Geospatial Decision Making: The South Carolina National Guard Data-Driven COVID-19 Response

Christy Jacobs, GIS Program Manager

Kevin Haynes, Environmental GIS Manager

Speakers

Christy Jacobs
GIS Program Manager
SC National Guard

Kevin Haynes
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SC National Guard

Background

- SC National Guard leadership relies on GIS as the primary source of information to drive decision making during the COVID-19 mission.

- ArcGIS Dashboard became the primary tool for COVID-19 response decision making.

- The mission continually changed throughout 2020 and 2021.
  - First Phase – initiate DRP, focus on hospital status and cases
  - Second Phase – data sharing and detailed hospital data
  - Beginning of the End – vaccine distribution and allocation

Objectives

- **Demonstrate the adaptability and scalability of ArcGIS Dashboard.**
- **Highlight how the ESRI Disaster Response Program provided necessary resources to rapidly deploy new geospatial solutions.**

"I'm being briefed three times a week, but I've relied on that dashboard almost hourly for more than 300 days."

~Major General Stephen B. Owens~

Assistant Adjutant General overseeing all of the SC National Guard COVID-19 response.

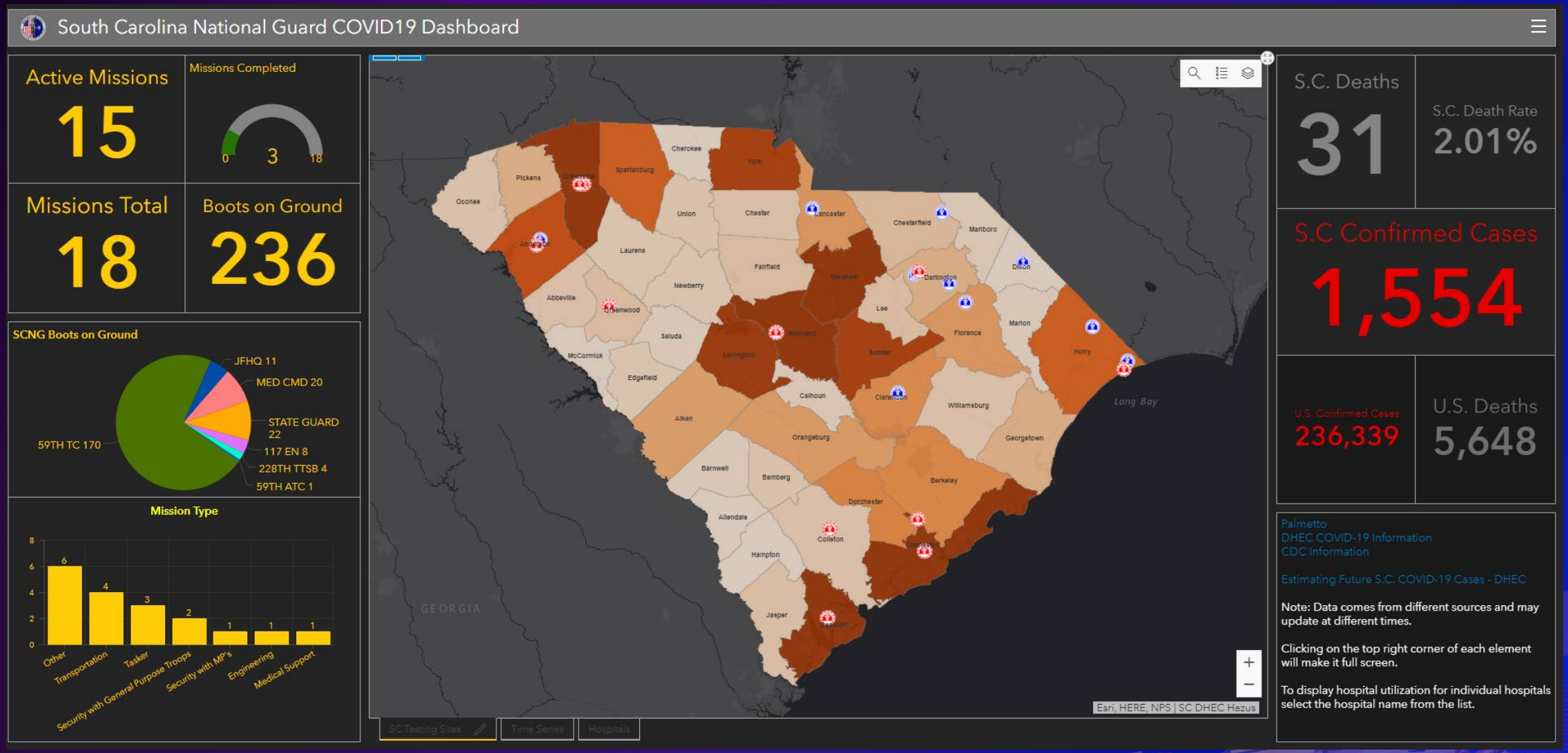
www.esri.com/about/newsroom/blog/south-carolina-guard-guides-covid19-missions/

