



# MONTANA EMS ANNUAL REPORT 2021



MONTANA  
EMS, TRAUMA SYSTEMS &  
INJURY PREVENTION PROGRAM



A Summary of 2020 EMS Data

# Executive Summary

We are pleased to present the Montana EMS Annual Report 2021 made possible by the hard work of more than 5,000 emergency care providers across the state. The report analyzes 2020 EMS data by agency-type (non-transporting, ground transport, air transport) and by time-sensitive illnesses and injuries, including alcohol/drug exposure, trauma, traumatic brain injury, stroke, heart attack and cardiac arrest.

The intent of this report is to create a baseline for important EMS system measures that can be tracked and trended over time and to provide EMS agencies with information that can be used in their quality improvement activities.

EMS agencies that wish to replicate the measures presented in this report are encouraged to contact the EMS and Trauma System Section for more information.

## KEY FINDINGS OF THIS REPORT INCLUDE THE FOLLOWING:

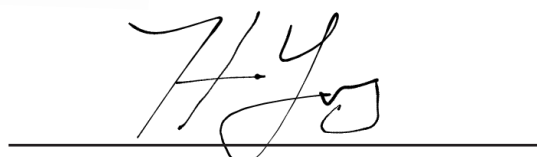
- 123 ground ambulance agencies responded to 122,551 requests for service
- 12 air medical providers responded to 5,102 requests for service
- Injury-related complaints accounted for 1 in 5 ground 911 transports and 2 in 5 air 911 transports
- Among pediatric patients (aged 0-17 years), mental and behavioral health-related complaints accounted for 1 in 3 interfacility transports, and over 10% of 911 transports
- Volunteer agencies transported 911 patients roughly three-times farther than paid agencies, with most calls lasting 30 to 90 minutes longer than paid agencies
- Volunteer agencies typically transport interfacility patients further than 60 miles, and most of these calls last from 3 to 6 hours
- The rotor wing ambulance cancellation rate for 911 (scene) responses is 24%
- There were more than 2,000 fixed and rotor wing interfacility transports originating from critical access hospitals or Indian Health Service hospitals

## OPPORTUNITIES:

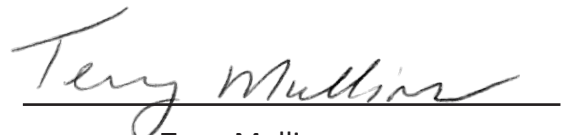
- Ground ambulance documentation of trauma, stroke and heart attack performance measures is low, likely due to the method data are recorded
- Most of the volunteer non-transporting agencies did not submit data, limiting the ability to describe their important role in Montana's EMS system
- The impact of mental and behavioral patients, particularly pediatric patients, on the health system needs further exploration



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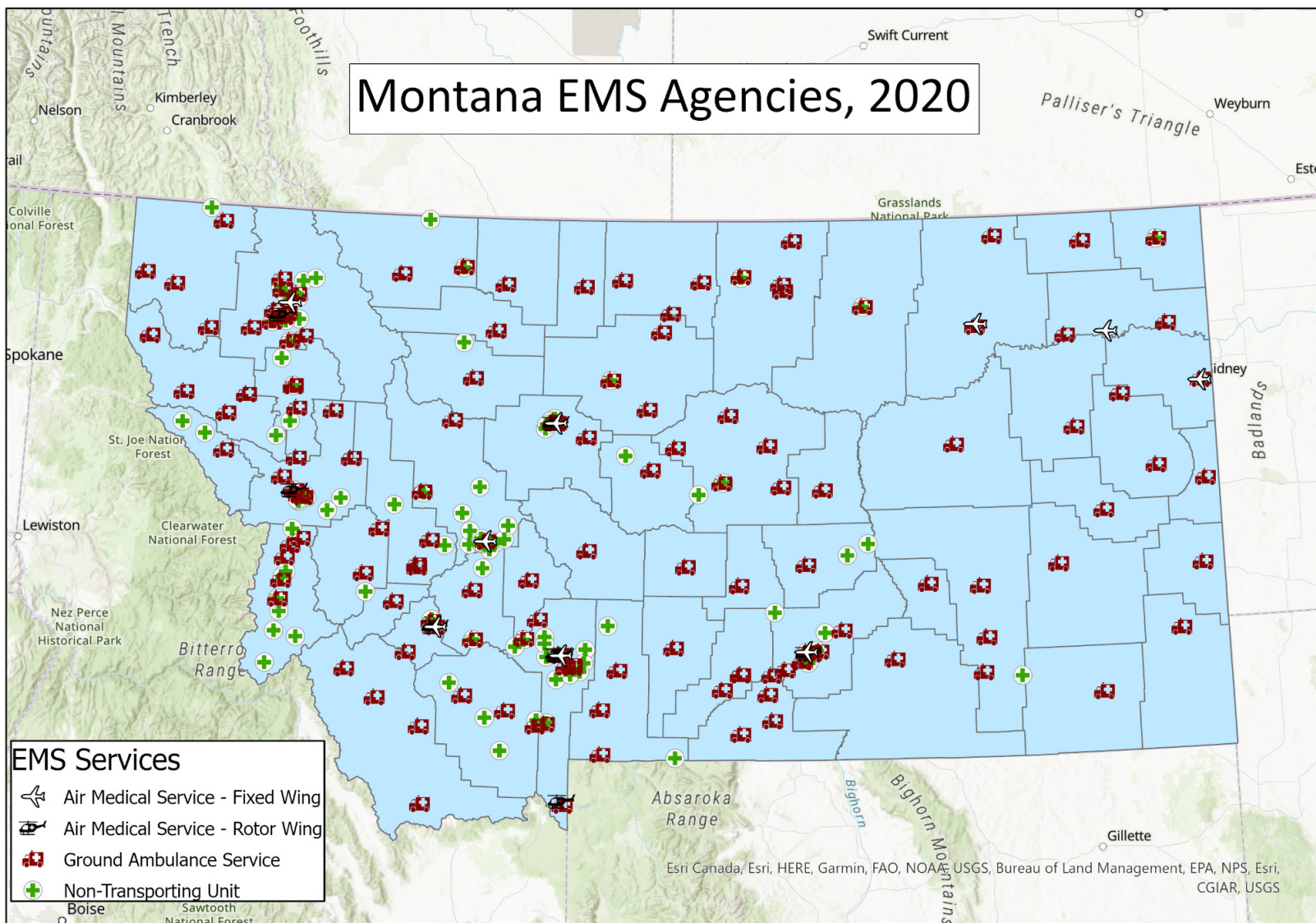
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# Introduction

## MONTANA EMS AGENCIES





*Special thanks to the following EMS Agencies that contributed data to this report:*

