutate(inmate_death_prop_perc = 100 * (total_inmate_deaths / total_inmate_cases)) %>%
  drop_na(inmate_death_prop_perc) %>%
  mutate(yonkers = fct_recode(facility_type,
                              "Federal" = "Detention center",
                              "Federal" = "Federal halfway house",
                              "Federal" = "Federal prison",
                              "State" = "Jail",
                              "State" = "Juvenile detention at jail",
                              "State" = "Low-security work release",
                              "State" =  "State halfway house",
                              "State" = "State juvenile detention",
                              "State" = "State prison",
                              "State" = "State rehabilitation center",
                              "State" = "State work camp",
                              "State" =  "State facility",
                              "Federal" = "Reservation jail",
                              "Federal" = "U.S. Marshalls")) %>%
  group_by(yonkers) %>%
  summarise(fatality = mean(inmate_death_prop_perc))
```

Our Process - Code (Pt. 2)


```
facilities1 %>%
  ggplot(aes(x = yonkers, y = fatality, fill = yonkers)) +
           geom_bar(stat = "identity") +
  ylab("Fatality Percentage") +
  xlab("Facility Type") +
  ggtitle("Fatality Rate in Infected Inmates Across Facility Types") +
  guides(fill = guide_legend(title = "Facility Type"))
```

Data Visualization & Findings



2.

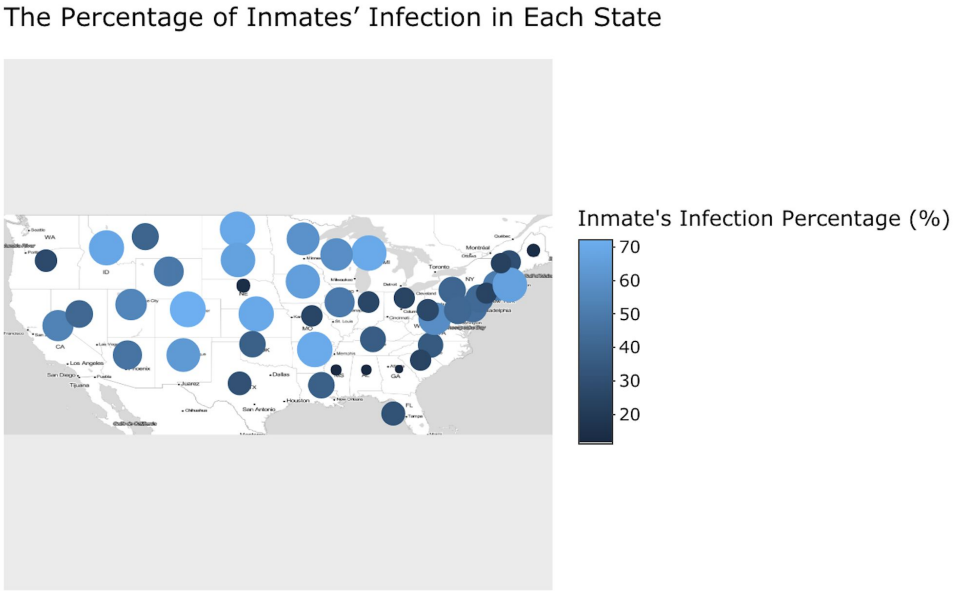
Comparing COVID Fatality Rates between States

Cleaning up the code

```
#Rename the level "kentucky" to "Kentucky"
pstate1<-prisons%>%
  mutate(facility_state1=fct_recode(facility_state,"kentucky"="Kentucky"))

#Group by the vairable facility_state1
pstate2<-pstate1%>%
  select(facility_state1,latest_inmate_population,total_inmate_cases,
         total_inmate_deaths,total_officer_cases,total_officer_deaths)%>%
  group_by(facility_state1)%>%
  summarize(total_latest_inmate_population=sum(latest_inmate_population,na.rm=T),
            total_inmate_cases1=sum(total_inmate_cases,na.rm=T),
            total_inmate_deaths1=sum(total_inmate_deaths,na.rm=T),
            total_officer_cases1=sum(total_officer_cases,na.rm=T),
            total_officer_deaths1=sum(total_officer_deaths,na.rm=T))

#Drop unnecessary rows in pstate2
pstate3<-pstate2[!(pstate2$facility_state1==""|pstate2$facility_state1=="Puerto Rico"),]

#Create new variables--COVID fatality rates for inmates and officers
pstate4<-pstate3%>%
  mutate(proportion_inmate_cases=total_inmate_cases1/total_latest_inmate_population)%>%
  mutate(proportion_inmate_deaths=total_inmate_deaths1/total_inmate_cases1)%>%
  mutate(proportion_officer_deaths=total_officer_deaths1/total_officer_cases1)

#Import the state's latitude and longitude data
usstates<-read.csv("statelatlong.csv")

#Rename the city variable to facility_state1
usstates1<-rename(usstates,facility_state1=City)

#Keep only needed variables
usstates2<-usstates1%>%
  select(Latitude,Longitude,facility_state1)