First COVID-19 Phase

ESRI Disaster Response Program (DRP), Focus on Cases, and Hospital Status

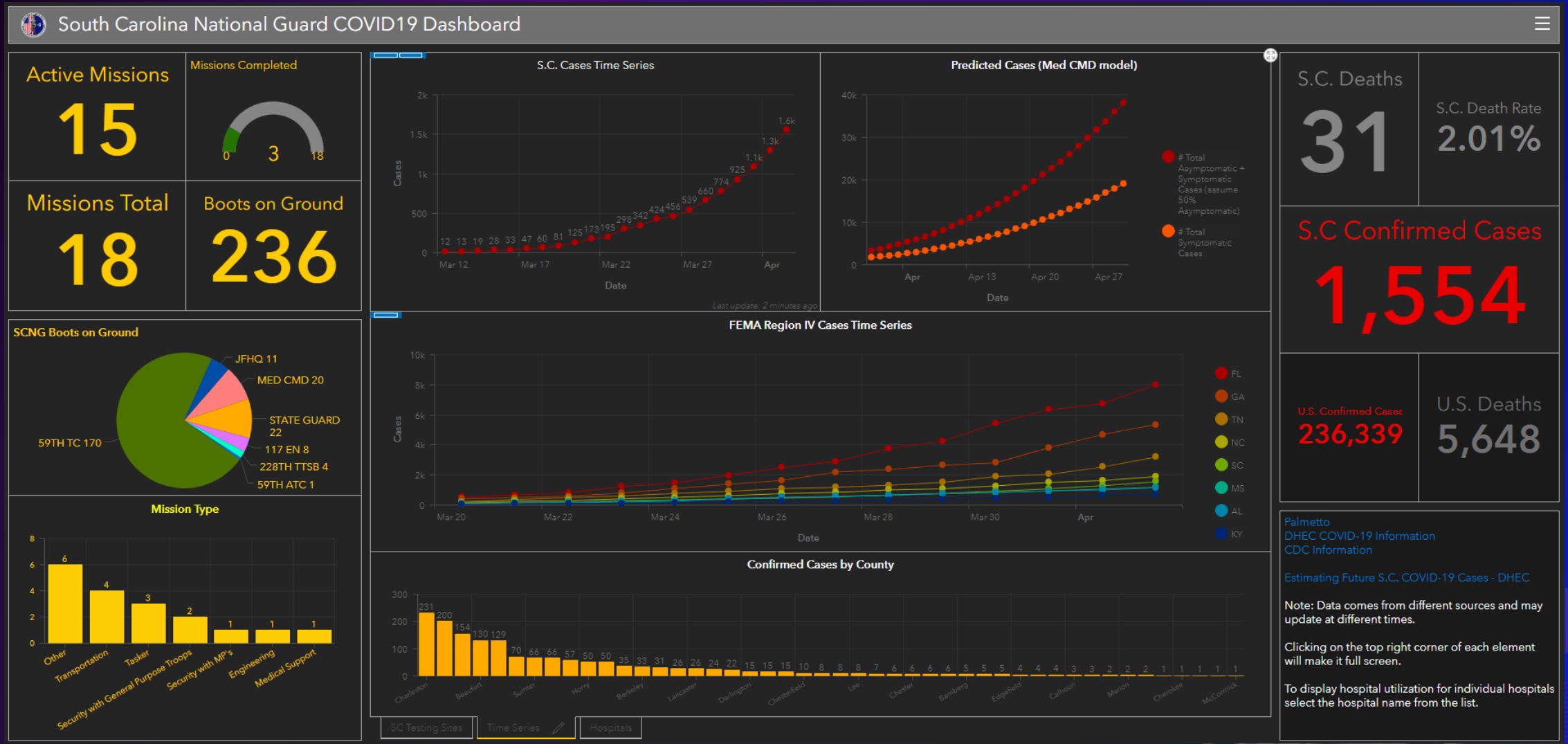
ArcGIS COVID-19 Dashboard 1.0

April 2, 2020



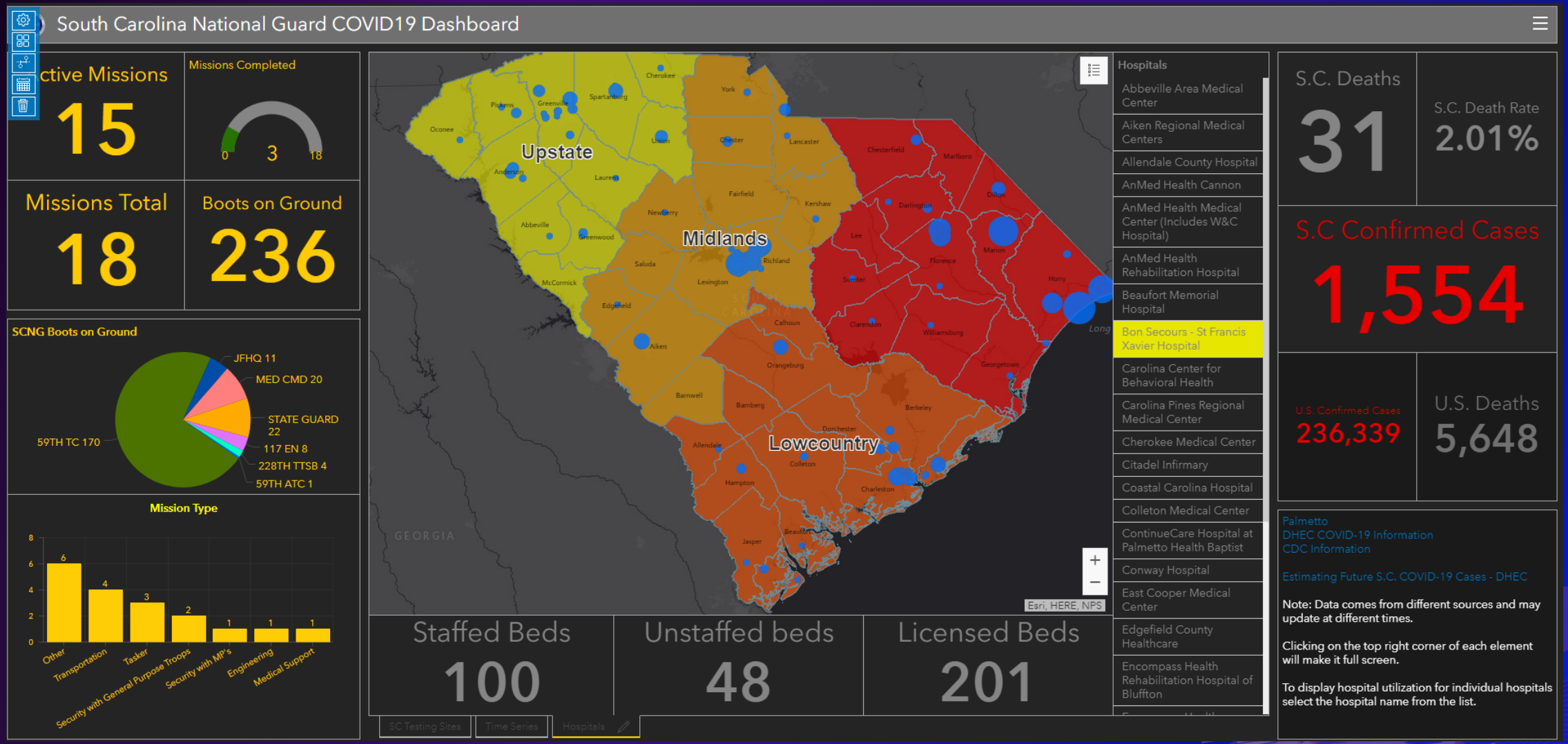
ArcGIS COVID-19 Dashboard 1.0

April 2, 2020



ArcGIS COVID-19 Dashboard 1.0

April 2, 2020



Activation of the DRP

Multiple points per hospital

Point layer (Features: 1293, Selected: 0)

Bed Title	Available	Census	Staffed	Hospital Name	County	Licensed Beds	Facility Type	Address
				Center				
Critical Care/ICU (Non-Pediatric)	37	30	30	MUSC Health Florence Medical Center	Florence	310	Acute Care	805 Pamplico Highway
Intermediate Care	12	9	9	MUSC Health Florence Medic Center				
Medical/Surgical	213	120	120	MUSC Health Florence Medic Center				
Burn	0	0	0	MUSC Health Florence Medic Center				
Pediatric (includes newborn nursery beds)	0	0	0	MUSC Health Florence Medic Center				
Pediatric ICU (includes NICU beds)	0	0	0	MUSC Health Florence Medic Center				

ArcGIS Notebook python script

COVID | Catalog | Bed_Updates

Edit | View | Insert | Cell | Help | Run | Code | ArcGISPro

```
In [13]: updates_fset = flyr.query()

         features_for_update = []

         all_features = updates_fset.features

         from arcgis import geometry
         from copy import deepcopy

         for hospital in final_sdf['pvHosp
             try:
                 # get the feature to be u
                 original_feature = [f for
             except Exception:
                 print("Error with updatin
                 print("{} is not in targe

             try:
                 feature_to_be_updated = d

                 # get the matching row fr
                 matching_row = final_sdf.

                 # assign the updated valu
                 feature_to_be_updated.att
                 feature_to_be_updated.att
                 feature_to_be_updated.att
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                 feature_to_be_updated.att
                 feature_to_be_updated.att


                 #add this to the list of
                 features_for_update.appen

                 print(str(feature_to_be_u
                 print("================
             except:
                 print("Error updating row
tical_Care_Census": 11.0, "Critical
```

Clean data

Hospital Capacity (Palmetto) (Features: 64, Selected: 0)

Hospital Name	Census	Critical Care Census	Critical Care Staffed	Critical Care Unstaffed	Non-Critical Care Staffed	Staffed	Unstaffed	Critical Care Av...
McLeod Regional Medical Center of the Pee Dee	377	48	74	0	339	413	16	74
McLeod Seacoast	96	10	18	0	84	102	30	18
Mount Pleasant Hospital	82	9	9	3	64	73	60	10
MUSC Health Florence Medical Center	183	9	32	0	170	202	58	37
MUSC Health Florence Women's Pavilion	11	0	0	0	20	20	0	0
MUSC Health Lancaster Medical Center	97	7	10	0	102	112	9	10
MUSC Health Marion Medical Center	37	3	6	5	40	46	85	12
MUSC Medical Center	795	76	96	0	887	983	0	96

