Visualizations

Data:

In [1]:
```
import plotly.graph_objects as go
import pandas as pd
df_all = pd.read_csv('data/all_data.csv', parse_dates=['date'])
df_all.tail()
```

Out[1]:

	group	date	area	Daily Deaths	Daily Cases	Deaths	Cases
81978	usa	2020-12-05	Virginia	16	894	4189	217527
81979	usa	2020-12-05	Washington	13	762	2768	142733
81980	usa	2020-12-05	West Virginia	6	319	662	36850
81981	usa	2020-12-05	Wisconsin	66	5996	4335	444479
81982	usa	2020-12-05	Wyoming	5	443	226	28675

Use California as an Example:

In [2]:
```
df_california = df_all.query('group == "usa" and area == "California"')
df_california = df_california.set_index('date')
df_california.tail()
```

Out[2]:

date	group	area	Daily Deaths	Daily Cases	Deaths	Cases
2020-12-01	usa	California	68	3354	19716	1060993
2020-12-02	usa	California	68	3328	19784	1064321
2020-12-03	usa	California	67	3301	19851	1067622
2020-12-04	usa	California	67	3274	19918	1070896
2020-12-05	usa	California	67	3247	19985	1074143

In [3]:
```
df_summary = pd.read_csv('data/summary.csv', parse_dates=['date'])
df_summary.head()
```

Out[3]:

	group	area	Daily Deaths	Daily Cases	Deaths	Cases	code	population	Deaths per Million	Cases per Million	date
0	world	Afghanistan	4	86	1548	41814	AFG	38.928341	40.0	1070.0	2020-11-05
1	world	Albania	7	421	543	22721	ALB	2.877800	189.0	7900.0	2020-11-05
2	world	Algeria	12	642	2011	60169	DZA	43.851043	46.0	1370.0	2020-11-05
3	world	Andorra	0	90	75	5135	AND	0.077265	971.0	66460.0	2020-11-05
4	world	Angola	3	289	299	12102	AGO	32.866268	9.0	370.0	2020-11-05

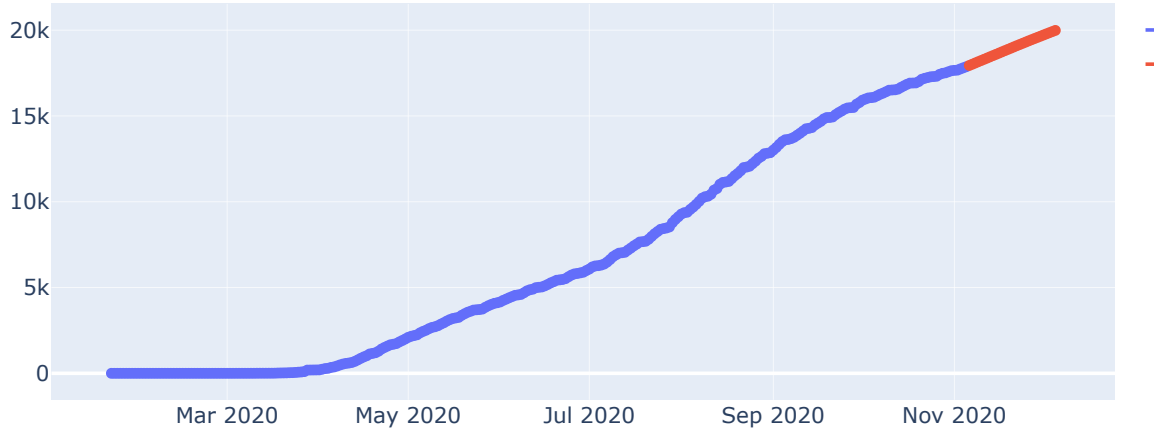
In [4]:
```
last_date = df_summary['date'].iloc[0]
first_pred_date = last_date + pd.Timedelta('1D')
last_date, first_pred_date
```

Out[4]:
```
(Timestamp('2020-11-05 00:00:00'), Timestamp('2020-11-06 00:00:00'))
```