## **GROUND TRANSPORTING AGENCIES**

A-1 Ambulance	Frenchtown Rural Fire District
Absarokee Rural Fire District*	Garfield Ambulance*
Alert III - Ground	Geraldine Community Ambulance Service*
American Medical Response (Billings)	Glendive Ambulance Service*
American Medical Response (Bozeman)	Golden Valley Quick Response Ambulance*
Anaconda Fire	Grass Range Ambulance Service*
Arlee Ambulance Service*	Grasshopper Valley Ambulance*
Augusta Volunteer Ambulance Service*	Great Falls Emergency Services
Avon Volunteer Fire Department & QRU*	Great Falls Fire Rescue
Beartooth EMS & Rescue	Hebgen Basin Fire District
Beaverhead EMS*	Hill County Ambulance Service of Rudyard*
Belt Volunteer Ambulance*	Hot Springs Community Ambulance Service Inc.*
Big Horn County Ambulance	Hot Springs Fire Department Ambulance*
Big Mountain Fire & Rescue	Jesse Ambulance Service*
Big Sandy Volunteer Ambulance Service*	Joliet EMS Inc.*
Big Sky Fire Department	Judith Basin County EMS*
Bigfork Fire District	Kalispell Fire/Ambulance Department
Blackfeet Tribal EMS	Lakeside QRU, Inc*
Blaine County Ambulance I*	Laurel Volunteer Ambulance Service*
Boulder Ambulance Service*	Libby Volunteer Ambulance*
Broadwater Health Center Ambulance*	Liberty County Ambulance and QRU*
Central Montana Medical Center Ambulance Service	Lima Rural Fire Department and Ambulance*
Central Valley Fire District / Belgrade City Fire Department	Lincoln Volunteer Ambulance Service*
City of Bozeman Fire Dept	Livingston Fire Rescue
City of Havre Ambulance/Fire Department	Lockwood Rural Fire District Ambulance
City of Whitefish Fire Department	Marcus Daly Memorial Hospital Ambulance Service
Clarks Fork Valley Ambulance*	Marion Fire District*
Clarkston Fire Service Area*	Meagher County Ambulance*
Colstrip Ambulance Service*	Memorial Ambulance of Fort Benton*
Columbus Rural Fire District 3	Miles City Fire Rescue
Community Ambulance Service of Western Sanders County*	Missoula Emergency Services Inc.
Condon/Swan Valley QRU*	Montana Medical Transport Ambulance
Dahl Memorial Healthcare Ambulance*	Musselshell County Ambulance*
Daniels County Ambulance Service*	North Valley EMS Inc.*
Drummond Volunteer Ambulance*	Northeast Montana Health Services
Eagle Ambulance Service, Inc.	Northern Cheyenne Ambulance Service
Ennis Ambulance Service*	Northern Rockies EMS
Eureka Volunteer Ambulance Service*	Paradise Valley Fire Service Area*
Evergreen Fire Rescue	Park City Volunteer Ambulance Service*
Fallon County Ambulance*	Petroleum County Ambulance Service*
Fisher River Valley Fire/Rescue*	Philipsburg Ambulance Service*
Fort Belknap EMS	Phillips County Ambulance*
	Plains Community Ambulance*
	Polson Ambulance Inc.

Pondera County Ambulance\*  
 Powell EMS\*  
 Prairie County Ambulance Service\*  
 Pulse dba Jefferson Valley EMS and Rescue\*  
 Red Lodge Fire/Rescue\*  
 Redwater Valley Ambulance Service\*  
 Richey Ambulance Service\*  
 Richland County Ambulance\*  
 Ronan Ambulance Service  
 Roosevelt Memorial Medical Center Ambulance\*  
 Rosebud County  
 Roy Ambulance Service\*  
 Ruby Valley EMS\*  
 Seeley Lake QRU/Rural Fire Department\*  
 Sheridan Memorial Hospital EMS\*  
 Shields Fire & Rescue  
 Smith Valley Volunteer Fire Department Ambulance\*  
 Spectrum  
 St Peters Hospital Ambulance  
 Stat Ambulance Service\*  
 Stevensville City & Rural Fire Dept.\*  
 Superior Area Ambulance Service\*  
 Sweet Grass County Ambulance Service\*  
 Teton County Ambulance Service\*  
 Thompson Falls Ambulance\*  
 Three Forks Area Ambulance Service\*  
 Three Rivers EMS\*  
 Toole County Ambulance\*  
 Treasure County Ambulance Service\*  
 Troy Volunteer Ambulance Service\*  
 West Valley Volunteer Fire Department\*  
 Wheatland County Ambulance Service\*  
 Wibaux County Ambulance Service\*  
 Winifred Community Ambulance\*  
 Wise River Volunteer Fire Company\*  
 Worden Fire Department & Ambulance\*  
 Yellowstone Club Public Safety & Privacy

\* denotes volunteer agency

## NON-TRANSPORTING AGENCIES

Billings Fire Department  
 Cascade County QRT\*  
 Chief Cliff Fire Service QRU\*  
 Elliston EMS\*  
 Gore Hill Fire Rescue\*  
 Helena Fire Department  
 Helmville Volunteer Fire and Quick Response Unit\*  
 Lincoln Volunteer Fire & Rescue\*  
 Montana City Volunteer Fire Department\*  
 Polson Fire Department\*  
 Pulse dba Jefferson Valley EMS & Rescue, NTU\*  
 Sheridan Memorial Hospital Rapid Response System\*  
 Tri-Lakes Volunteer Fire Department\*  
 Victor Volunteer Rural Fire Department QRU\*

## AIR MEDICAL AGENCIES

### ROTOR WING

Alert I - Rotor  
 Help Flight St Vincent Healthcare - Rotor  
 Life Flight Network Butte  
 Mercy Flight Benefis Healthcare - Rotor  
 Reach Air Medical Services LLC - Rotor Wing  
 Rocky Mountain Holdings, LLC. dba Air Idaho Rescue

### FIXED WING

Alert II - Fixed  
 Help Flight St Vincent Healthcare - Fixed  
 Life Flight Network Fixed Wing Butte  
 Mercy Flight - Benefis Healthcare - Fixed  
 Montana Medical Transport - Fixed  
 Stat Air Ambulance Service – Fixed

## REPORT BACKGROUND

The purpose of this report is to describe Emergency Medical Services (EMS) system utilization and performance in Montana during 2020, through analysis of the state's EMS incident dataset.

Montana's EMS incident dataset consists of patient care documentation collected by emergency care providers. Montana statute requires all ground transporting agencies (GTAs) and air medical agencies (AMAs) licensed in the state to submit a patient care report (PCR) for each patient encountered during an EMS activation. Non-transporting agencies (NTAs) are not required to report data, however, some NTAs voluntarily report. The EMS incident dataset captures agency information, patient demographics, response times, incident location, prehospital interventions, and treatments provided to the patient. In general, PCRs are uploaded to the state data repository within 24 hours of the patient encounter. Montana has been collecting NEMSIS v3.4.0 data since January 2017.

This report includes:

- System utilization volumes and demand analysis
- Descriptive analysis of who is utilizing EMS (age-sex pyramids, pie charts showing race)
- Descriptive analysis of why EMS is activated (primary impressions)
- Focused reports on time sensitive illnesses and injuries:  
drug overdose, trauma, traumatic brain injury (TBI), suspected stroke, suspected cardiac chest pain and STEMI, non-traumatic out-of-hospital cardiac arrests (OHCA)

The report is divided into separate sections for ground transporting agencies, non-transporting agencies, and air medical agencies including rotor wing agencies (RWAs) and fixed wing agencies (FWAs). Within each section, data is divided by response type and patient disposition.





## METHODS

This report includes EMS incidents that occurred in Montana between Jan 1, 2020- Dec 31, 2020. Records for out-of-state incidents and records missing values for response type or patient disposition were excluded from the analysis. 2019 US Census bridged race population estimates were used to calculate age adjusted rates per 100,000 residents.<sup>1</sup>

The EMS dataset is a registry of EMS activations; it is not a “patient-based” dataset. A single patient or a single event may be represented in more than one record for a variety of reasons. For example, if several agencies responded to the same incident, they would each submit a PCR. No attempt was made to link records from different EMS agencies that pertained to the same incident.

Extreme outliers were excluded when calculating response times and distances traveled. Within each agency type and response type category, any value greater than the third quartile plus the interquartile range multiplied by ten ( $Q3+10 \times IQR$ ) was excluded.

Response times were defined as follows:

- **Chute Time**  
“Unit notified by dispatch” to “Unit en route.” Measures the time it takes the ambulance crew start moving toward the scene, from the time they are notified
- **On-scene Time**  
“Unit on scene” to “Unit left scene.” Measures the time spent by the EMS crew on scene.
- **Time at Sending Facility**  
“Unit on scene” to “Unit left scene.” Measures the time spent by EMS at the sending/first facility while picking up the patient during an interfacility or medical transport.
- **EMS Transport Time**  
“Unit left scene” to “Unit arrived at destination.” Measures patient-loaded travel time
- **Turnaround Time**  
“Unit arrived at destination” to “Unit back in service.” Measures the time from when the ambulance arrives at the ED with a patient until the EMS unit is back in service
- **Total Call Time**  
“Unit notified by dispatch” to “Unit back in service.” Measures the time from when the ambulance was notified by dispatch until the EMS unit is back in service.