ArcGIS COVID-19 Dashboard 1.1

April 14, 2020

Second COVID-19 Phase

Data Sharing and Hospital Status

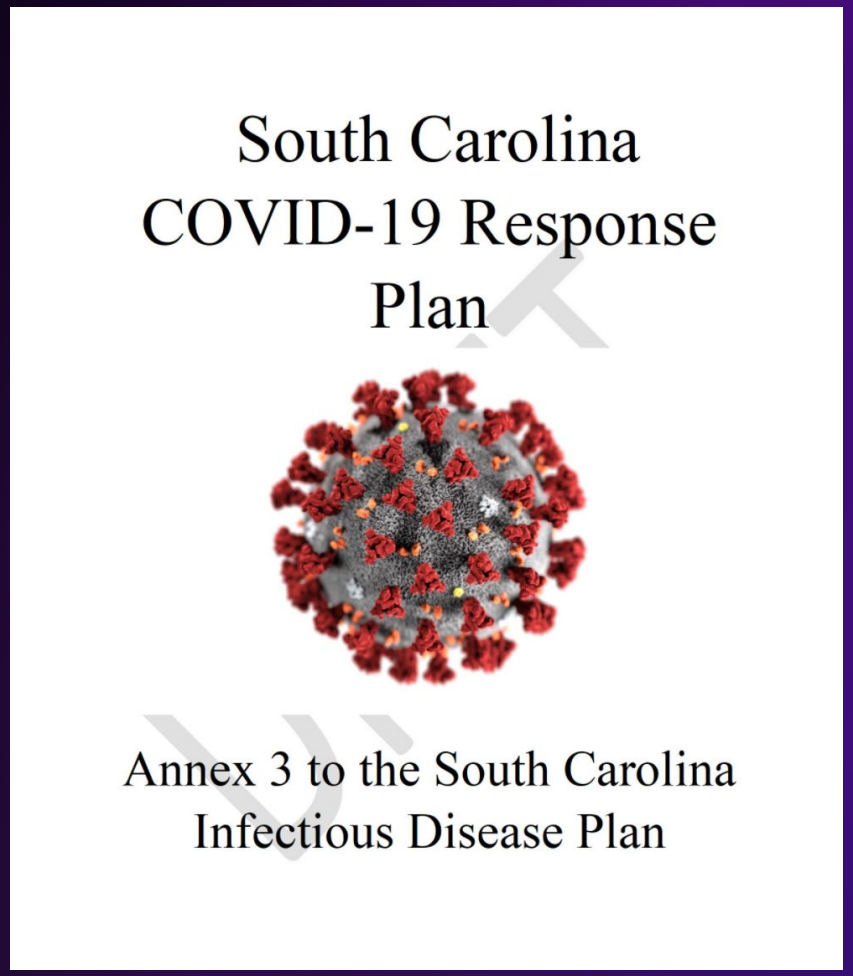
Data Sharing

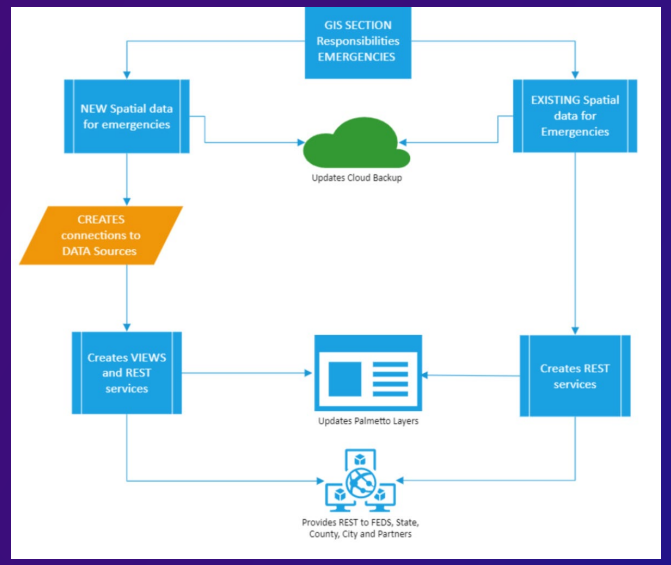
- Second phase began in June 2020
- Data sharing challenges
- Data sharing solutions

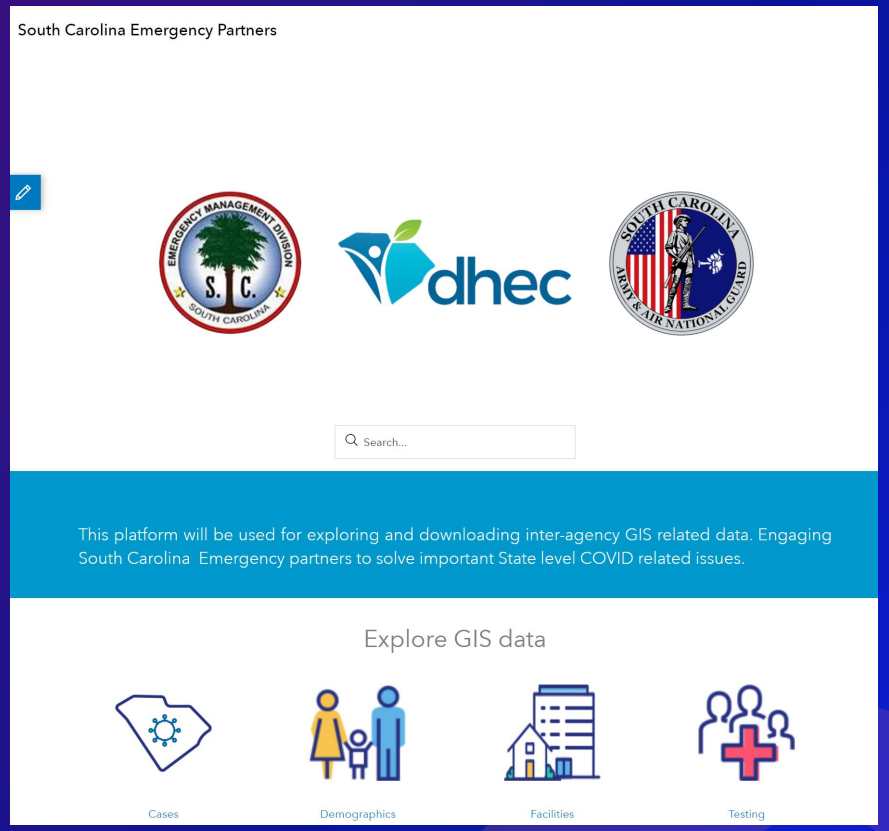
Key Partners

- The SC National Guard
- SC Emergency Management Dept.
- SC Dept. of Health and Environmental Control