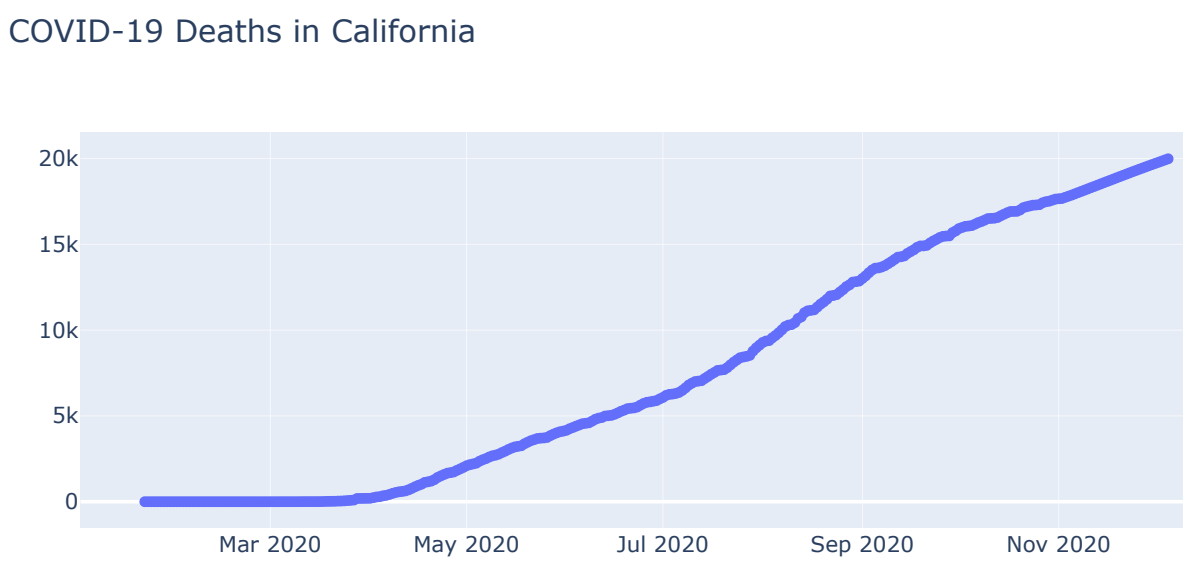
In [5]:
```
x = df_california.index
y = df_california['Deaths']
fig = go.Figure()
fig.add_scatter(x=x, y=y, mode="lines+markers")
```

Adding Traces to Graphs

In [6]:
```
import plotly.graph_objects as go
df_california_actual = df_california[:last_date]
df_california_pred = df_california[first_pred_date:]
fig = go.Figure()
fig.add_scatter(x=df_california_actual.index,
                y=df_california_actual['Deaths'],
                mode="lines+markers",
                name='actual')
fig.add_scatter(x=df_california_pred.index,
                y=df_california_pred['Deaths'],
                mode="lines+markers",
                name='prediction')
fig.update_layout(height=400, width=800)
```