Analysis was done in SAS version 9.4.

# Overview of EMS Incident Dataset

## IMPORTANT DEFINITIONS

**EMS ACTIVATION** is an occurrence which initiates an EMS response with the potential of patient medical care.

**RESPONSE TYPE** describes the circumstances under which a particular EMS Agency was requested to respond.

- **911 Response**  
EMS activation where the response is emergent or immediate to an incident location (scene), regardless of method of notification (e.g., 9-1-1, direct dial, walk-in, flagging down, air ambulance scene flight)
- **Interfacility Transport Response**  
Emergent response for transport from one healthcare facility to another for the purpose of continuation of acute care
- **Medical Transport Response**  
Non-emergent response for transport that is not between hospitals or that does not require an immediate response, i.e.- to/from an appointment, for a scheduled procedure
- **Other**  
Includes intercept, standby, mutual aid, and public assistance.

**PATIENT DISPOSITION** describes whether care and/or transport were provided to the patient by the responding EMS personnel.

- **911 Transport**  
A 911 response that resulted in patient transport by the responding EMS unit
- **Interfacility and Medical Transport**  
An interfacility or medical transport (IFMT) response that resulted in patient transport by the responding EMS unit

Table 1 shows the patient disposition categories in detail.<sup>2</sup>

## 2020 MONTANA EMS DATA

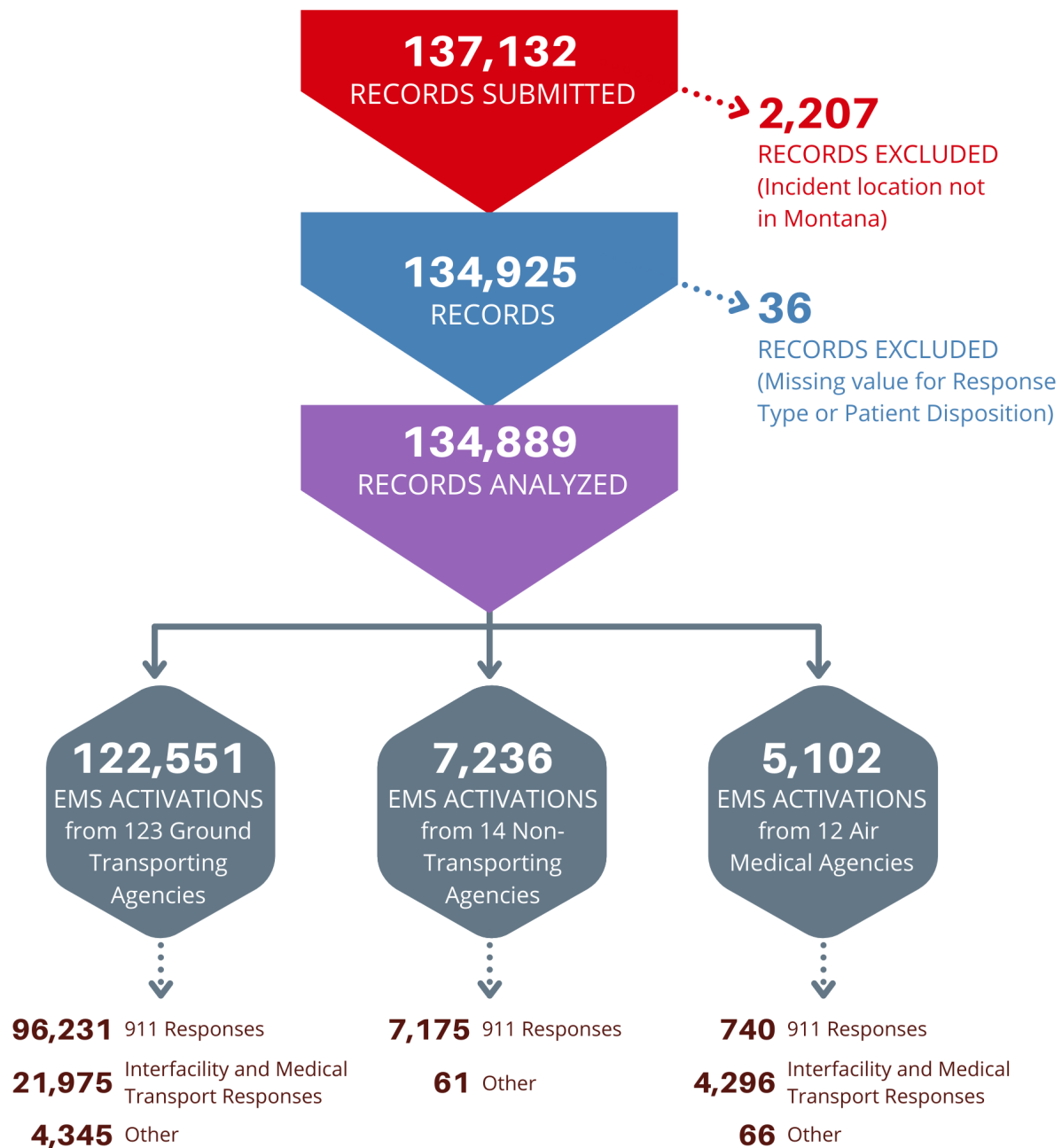




Table 1. EMS activations by patient disposition and agency type, 2020

Patient Disposition	Ground Transporting Agencies	Non-Transporting Agencies	Air Medical Agencies	All
<b>Patient Transported by this EMS Unit</b>	<b>84,728</b>	<b>83</b>	<b>4,795</b>	<b>89,606</b>
Patient Treated, Transported by this EMS Unit	84,595	79	4,795	89,469
Patient Dead at Scene-No Resuscitation Attempted (With Transport)	46	2	0	48
Patient Dead at Scene-Resuscitation Attempted (With Transport)	44	2	0	46
Patient Refused Evaluation/Care (With Transport)	43	0	0	43
<b>Patient Treated, No Transport (per protocol)</b>	<b>6,105</b>	<b>2,724</b>	<b>13</b>	<b>8,842</b>
Patient Treated, Transferred Care to Another EMS Unit	3,985	2,647	13	6,645
Patient Treated, Released (per protocol)	1,723	40	0	1,763
Patient Treated, Transported by Law Enforcement	158	18	0	176
Patient Treated, Transported by Private Vehicle	239	19	0	258
<b>Patient Evaluated, No Treatment/Transport Required</b>	<b>3,398</b>	<b>128</b>	<b>1</b>	<b>3,527</b>
<b>Patient Refusal, No Transport</b>	<b>11,719</b>	<b>232</b>	<b>16</b>	<b>11,967</b>
Patient Refused Evaluation/Care (Without Transport)	7,334	165	16	7,515
Patient Treated, Released (Against Medical Advice)	4,385	67	0	4,452
<b>Patient Dead at Scene, No Transport</b>	<b>1,493</b>	<b>86</b>	<b>16</b>	<b>1,595</b>
Patient Dead at Scene-No Resuscitation Attempted (Without Transport)	946	57	0	1,003
Patient Dead at Scene-Resuscitation Attempted (Without Transport)	547	29	16	592
<b>Other (No Patient Contact)</b>	<b>15,108</b>	<b>3,983</b>	<b>261</b>	<b>19,352</b>
Assist/Standby/Non-Patient	4,061	3,958	3	8,022
Assist, Agency	1,736	3,920	0	5,656
Assist, Public	1,246	25	0	1,271
Assist, Unit	159	9	0	168
Standby-No Services or Support Provided	144	1	0	145
Standby-Public Safety, Fire, or EMS Operational Support Provided	618	3	0	621
Transport Non-Patient, Organs, etc.	158	0	3	161
Canceled	11,047	25	258	11,330
Canceled (Prior to Arrival At Scene)	4,809	4	221	5,034
Canceled on Scene (No Patient Contact)	5,531	21	14	5,566
Canceled on Scene (No Patient Found)	707	0	23	730
<b>All Patient Transports</b>	<b>84,728</b>	<b>83</b>	<b>4,795</b>	<b>89,606</b>
<b>All Patient Contacts</b>	<b>107,443</b>	<b>3,253</b>	<b>4,841</b>	<b>115,537</b>
<b>All EMS Activations</b>	<b>122,551</b>	<b>7,236</b>	<b>5,102</b>	<b>134,889</b>