#Join pstate4 and usstate2
pstate<-inner_join(pstate4,usstates2,by="facility_state1")
```

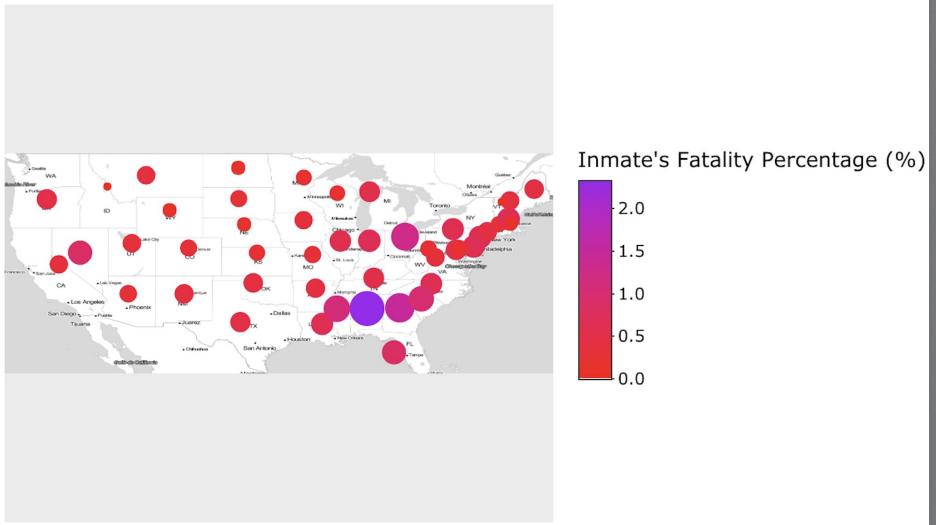
Map 1: The Percentage of Inmates' Infection in Each State

```
us<-c(left=-125,bottom=25.75,right=-67,top=49)
map<-get_stamenmap(us,zoom=5,maptype="toner-lite")

#The U.S. map of inmate's cases prportion
stateplot1<-ggmap(map)+geom_point(data=pstate,aes(x=Longitude,y=Latitude,
                                                  group=facility_state1,
                                                  color=proportion_inmate_cases,
                                                  size=proportion_inmate_cases),na.rm=T)+
  labs(x="",y="",title="The Percentage of Inmates' Infection in Each State")+
  scale_color_gradient(name="Inmate's Infection Percentage (%)")
ggplotly(stateplot1)
```



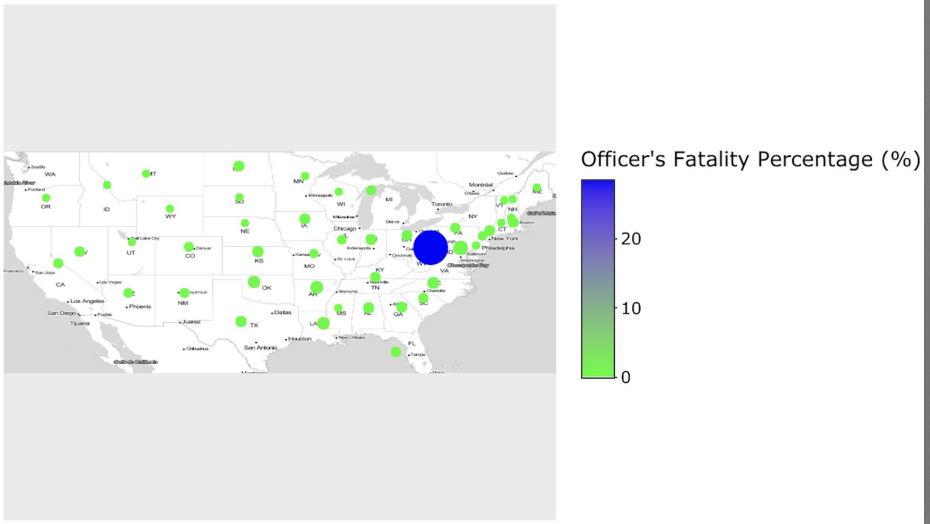
Map 2: The Percentage of Inmates' COVID Fatality in Each State

```
#The U.S. map of inmate's fatality
stateplot2<-ggmap(map)+geom_point(data=pstate,aes(x=Longitude,y=Latitude,
                                                  group=facility_state1,
                                                  color=proportion_inmate_deaths,
                                                  size=proportion_inmate_deaths),na.rm=T)+
  scale_color_gradient(low="red",high="purple",name="Inmate's Fatality Percentage (%)")+
  labs(x="",y="",title="The Percentage of Inmates' COVID-19 Fatality in Each State")
ggplotly(stateplot2)
```



Map 3: The Percentage of Officers' COVID Fatality in Each State

```
#The U.S. map of officer's fatality
stateplot3<-ggmap(map)+geom_point(data=pstate,aes(x=Longitude,y=Latitude,
                                                  group=facility_state1,
                                                  color=proportion_officer_deaths,
                                                  size=proportion_officer_deaths),na.rm=T)+
  scale_color_gradient(low="green",high="blue",name="Officer's Fatality Percentage (%)")+
  labs(x="",y="",title="The Percentage of Officers' COVID-19 Fatality in Each State")
ggplotly(stateplot3)
```



Conclusions

- No significant relationships between facility type and fatality rate
  - Both state and federal facilities

THANKS!