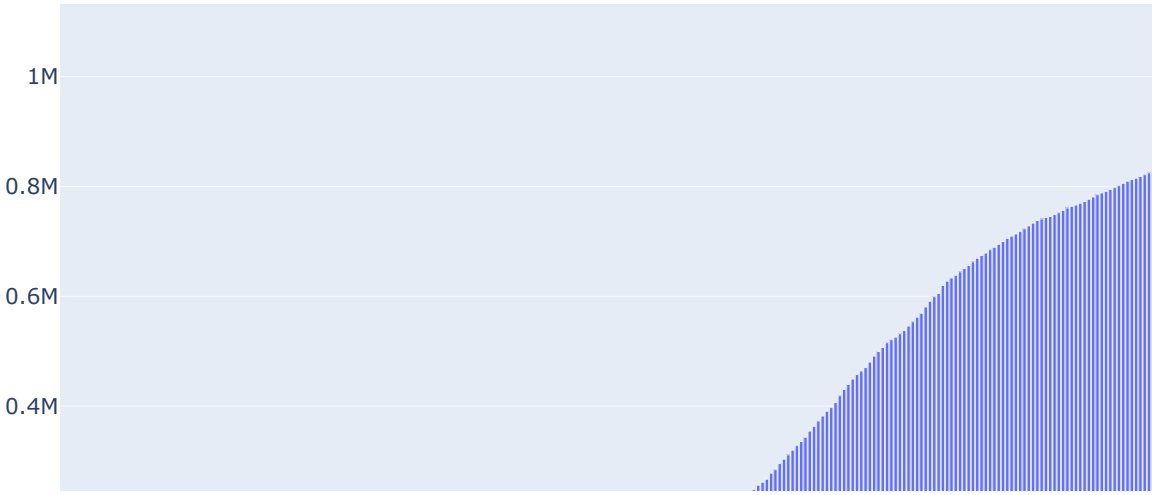


In [7]:
```
import plotly.graph_objects as go

fig = go.Figure()
fig.add_scatter(x=x, y=y, mode="lines+markers")
fig.update_layout(height=400,
                  width=800,
                  title="COVID-19 Deaths in California")
```



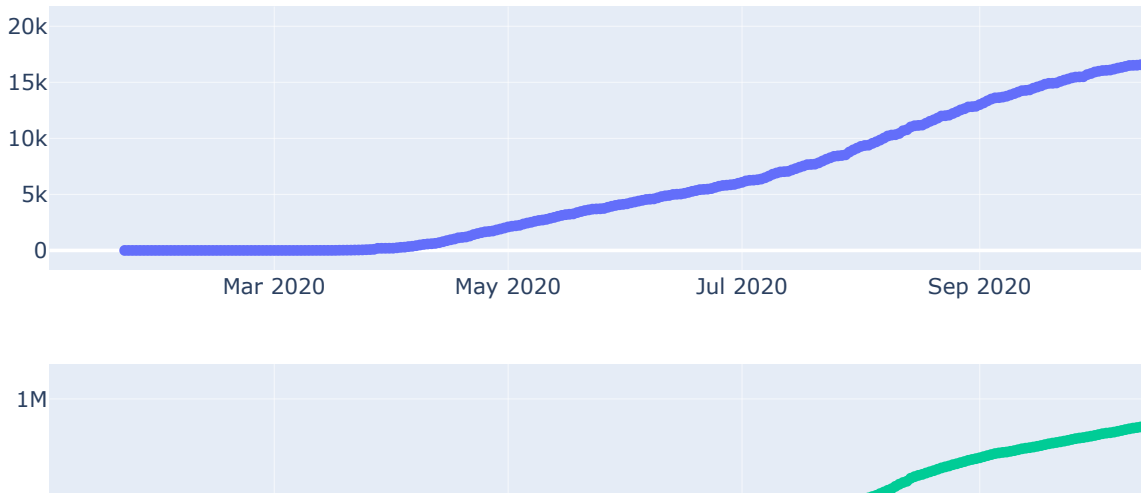
In [8]:
```
def area_bar_plot(df, group, area, kind, last_date, first_pred_date):
    """
    Generates a bar plot of actual vs. predicted values for an area.

    Parameters
    ----------
    df : DataFrame
    group, area : str
    kind : str
    last_date, first_pred_date : str

    Returns
    -------
    plotly.graph_objects.Figure
    """
    df = df.query("group == @group and area == @area").set_index("date")
    df_actual = df[:last_date]
    df_pred = df[first_pred_date:]
    fig = go.Figure()
    fig.add_bar(x=df_actual.index, y=df_actual[kind], name="actual")
    fig.add_bar(x=df_pred.index, y=df_pred[kind], name="prediction")
    return fig
```

In [9]:
```
from functions import area_bar_plot
area_bar_plot(df_all, 'usa', 'California', 'Cases', last_date, first_pred_date)
```