State Emergency Response Data Sharing Solutions

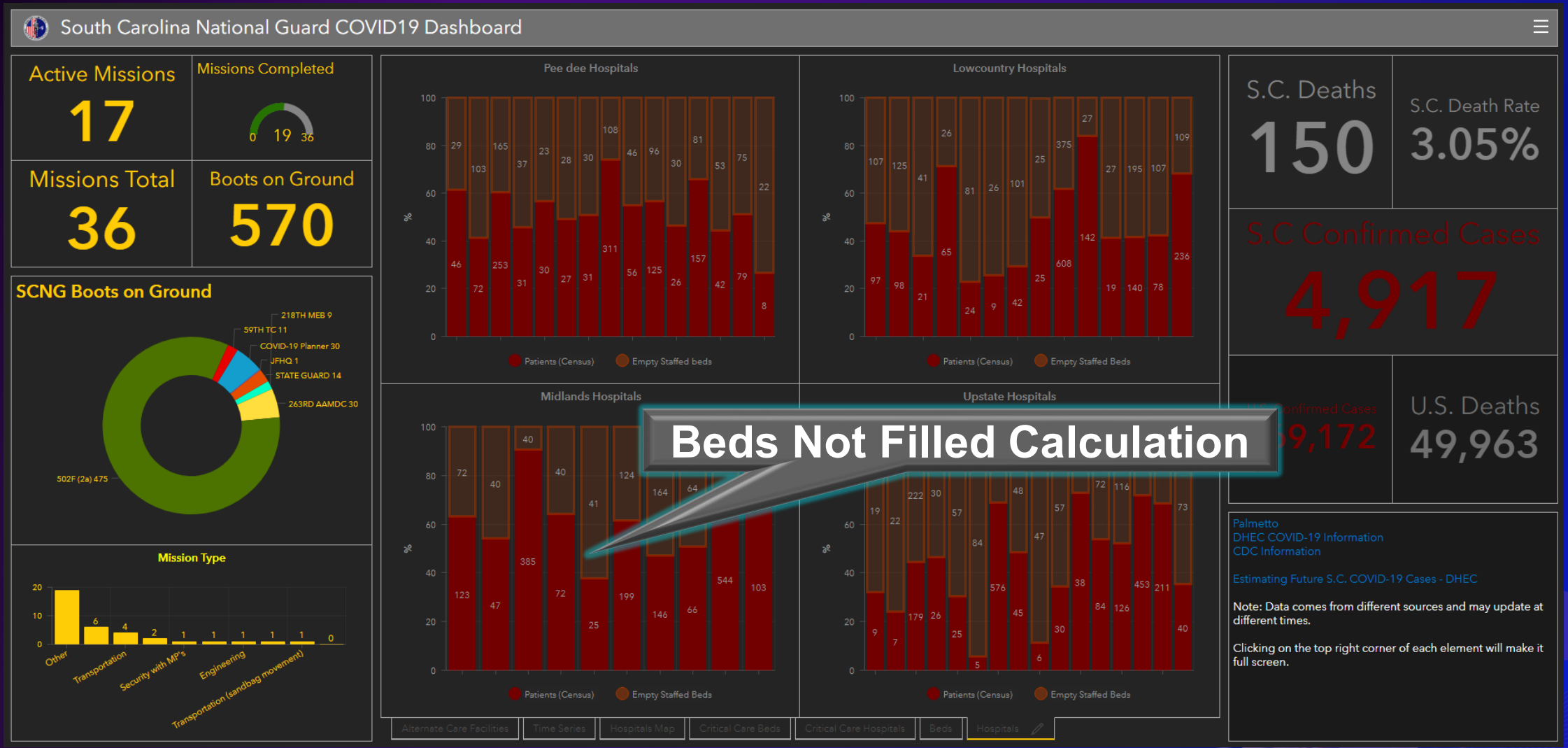






ArcGIS COVID-19 Dashboard 2.0

April 24, 2020



ArcGIS COVID-19 Dashboard 2.0

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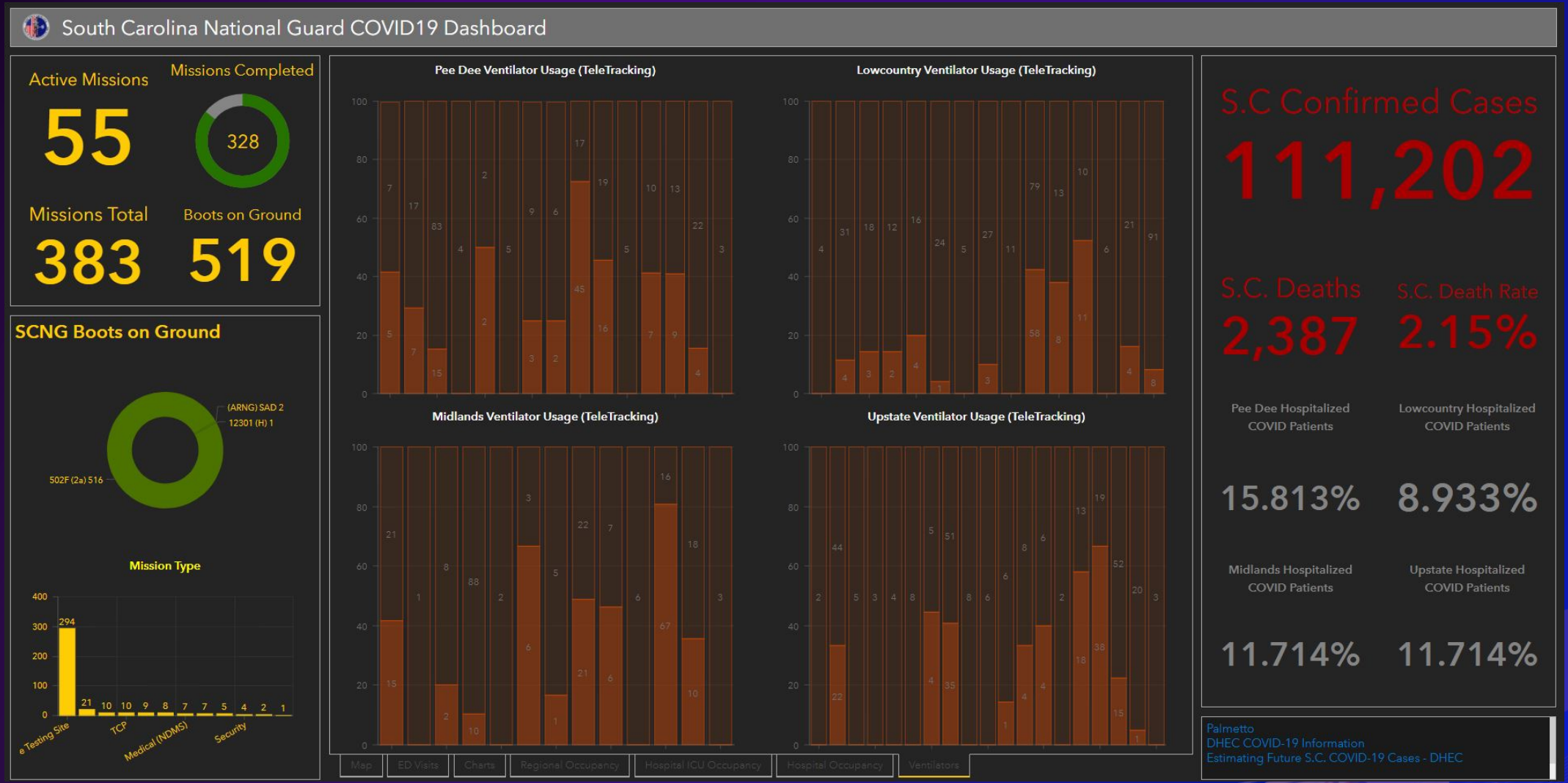
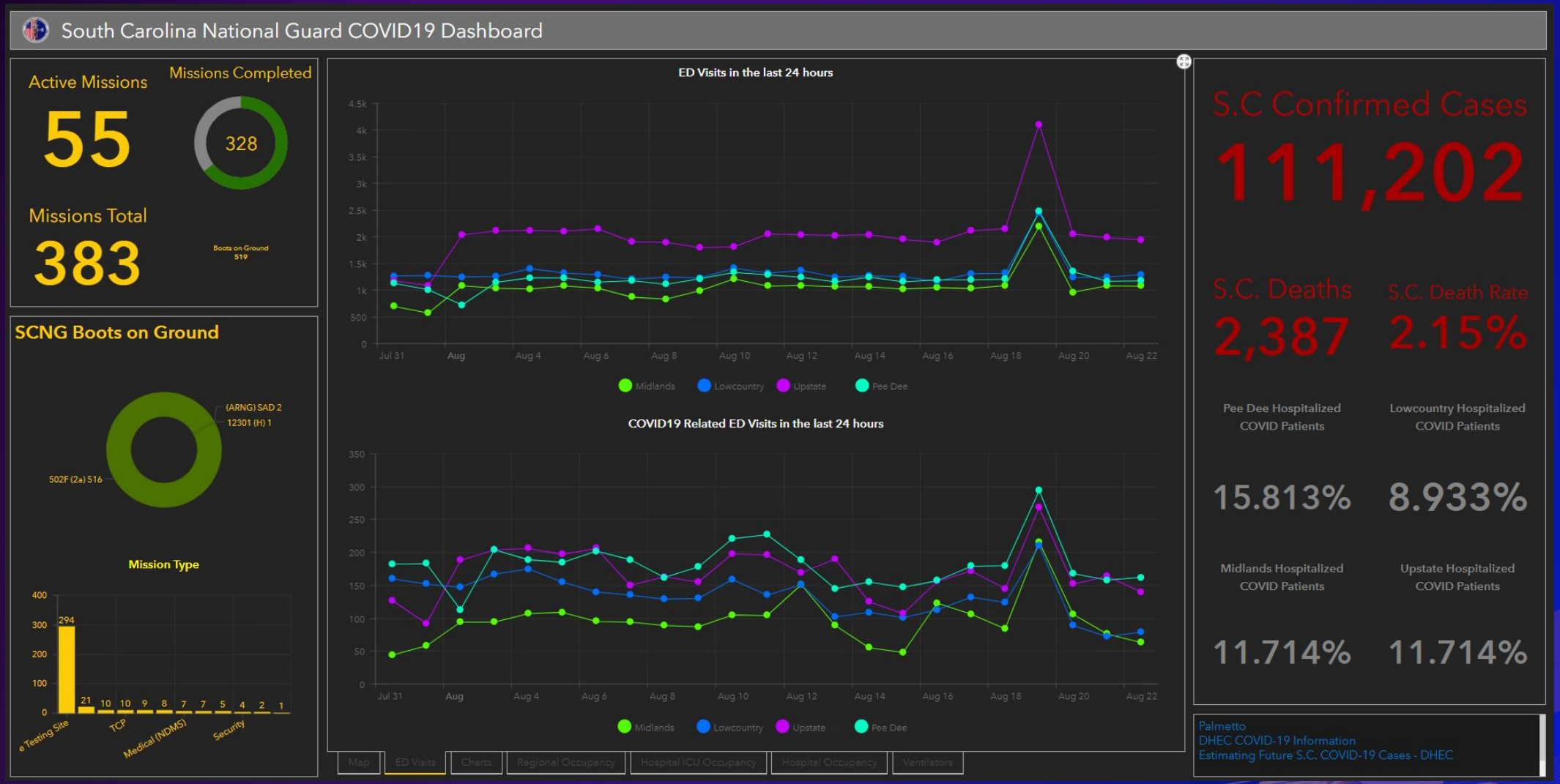