Figure 1. Map of all 911 responses by county (age-adjusted rate per 100,000 population), Montana, 2020

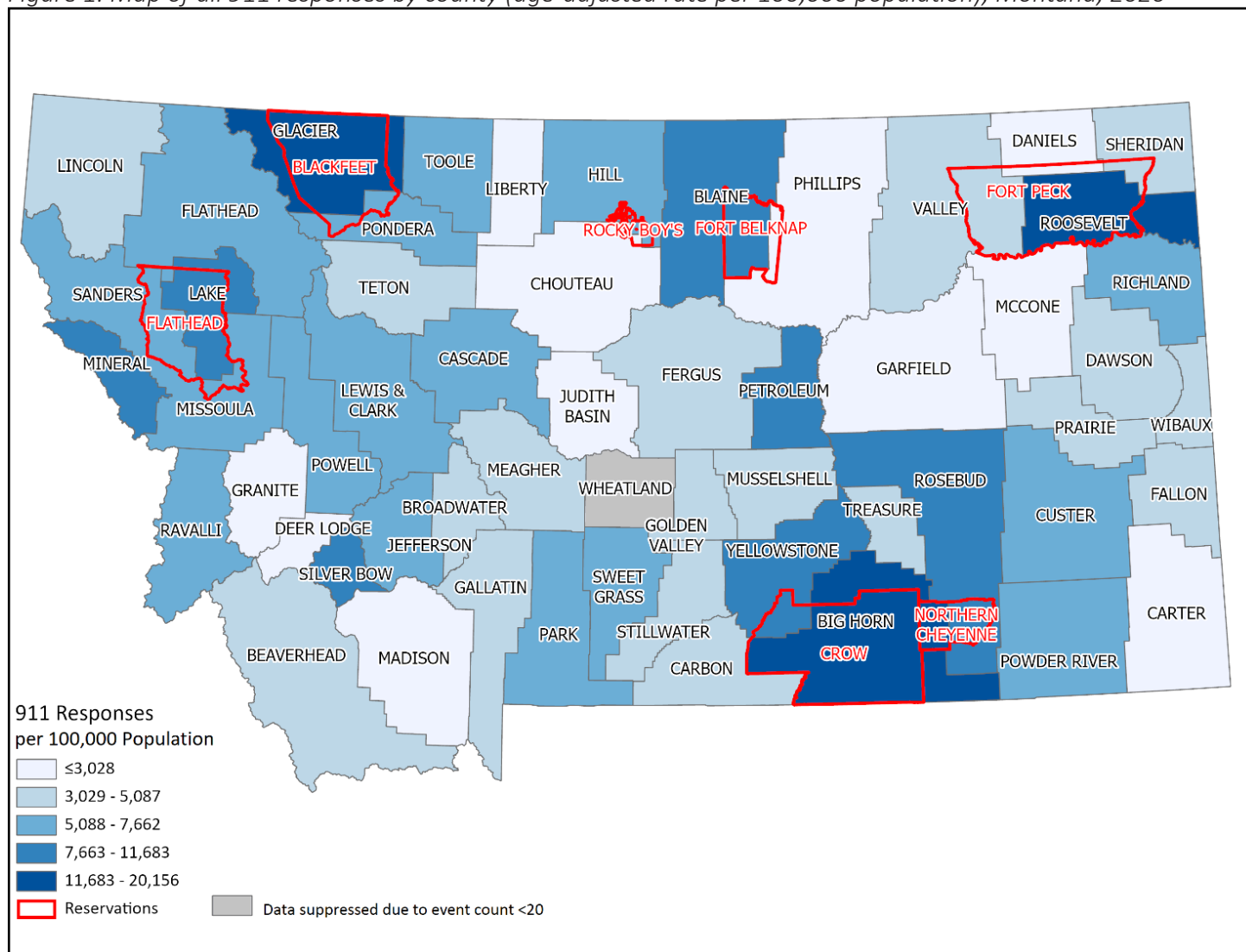


Figure 2. Weekly count of all 911 responses, 2020

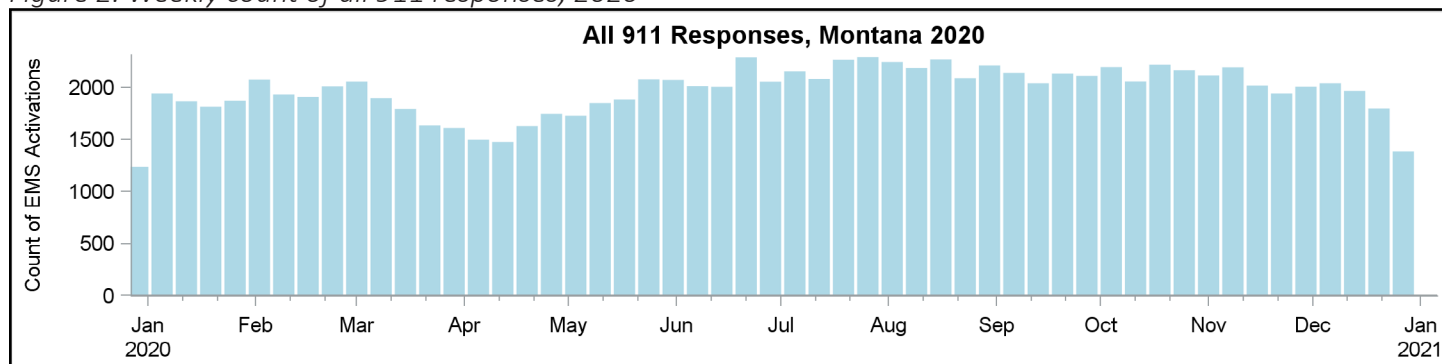


Figure 3. Map of all IFMT responses by county (age-adjusted rate per 100,000 population), Montana, 2020