Creating subplots

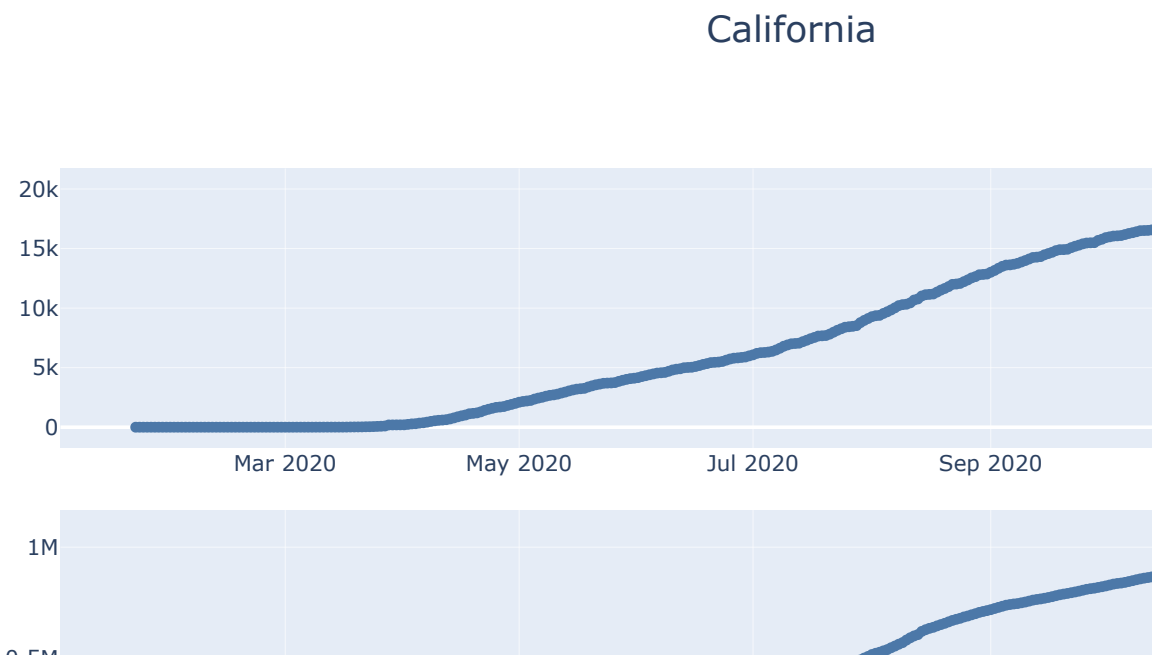
In [10]:
```
from plotly.subplots import make_subplots
fig = make_subplots(rows=2, cols=1)

# top subplot
fig.add_scatter(x=df_california_actual.index,
                y=df_california_actual['Deaths'],
                mode="lines+markers",
                name='actual',
                row=1,
                col=1)
fig.add_scatter(x=df_california_pred.index,
                y=df_california_pred['Deaths'],
                mode="lines+markers",
                name='prediction',
                row=1,
                col=1)

# bottom subplot
fig.add_scatter(x=df_california_actual.index,
                y=df_california_actual['Cases'],
                mode="lines+markers",
                name='actual',
                row=2,
                col=1)
fig.add_scatter(x=df_california_pred.index,
                y=df_california_pred['Cases'],
                mode="lines+markers",
                name='prediction',
                row=2,
                col=1)
```