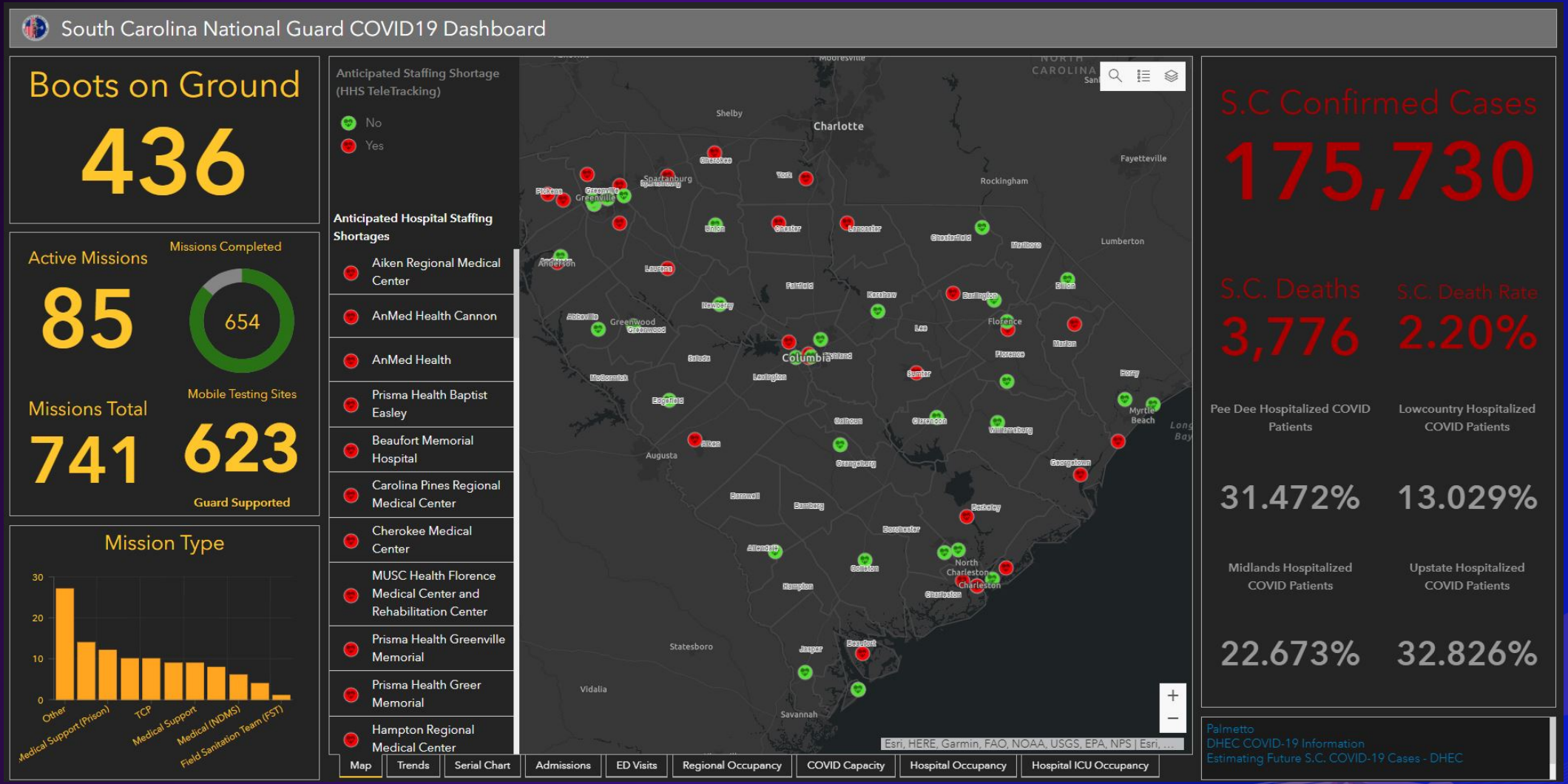
ArcGIS COVID-19 Dashboard 2.0

August, 8, 2020



ArcGIS COVID-19 Dashboard 2.0

November 9, 2020



ArcGIS COVID-19 Dashboard 2.0

January 11, 2021

SCNG COVID19 Dashboard Review Tabs at Bottom to Explore Regional & Individual Hospital Charts

Active Missions	Boots on Ground
94	474
Missions Total	**Missions Complete**
985	90%

Mission Type (Palmetto)
Mobile Testing Site - 807
Medical Team - 34
Other - 32
Medical Support - 23
Medical Support (Prison) - 17
Food Bank Support - 12
Tasker - 10
TCP - 10
Transportation - 9
Medical Support (Hospital) - 9
Medical (NDMS) - 6
Security - 4

Upstate COVID Hospitalized	Midlands COVID Hospitalized
39.182%	20.455%
PeeDee COVID Hospitalized	**Lowcountry COVID Hospitalized**
24.864%	15.5%

S.C. Cases
332,990

Cases in last 14 days
49,020

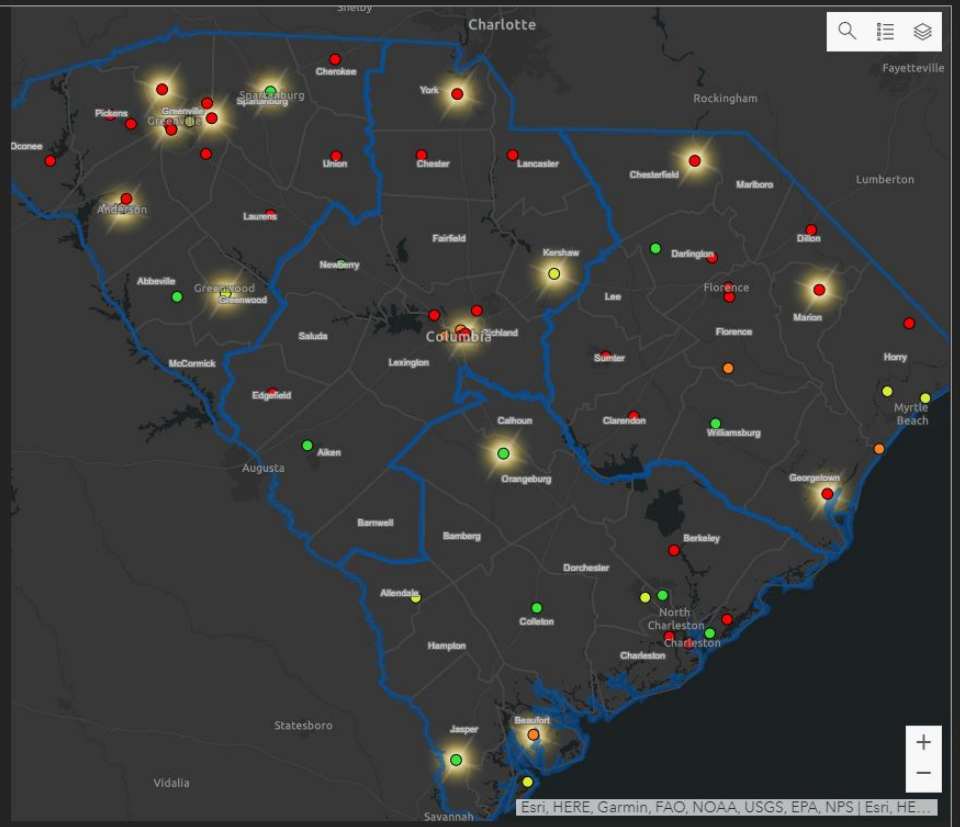
S.C. Deaths
5,402

S.C. Death Rate
1.63%

VaccineData

Total Utilization
- Greater than 90%
- 60-90%
- 30-60%
- Less than 30%

Hospitals of Concern
- >90% Capacity and >25% Covid



>90% Capacity & >25% COVID	>90% Capacity & 25% COVID	>90% Capacity & > 25% COVID	>90% Capacity & > 25% COVID
3	3	3	6
Hospitals in PeeDee	Hospitals in Lowcountry	Hospitals in Midlands	Hospitals in Upstate