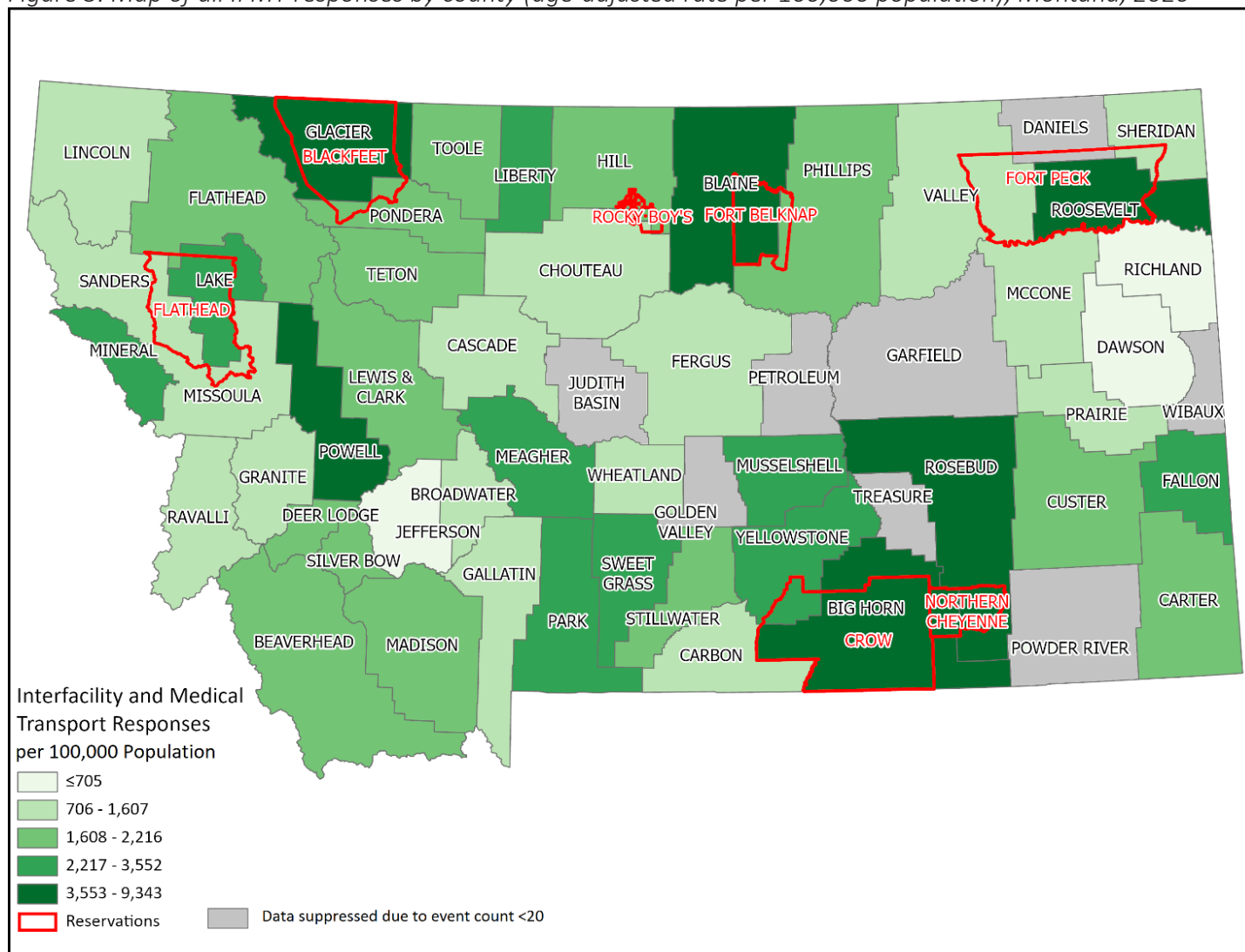
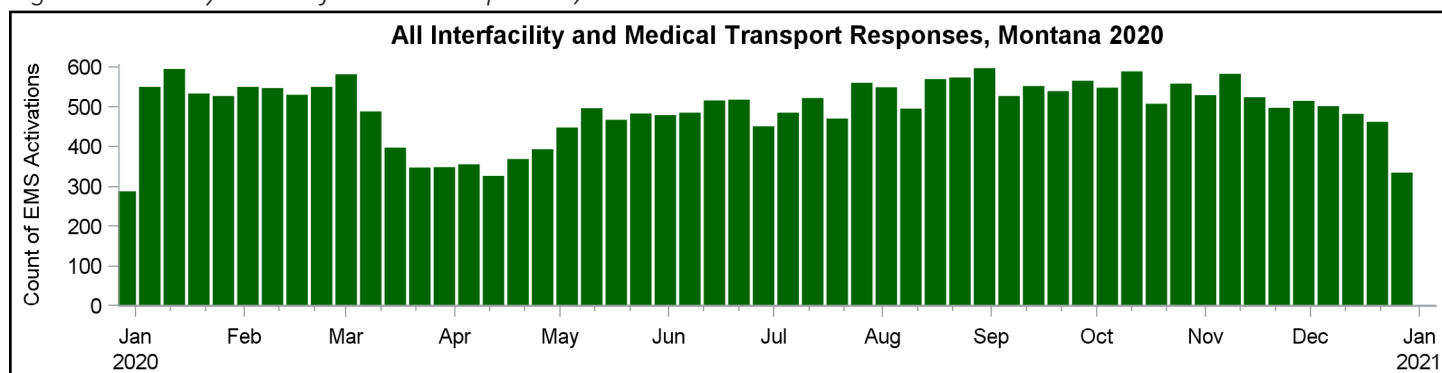


Figure 4. Weekly count of all IFMT responses, 2020





# Ground Transporting Agencies

A total of 123 GTAs submitted data for this report, documenting 122,551 EMS activations during 2020. 84.6% (N=103,689) of the records were submitted by paid GTAs and 15.6% (N=18,862) by volunteer GTAs.