20k
15k
10k
5k
0
Mar 2020
May 2020
Jul 2020
Sep 2020

1M

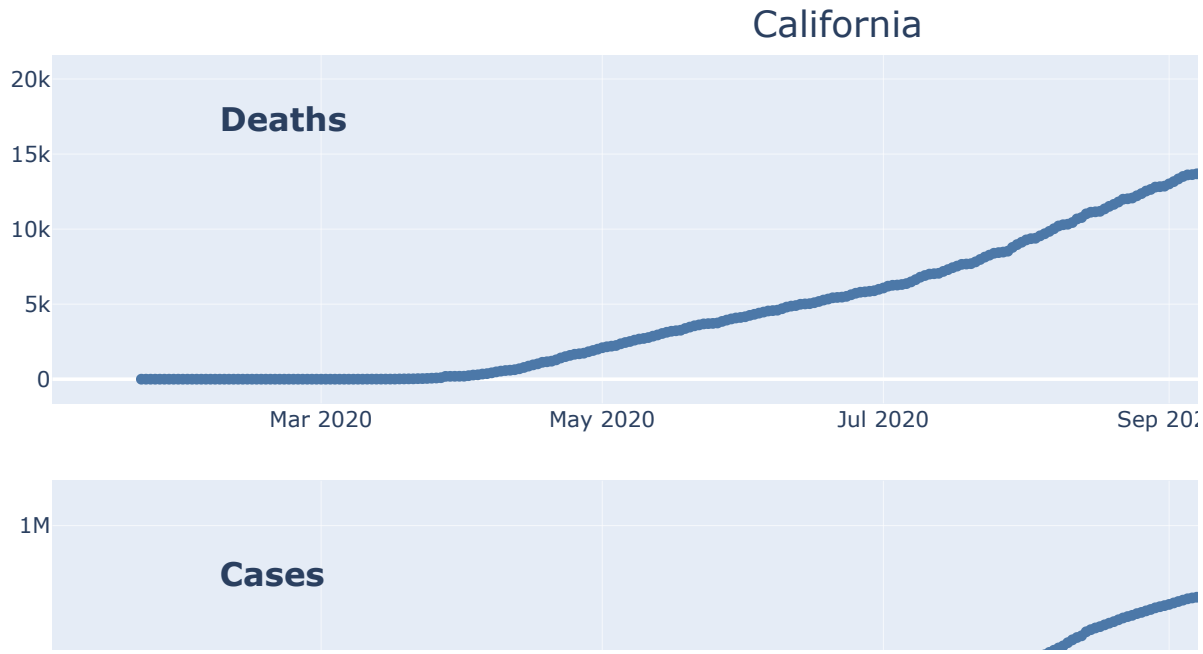
Cleaning up the subplots

In [11]:
```
from plotly.colors import qualitative
COLORS = qualitative.T10[:2]
KINDS = 'Deaths', 'Cases'
dfs = {'actual': df_california_actual, 'prediction': df_california_pred}

fig = make_subplots(rows=2, cols=1, vertical_spacing=.1)
for row, kind in enumerate(KINDS, start=1):
    for i, (name, df) in enumerate(dfs.items()):
        fig.add_scatter(x=df.index,
                        y=df[kind],
                        mode="lines+markers",
                        name=name,
                        line={"color": COLORS[i]},
                        row=row,
                        col=1)

fig.update_traces(showlegend=False, row=2, col=1)
fig.update_layout(title={"text": "California", "x": 0.5, "y": 0.97, "font": {"size
fig
```



Adding annotations

In [12]:
```
fig.update_layout(
            annotations=[
                {"y": 0.95, "text": "<b>Deaths</b>"},
                {"y": 0.3, "text": "<b>Cases</b>"},
            ],
            margin={"t": 40, "l": 50, "r": 10, "b": 0},
            legend={
                "x": 0.5,
                "y": -0.05,
                "xanchor": "center",
                "orientation": "h",
                "font": {"size": 15}},
        )
annot_props = {
        "x": 0.1,
        "xref": "paper",
        "yref": "paper",
        "xanchor": "left",
        "showarrow": False,
        "font": {"size": 18},
    }
fig.update_annotations(annot_props)
fig
```



Choropleth maps

Applying Color scale to Counties:

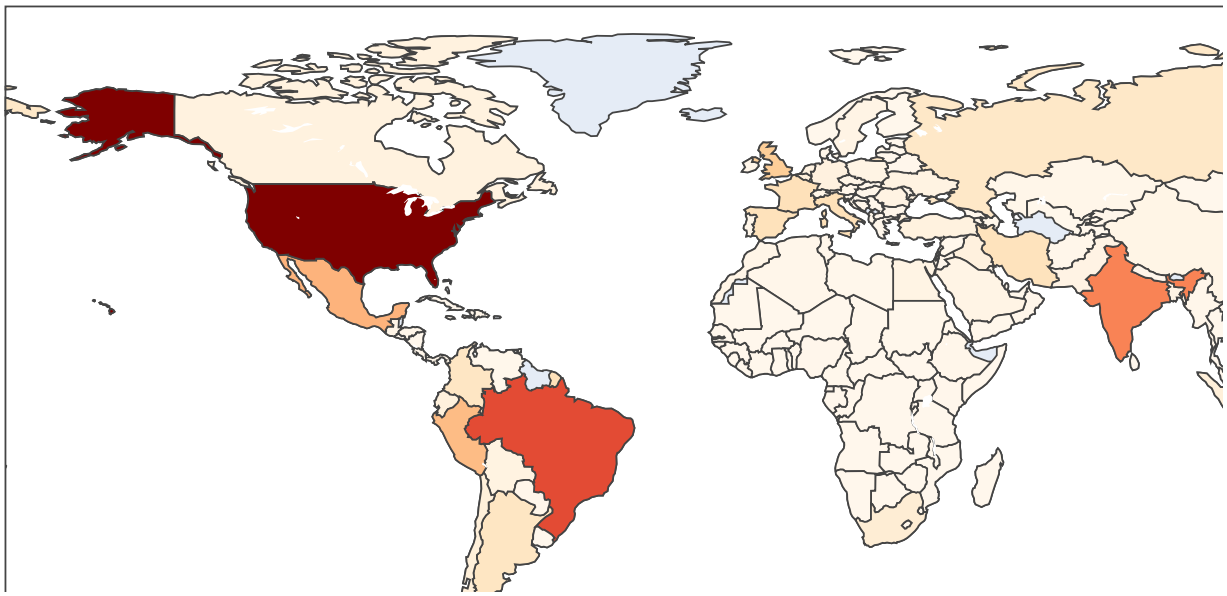
In [13]:
```
df_world = df_summary.query("group == 'world' and population > 1")
df_world.head(3)
```

Out[13]:

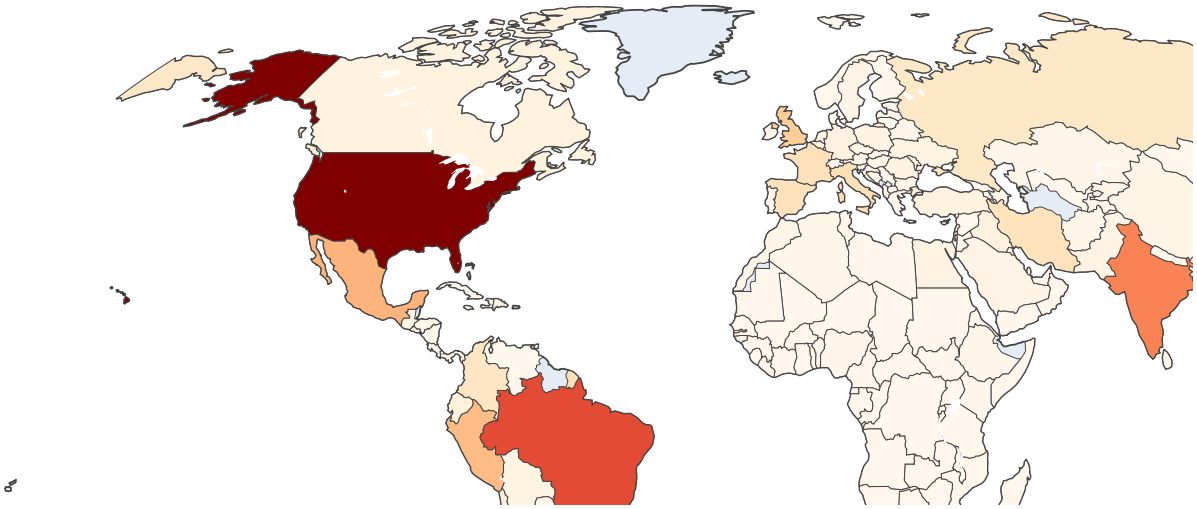
	group	area	Daily Deaths	Daily Cases	Deaths	Cases	code	population	Deaths per Million	Cases per Million	date
0	world	Afghanistan	4	86	1548	41814	AFG	38.928341	40.0	1070.0	2020-11-05
1	world	Albania	7	421	543	22721	ALB	2.877800	189.0	7900.0	2020-11-05
2	world	Algeria	12	642	2011	60169	DZA	43.851043	46.0	1370.0	2020-11-05

In [14]:
```
locations = df_world['code']
z = df_world['Deaths']
```

In [15]:
```
fig = go.Figure()
fig.add_choropleth(locations=locations, z=z, zmin=0, colorscale="orrd")
fig.update_layout(margin={"t": 0, "l": 10, "r": 10, "b": 0})
```