Group | Trends | Admissions | ED Visits | Regional Occupancy | Hospital Capacity | COVID Capacity | Hospital ICU Capacity

South Carolina

Total Received
233,600
as of 12 JAN 2021 (Source: DHEC)

South Carolina

Total Administered / Utilized
114,970 / 49%
as of 12 JAN 2021 (Source: DHEC)

Pfizer

Total Received
147,200
as of 12 JAN 2021 (Source: DHEC)

Pfizer

Administered - 1st/2nd Dose
76,676/18,600
as of 12 JAN 2021 (Source: DHEC)

Pfizer

Appointments Scheduled
105,859
as of 12 JAN 2021 (Source: DHEC)

Pfizer

Total Utilization
65%
as of 11 JAN 2021 (Source: DHEC)

Moderna

Total Received / Utilized
86,400 / 23%
as of 11 JAN 2021 (Source: DHEC)

Moderna

Administered - 1st/2nd Dose
19,694 / NA
as of 12 JAN 2021 (Source: DHEC)

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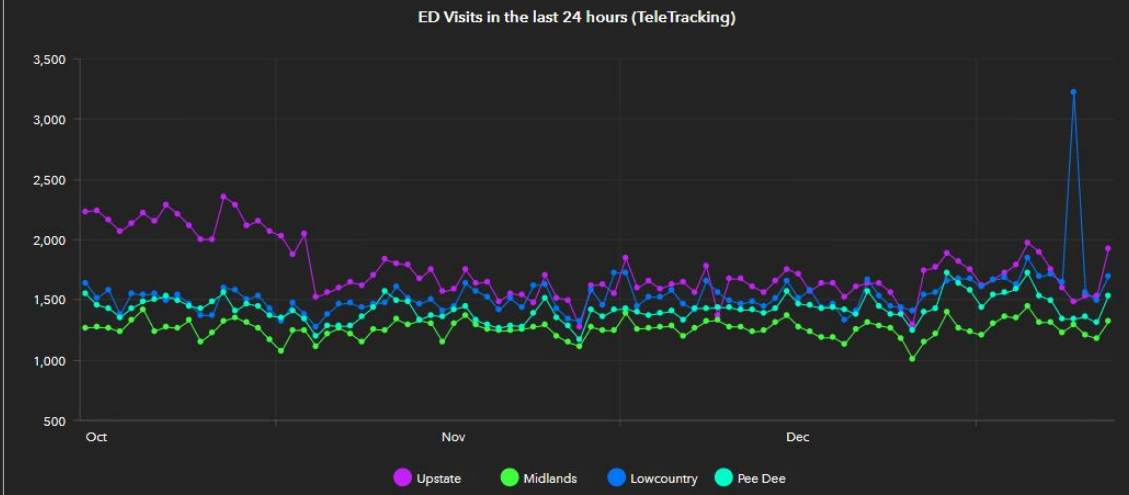

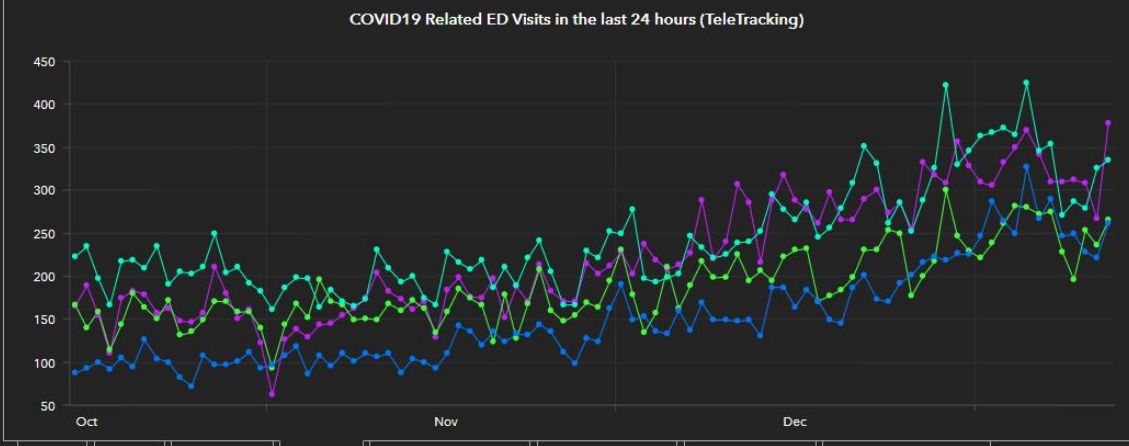

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as of 12 JAN 2021 (Source: DHEC)	as of 12 JAN 2021 (Source: DHEC)

Pfizer	Pfizer
Total Received	Administered - 1st/2nd Dose
147,200	76,676/18,600
as of 12 JAN 2021 (Source: DHEC)	as of 12 JAN 2021 (Source: DHEC)
Pfizer	**Pfizer**
Appointments Scheduled	Total Utilization
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as of 12 JAN 2021 (Source: DHEC)	as of 11 JAN 2021 (Source: DHEC)

Moderna	Moderna
Total Received / Utilized	Administered - 1st/2nd Dose
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Total Received / Utilized	Administered - 1st/2nd Dose
86,400 / 23%	19,694 / NA
as of 11 JAN 2021 (Source: DHEC)	as of 12 JAN 2021 (Source: DHEC)

The Beginning of the End

Vaccine Distribution

ArcGIS COVID-19 Dashboard 2.0

April 14, 2021

SCNG COVID19 Dashboard Review Arrows/Tabs at Bottom to Explore Regional & Individual Hospital Charts

Active Missions
384

PAX on COVID Mission
661

Mission Total
1,625

Missions Complete
77%

Mission Type (Palmetto)

- Mobile Testing Site - 1,042
- Vaccination Site Without Medics - 312
- Op Order - 51
- Mobile Testing Site With Medics - 49
- Vaccination Site With Medics - 39
- Medical Support (Prison) - 22
- Prisma Mobile Vaccination Site - 21
- Food Bank Support - 19
- Medical Support (Hospital) - 17
- Tasker - 11
- Transportation - 10
- Food Distribution - 6

Upstate
35%
COVID Hospitalized

Midlands
24%
COVID Hospitalized

PeeDee
21%
COVID Hospitalized

Lowcountry
20%
COVID Hospitalized

S.C. Cases
472,786
Cases in last 14 days
7,581

S.C. Deaths
8,192

S.C. Death Rate
1.73%

Vaccine Locations by Appointment (DHEC)

Taking Appointments

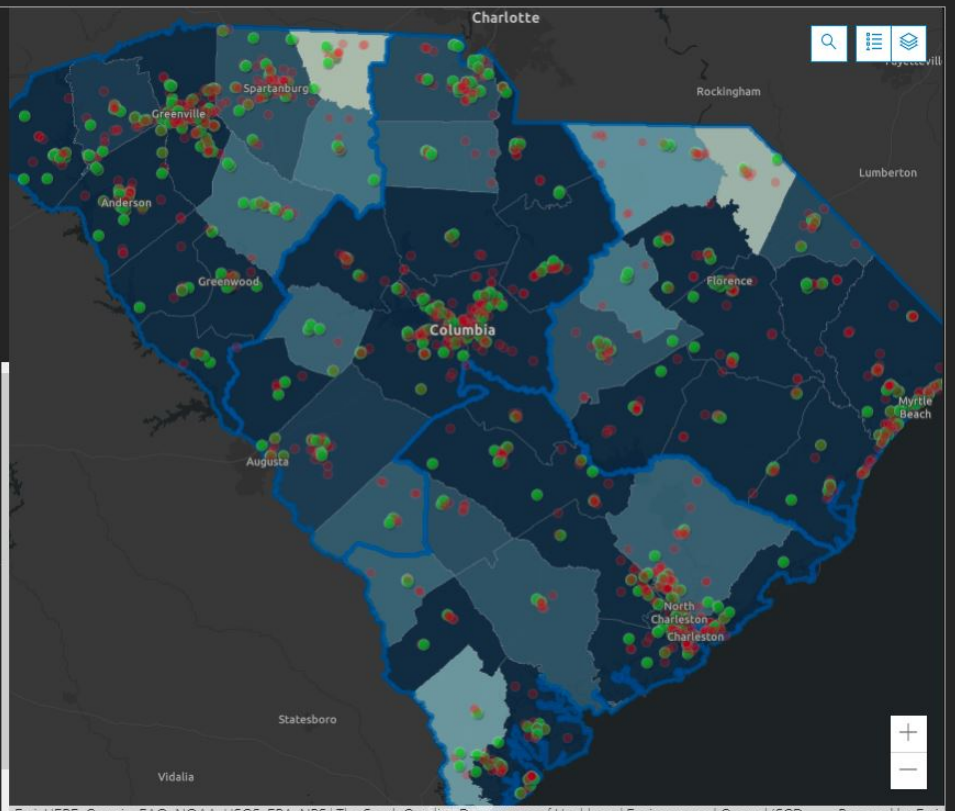
- Yes
- No

Vaccine Recipients Rate per 10,000 People (DHEC)