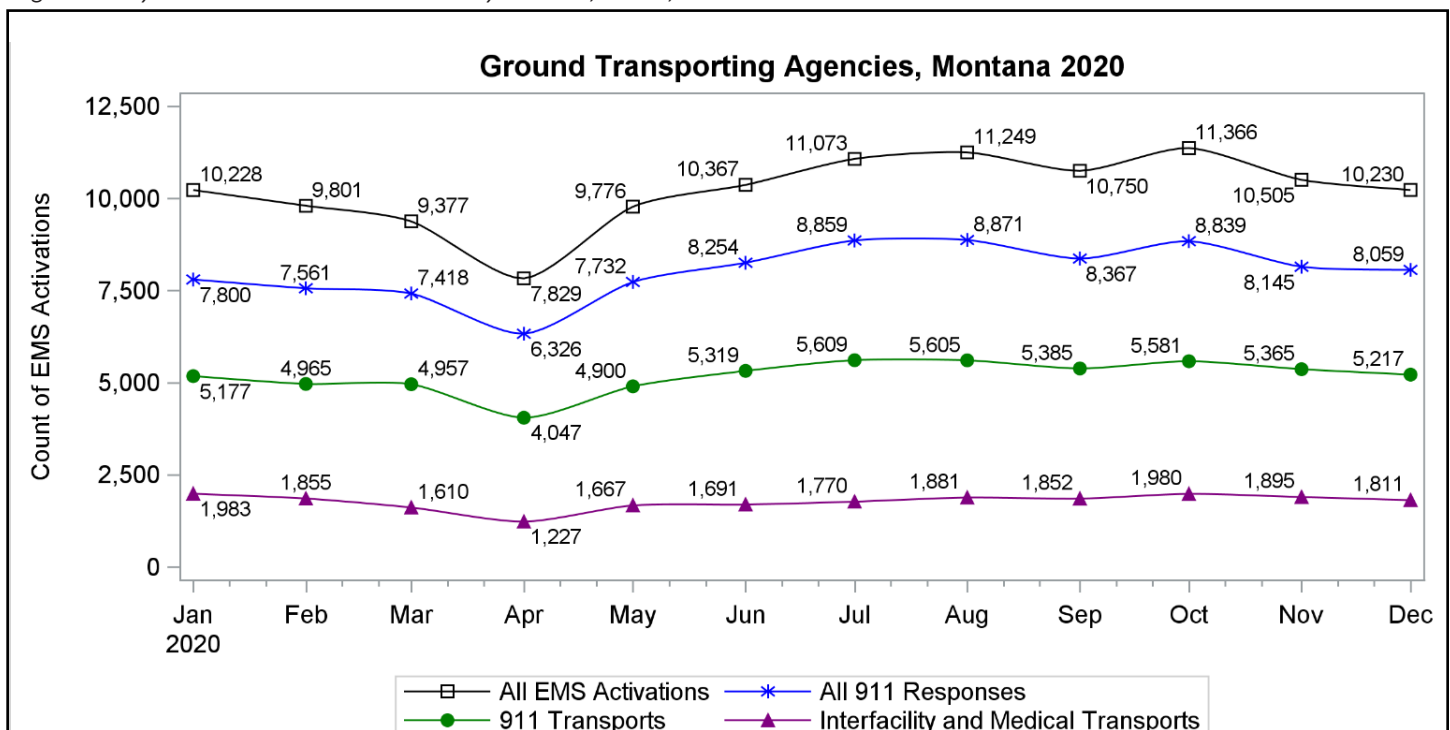
## SYSTEM UTILIZATION

Table 2. EMS activations by patient disposition and response type, GTAs, 2020

Patient Disposition	Response Type			All (N)	All (Col %)
	911 Response	Interfacility and Medical Transport (IFMT) Response	Other		
Patient Transported by this EMS Unit	62,127	21,222	1,379	<b>84,728</b>	69.1%
Patient Treated, No Transport (per protocol)	5,886	39	180	<b>6,105</b>	5.0%
Patient Evaluated, No Treatment/Transport Required	3,139	72	187	<b>3,398</b>	2.8%
Patient Refusal/AMA, No Transport	11,386	33	300	<b>11,719</b>	9.6%
Patient Dead at Scene, No Transport	1,469	3	21	<b>1,493</b>	1.2%
Assist, Standby, or Non-patient Transport	1,724	353	1,984	<b>4,061</b>	3.3%
Canceled Call	10,500	253	294	<b>11,047</b>	9.0%
<b>All (N)</b>	<b>96,231</b>	<b>21,975</b>	<b>4,345</b>	<b>122,551</b>	100.0%
<b>All (Row %)</b>	78.5%	17.9%	3.5%	100.0%	

911 responses accounted for 79% of the activations (N=96,231), while IFMT responses comprised 18% (N=21,975). Of the 911 responses, 64% (N=62,127) resulted in patient transport by the responding EMS unit (Table 2). Table 4 details why the remaining 34,104 patients were not transported following a 911 response. 97% (N=21,222) of the IFMT responses resulted in patient transport.

Figure 5. System utilization volumes by month, GTAs, 2020





In April, during Montana's COVID-19 stay-at-home order, utilization volume in each category decreased. On average there were 10,212 EMS activations per month, 8,019 911 responses per month, 5,177 911 transports per month, and 1,768 IFM transports per month.

## 911 RESPONSES

### DEMAND ANALYSIS, 911 RESPONSES

Table 3. Demand analysis showing percentage of total N=96,231, All 911 responses, GTAs, 2020

Hour of Day	Day of Week							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0	0.52	0.41	0.41	0.41	0.40	0.38	0.51	3.04
1	0.46	0.31	0.33	0.35	0.33	0.36	0.46	2.61
2	0.41	0.32	0.30	0.34	0.31	0.29	0.39	2.37
3	0.29	0.26	0.31	0.27	0.30	0.28	0.38	2.09
4	0.27	0.29	0.26	0.27	0.25	0.25	0.29	1.88
5	0.33	0.27	0.27	0.29	0.25	0.30	0.31	2.02
6	0.30	0.35	0.34	0.34	0.34	0.35	0.34	2.38
7	0.43	0.48	0.43	0.47	0.50	0.46	0.44	3.21
8	0.48	0.61	0.61	0.60	0.59	0.55	0.54	3.99
9	0.56	0.75	0.71	0.66	0.71	0.68	0.61	4.68
10	0.64	0.74	0.77	0.79	0.75	0.75	0.64	5.07
11	0.64	0.79	0.77	0.84	0.79	0.82	0.70	5.35
12	0.72	0.81	0.80	0.82	0.82	0.81	0.76	5.53
13	0.72	0.81	0.78	0.84	0.81	0.86	0.75	5.58
14	0.73	0.80	0.77	0.82	0.82	0.82	0.79	5.54
15	0.72	0.82	0.81	0.79	0.80	0.89	0.75	5.58
16	0.75	0.80	0.81	0.86	0.83	0.81	0.80	5.65
17	0.70	0.81	0.80	0.81	0.80	0.82	0.82	5.56
18	0.74	0.69	0.80	0.81	0.76	0.80	0.77	5.37
19	0.75	0.71	0.81	0.74	0.80	0.81	0.80	5.41
20	0.71	0.65	0.70	0.70	0.71	0.77	0.72	4.96
21	0.65	0.61	0.59	0.70	0.64	0.76	0.71	4.65
22	0.53	0.56	0.55	0.53	0.57	0.63	0.66	4.03
23	0.49	0.45	0.49	0.44	0.46	0.58	0.52	3.44
Total	13.55	14.10	14.21	14.48	14.35	14.84	14.46	100.00

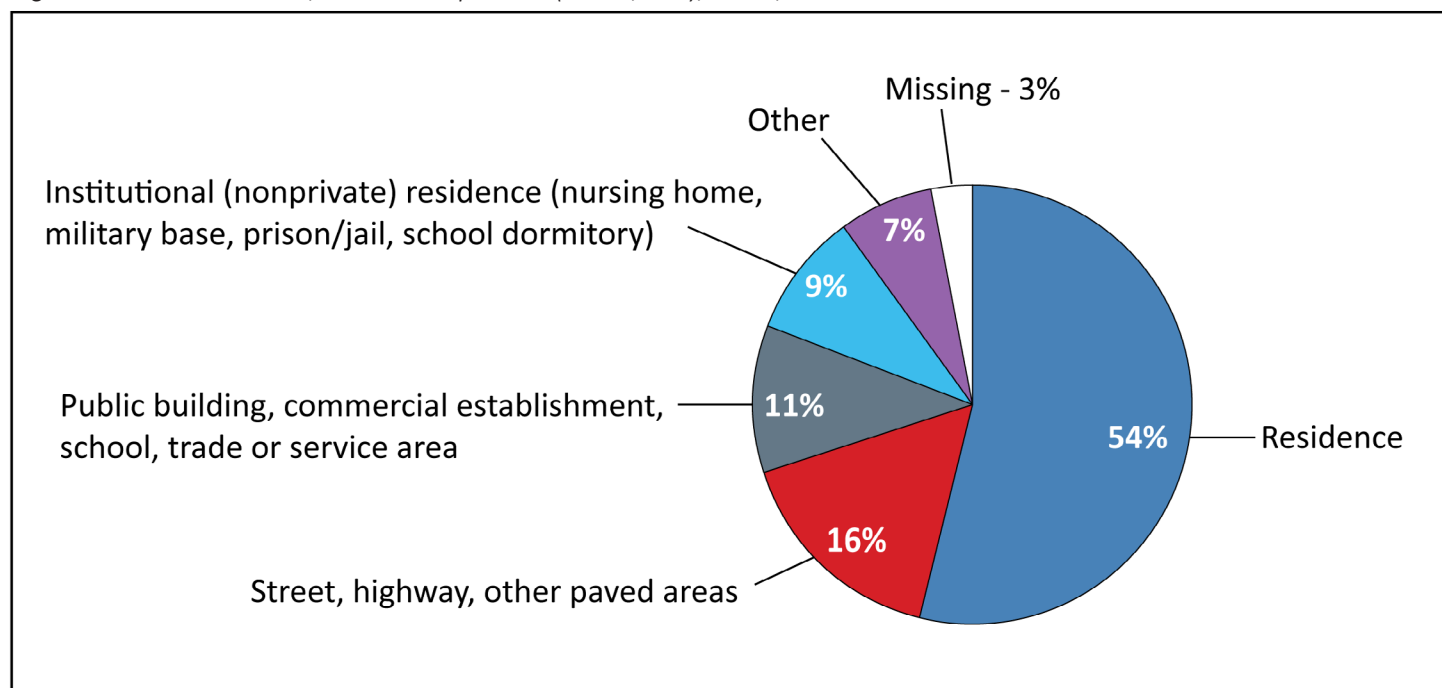
Table 3 presents the temporal pattern of demand for 911 service among GTAs. Each cell represents the percentage of 911 responses that occurred during that day of week and hour of day, with darker colors representing higher demand. Demand analysis can inform needs for staffing, scheduling, and resource allocation.

14.8% of GTA 911 responses occurred on Fridays, which was the busiest day of the week. 54.6% of GTA 911 responses occurred between the hours of 10AM-8PM.