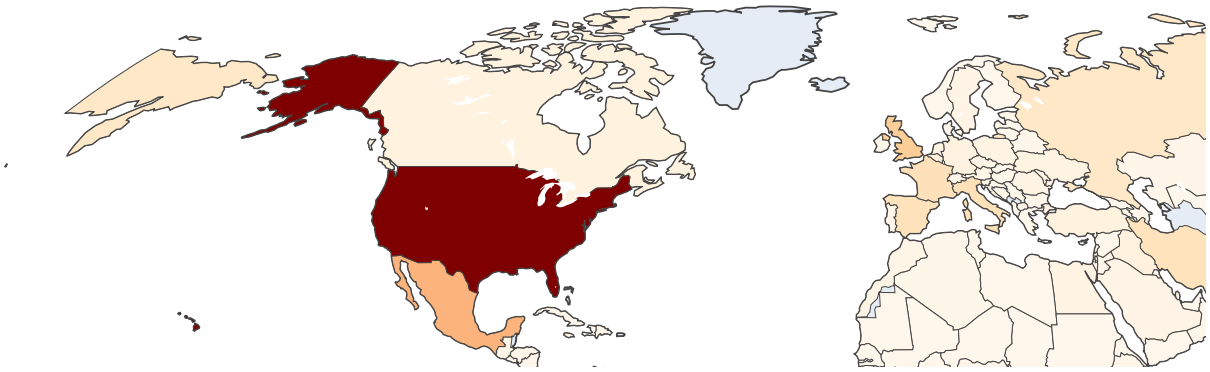
In [16]:
```
fig = go.Figure()
fig.add_choropleth(locations=locations, z=z, zmin=0, colorscale="orrd",  marker_li
fig.update_layout(
    geo={
        "showframe": False,
        "lataxis": {"range": [-37, 68]},
        "lonaxis": {"range": [-130, 150]},
        "projection": {"type": "robinson"}
    },
    margin={"t": 0, "l": 10, "r": 10, "b": 0})
```



In [17]:
```
def hover_text(x):
    name = x["area"]
    deaths = x["Deaths"]
    cases = x["Cases"]
    deathsm = x["Deaths per Million"]
    casesm = x["Cases per Million"]
    pop = x["population"]
    return (
        f"<b>{name}</b><br>"
        f"Deaths - {deaths:,.0f}<br>"
        f"Cases - {cases:,.0f}<br>"
        f"Deaths per Million - {deathsm:,.0f}<br>"
        f"Cases per Million - {casesm:,.0f}<br>"
        f"Population - {pop:,.0f}M"
    )

text = df_world.apply(hover_text, axis=1)
text.head()
```

Out[17]:
```
0    <b>Afghanistan</b><br>Deaths - 1,548<br>Cases ...
1    <b>Albania</b><br>Deaths - 543<br>Cases - 22,7...
2    <b>Algeria</b><br>Deaths - 2,011<br>Cases - 60...
4    <b>Angola</b><br>Deaths - 299<br>Cases - 12,10...
7    <b>Argentina</b><br>Deaths - 32,766<br>Cases -...
dtype: object
```

In [18]:
```
fig = go.Figure()
fig.add_choropleth(locations=locations, z=z, zmin=0, colorscale="orrd",
                   marker_line_width=0.5, text=text, hoverinfo="text")
fig.update_layout(
    geo={
        "showframe": False,
        "lataxis": {"range": [-37, 68]},
        "lonaxis": {"range": [-130, 150]},
        "projection": {"type": "robinson"}
    },
    margin={"t": 0, "l": 10, "r": 10, "b": 0})
```



USA Choropleth

In [19]:
```
df_states = df_summary.query("group == 'usa'")
locations = df_states['code']
z = df_states['Cases per Million']
text = df_states.apply(hover_text, axis=1)

fig = go.Figure()
fig.add_choropleth(locations=locations, locationmode='USA-states', z=z, zmin=0,
                   colorscale="orrd", marker_line_width=0.5, text=text, hoverinfo=
fig.update_layout(
    geo={
        "showframe": False,
        "projection": {"type": "albers usa"}
    },
    margin={"t": 0, "l": 10, "r": 10, "b": 0})
```