Vaccine Recipient Rate

> 3,385

2,853



Vaccine Locations
120
Taking Appointments in PeeDee

Vaccine Locations
111
Taking Appointments in Lowcountry

Vaccine Locations
154
Taking Appointments in Midlands

Vaccine Locations
161
Taking Appointments Upstate

Click arrow to view additional information

Click the link below for the SCDHEC Vaccine Dashboard
COVID-19 Vaccination Dashboard | SCDHEC

South Carolina
Received
3,598,723
4/14/2021, 7:11 AM

South Carolina
Utilized
70.00%
4/14/2021, 7:11 AM

South Carolina
Given
2,514,319
4/14/2021, 7:11 AM

Have at least 1 Vaccine
37.4%
4/11/2021, 11:45 PM

Complete Vaccination
23.3%
4/11/2021, 11:45 PM

Scheduled Appointments
267,014
H3707 Provider Database

Doses in Inventory
1,084,404
4/14/2021, 7:11 AM

Activated Vaccine Providers
1,942

SCARNG
Received
4,800
4/13/2021, 3:30 PM

SCARNG
Utilized
81%
4/13/2021, 3:30 PM

SCARNG
1st / 2nd
2,178 / 1699
4/13/2021, 3:30 PM

Vaccines to Civilians / Administered by Medics
83,801
4/14/2021, 8:00 AM

ArcGIS COVID-19 Dashboard 2.0

April 14, 2021

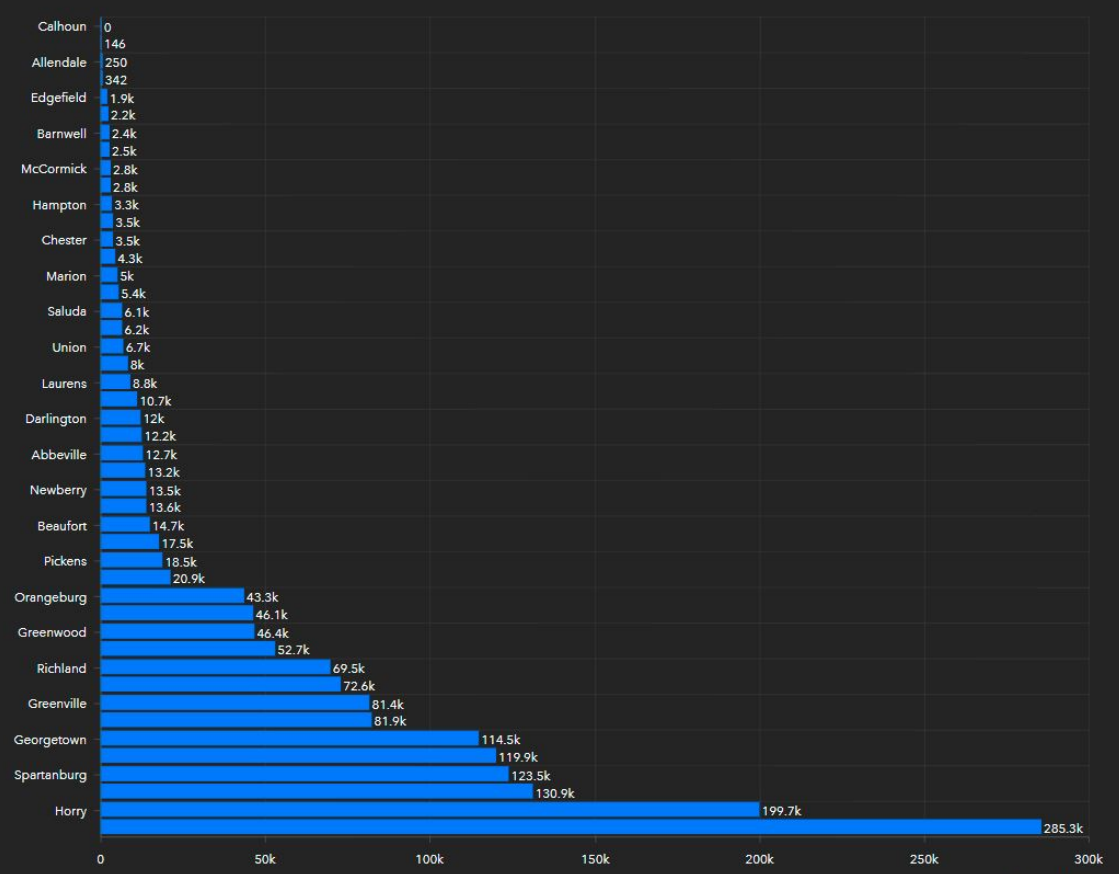
SCNG COVID19 Dashboard Review Arrows/Tabs at Bottom to Explore Regional & Individual Hospital Charts

Active Missions	PAX on COVID Mission
384	661
Mission Total	**Missions Complete**
1,625	77%

Mission Type (Palmetto)

- Mobile Testing Site - 1,042
- Vaccination Site Without Medics - 312
- Op Order - 51
- Mobile Testing Site With Medics - 49
- Vaccination Site With Medics - 39
- Medical Support (Prison) - 22
- Prisma Mobile Vaccination Site - 21
- Food Bank Support - 19
- Medical Support (Hospital) - 17
- Tasker - 11
- Transportation - 10
- Food Distribution - 6

Upstate	Midlands
35%	24%
COVID Hospitalized	COVID Hospitalized
PeeDee	**Lowcountry**
21%	20%
COVID Hospitalized	COVID Hospitalized



Click the link below for the SCDHEC Vaccine Dashboard
COVID-19 Vaccination Dashboard | SCDHEC

South Carolina	South Carolina	South Carolina
Received	Utilized	Given
3,598,723	70.00%	2,514,319
4/14/2021, 7:11 AM	4/14/2021, 7:11 AM	4/14/2021, 7:11 AM

Have at least 1 Vaccine	Complete Vaccination
37.4%	23.3%
4/11/2021, 11:45 PM	4/11/2021, 11:45 PM

Scheduled Appointments	Doses in Inventory
267,014	1,084,404
H3707 Provider Database	4/14/2021, 7:11 AM

Activated Vaccine Providers

1,942

SCARNG	SCARNG	SCARNG
Received	Utilized	1st / 2nd
4,800	81%	2,178 / 1699
4/13/2021, 3:30 PM	4/13/2021, 3:30 PM	4/13/2021, 3:30 PM

Vaccines to Civilians / Administered by Medics

83,801

4/14/2021, 8:00 AM

ArcGIS COVID-19 Dashboard 2.0

May 11, 2021

SCNG COVID19 Dashboard Review Arrows/Tabs at Bottom to Explore Regional & Individual Hospital Charts

Active Missions
1,013

PAX on COVID Mission
678

Mission Total
2,615

Missions Complete
73%

Mission Type (Palmetto)

- Mobile Testing Site - 1,077
- Vaccination Site Without Medics - 416
- Vaccination Site With Medics - 62
- Op Order - 52
- Mobile Testing Site With Medics - 49
- Food Bank Support - 24
- Medical Support (Prison) - 22
- Prisma Mobile Vaccination Site - 19
- Medical Support (Hospital) - 17
- Tasker - 11
- Transportation - 10
- Food Distribution - 6
- EMD SWP - 6
- Logistics Support (PPE Inventory Control) - 5