## SCENE LOCATION, 911 RESPONSES

Figure 6. Scene location, All 911 responses (N=96,231), GTAs, 2020



## 911 RESPONSES, NO TRANSPORT

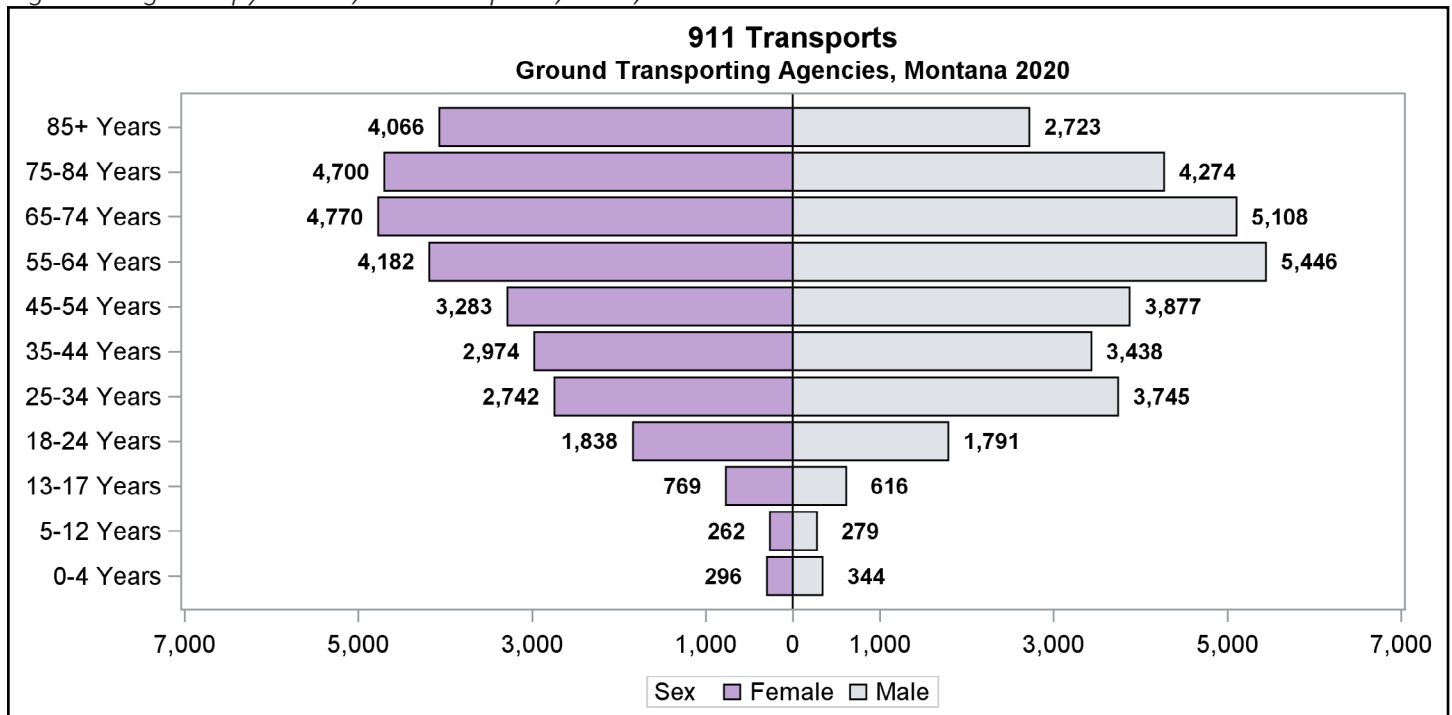
Table 4. Reason for 911 responses with no patient transport, GTAs, 2020

Reason For No Patient Transport	N	%
Patient refusal	11,386	33.4%
Canceled call	10,500	30.8%
Patient evaluated/treated, released (per protocol)	5,163	15.1%
Patient treated, transferred care to another EMS unit	3,862	11.3%
Assist/Standby/Non-Patient Transport (ie- organs)	1,724	5.1%
Patient dead at scene	1,469	4.3%
<b>All</b>	<b>34,104</b>	<b>100.0%</b>

34,104 GTA 911 responses did not result in patient transport. Canceled calls and patient refusals accounted for 64% of 911 responses with no patient transport (Table 4).

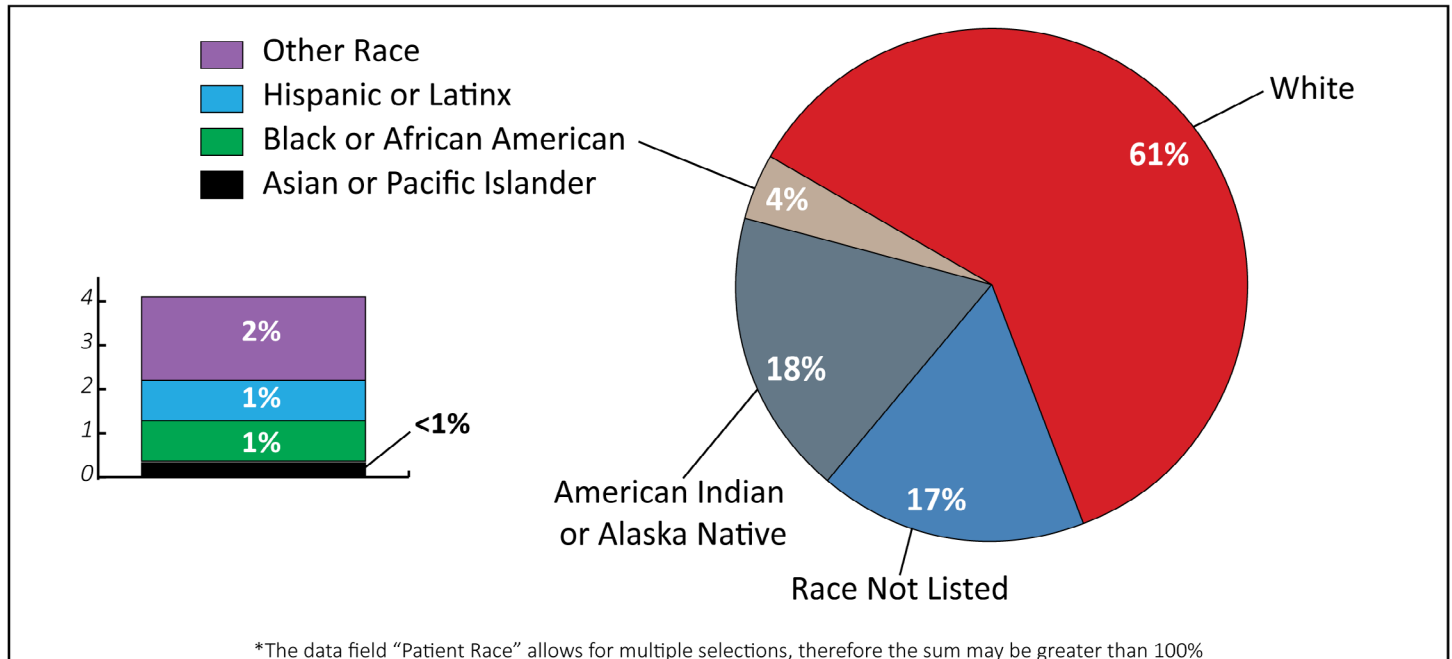
## PATIENT DEMOGRAPHICS, 911 TRANSPORTS

Figure 7. Age-sex pyramid\*, 911 transports, GTAs, 2020



\*See Appendix 1. for comparison with Montana's population.