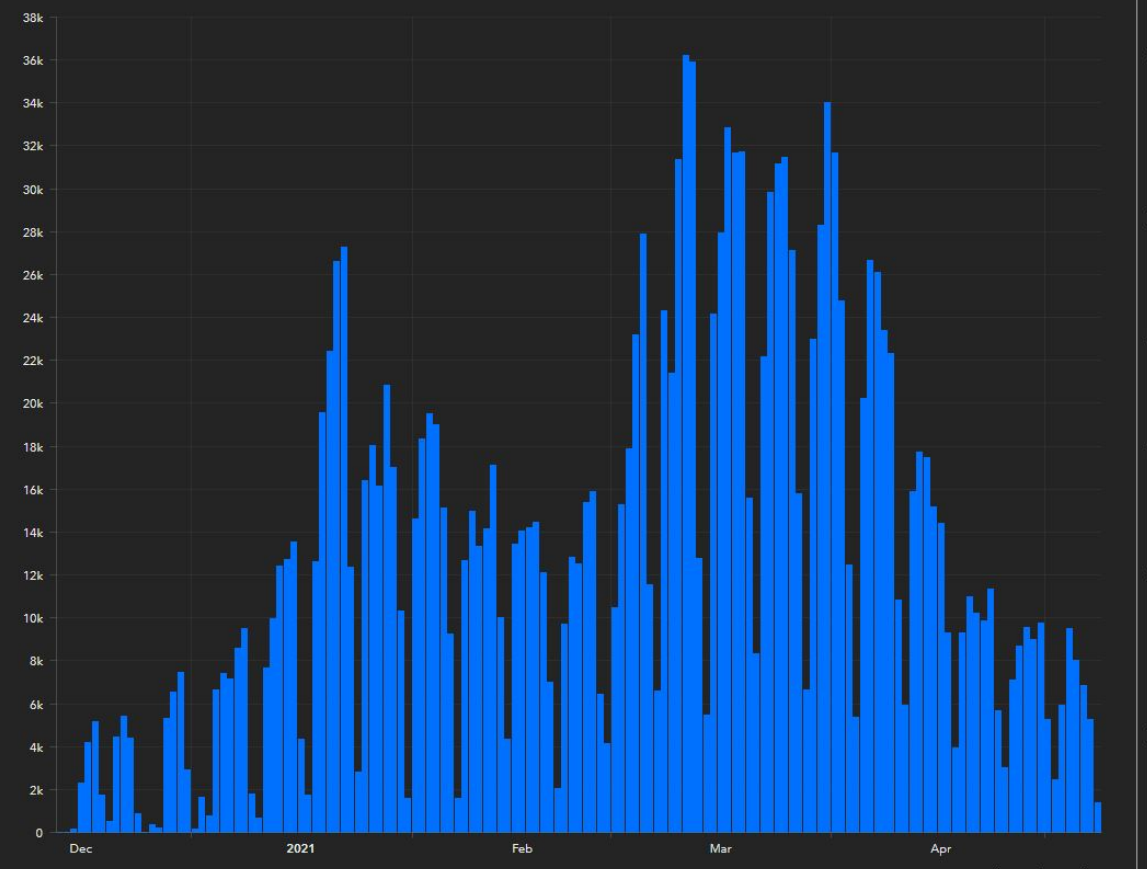
Upstate
37%
COVID Hospitalized

Midlands
26%
COVID Hospitalized

PeeDee
19%
COVID Hospitalized

Lowcountry
18%
COVID Hospitalized

First Dose Administered by Day



Last update: a minute ago

First Dose Administered

Click the link below for the
SCDHEC Vaccine Dashboard
COVID-19 Vaccination Dashboard | SCDHEC

South Carolina	South Carolina	South Carolina
Received	Utilized	Given
4,515,790	70%	3,140,987
5/10/2021, 10:30 AM	5/10/2021, 10:30 AM	5/10/2021, 10:30 AM

Have at least 1 Vaccine	Complete Vaccination
43.4%	34.6%
5/8/2021, 11:45 PM	5/8/2021, 11:45 PM

Scheduled Appointments	Doses in Inventory
82,348	1,374,803
H3707 Provider Database	5/10/2021, 10:30 AM

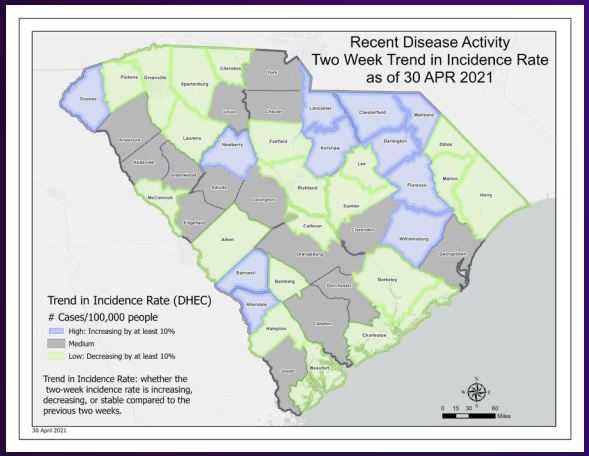
Activated Vaccine Providers
2,070

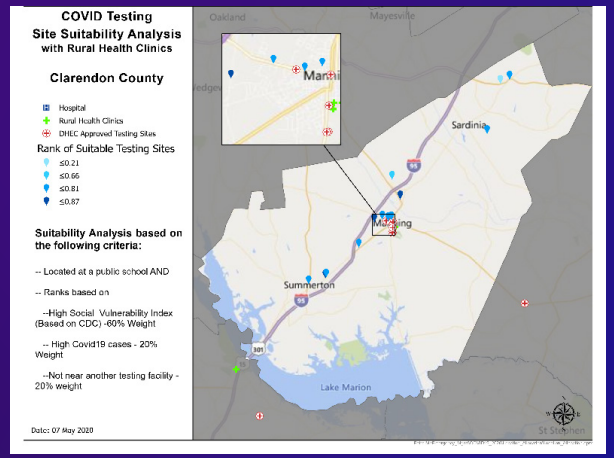
SCARNG	SCARNG	SCARNG
Received	Utilized	1st / 2nd
5,400	78%	2,263 / 1937
5/6/2021, 3:30 PM	5/6/2021, 3:30 PM	5/6/2021, 3:30 PM

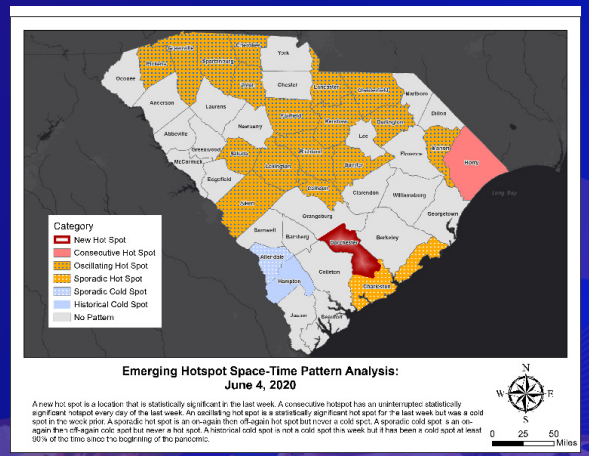
Vaccines to Civilians / Administered by Medics
104,132
5/10/2021, 8:00 AM

Other COVID-19 GIS Projects

- Space-Time pattern analysis with DRP support
- Site suitability analysis for testing and vaccination sites
- Vaccine site planning web app
- Community testing site planning web app
- Future operations mission planning web app
- Weekly maps for the SCNG State Surgeon COVID-19 briefs







Closing Statements

- Scalability and adaptability
- ESRI Disaster Response Program

Bonus tips…

- Get leadership involved in your GIS team. The SC National Guard has a culture of using GIS to inform all major decisions.
- Invite your leadership to the ESRI UC. Our Generals and Colonels attend ESRI User Conferences and read the ArcUser Magazines.
- Be resourceful, resilient, and keep fighting!

Thank you

Christy Jacobs
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SC National Guard
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803-299-4407

Kevin Haynes
Environmental GIS Manager
SC National Guard
hayneskb@tag.scmd.state.sc.us
803-730-0477