Figure 8. Patient race/ethnicity distribution, 911 transports (N=62,127), GTAs, 2020



## PRIMARY IMPRESSION, 911 TRANSPORTS

Table 5. Top 10 primary impressions, 911 transports (N=62,127)\*, GTAs, 2020

#	Primary Impression Pediatrics (Age 0-17)	N	%	Primary Impression Adults (Age 18 and Over)	N	%
1	Injury/Trauma	827	32%	Injury/Trauma	10,508	18%
2	Mental Health/Behavioral	306	12%	Cardiovascular/Circulatory	5,292	9%
3	Neurological	280	11%	Respiratory	5,146	9%
4	Alcohol, Drug, or Other Substance Exposure	169	7%	Pain	4,888	8%
5	Level of Consciousness	144	6%	Alcohol, Drug, or Other Substance Exposure	4,488	8%
6	Pain	123	5%	Level of Consciousness	4,438	7%
7	Respiratory	105	4%	Neurological	4,350	7%
8	Abdominal	57	2%	Malaise	3,996	7%
9	Digestive/Gastrointestinal (GI)	45	2%	Mental Health/Behavioral	3,952	7%
10	Illness and Infectious Disease	41	2%	Abdominal	3,322	6%
	<b>All Top 10</b>	<b>2,097</b>	<b>81%</b>	<b>All Top 10</b>	<b>50,380</b>	<b>85%</b>
	Other	218	8%	Other	8,634	15%
	Missing Impression	274	11%	Missing Impression	440	1%
	<b>Total (Patient Age 0-17)</b>	<b>2,589</b>	<b>100%</b>	<b>Total (Patient Age 18+)</b>	<b>59,454</b>	<b>100%</b>

\*Of 62,127 GTA 911 transports, 84 were missing age and were excluded from Table 5.

Injury/Trauma was the top primary impression for both pediatric (32%) and adult (18%) 911 transports. Among pediatric patients, Mental Health/Behavioral accounted for 12% of 911 transports, followed by Neurological (11%). Among adult patients, Cardiovascular/Circulatory and Respiratory both accounted for 9%.



## LIGHTS AND SIRENS, 911 TRANSPORTS

Figure 9. Lights and sirens during patient transport, 911 transports (N=62,127), GTAs, 2020

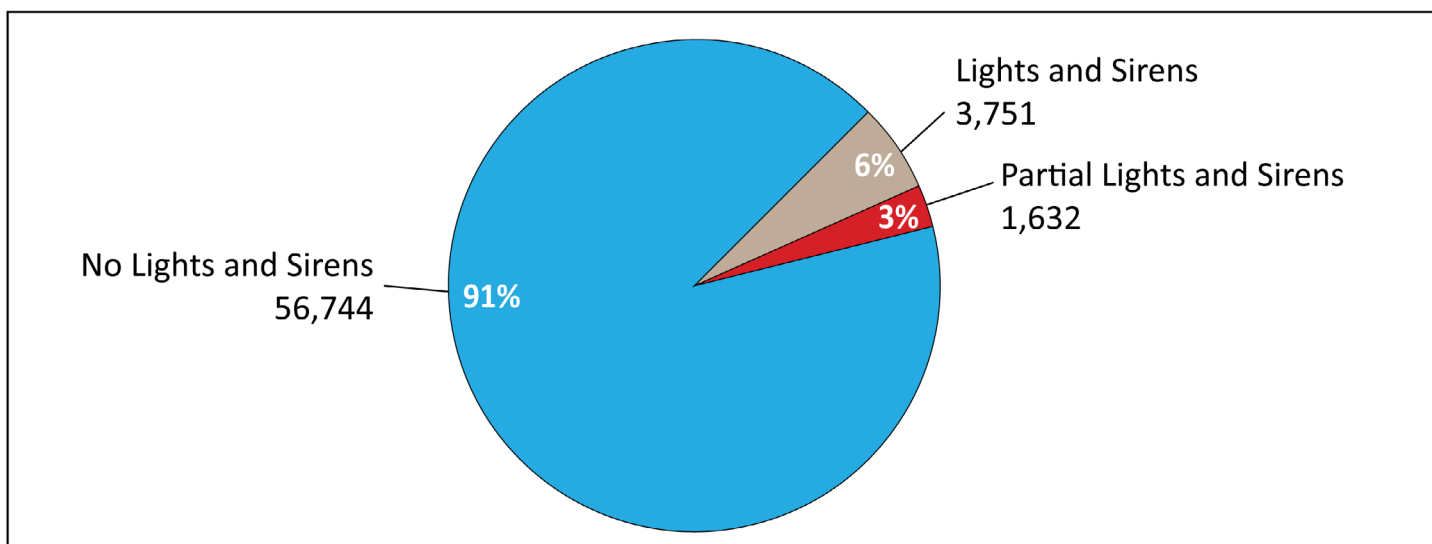
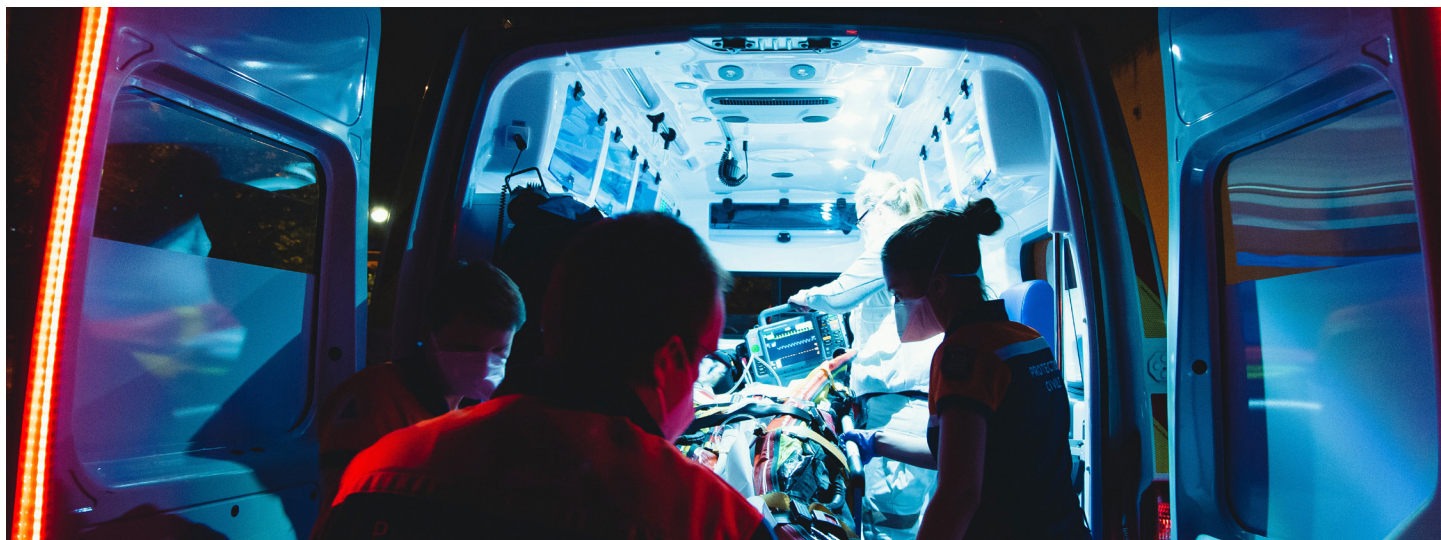


Table 6. Primary Impression for 911 Transports with Lights and Sirens during patient transport, GTAs

Primary Impression Category	N	%
Injury/Trauma	835	22%
Cardiovascular/Circulatory	742	20%
Neurological	508	14%
Respiratory	358	10%
Level of Consciousness	340	9%
Other	968	26%
Lights and Sirens Total	3,751	100%

3,751 GTA 911 transports (6%) used lights and sirens during patient transport. The majority of these were Injury/Trauma patients (22%), followed by Cardiovascular/Circulatory (20%).





## RESPONSE TIMES FOR PAID AND VOLUNTEER AGENCIES, 911 TRANSPORTS

Figure 10. Median and 90th percentile response times, 911 transports (N=52,456), Paid GTAs, 2020

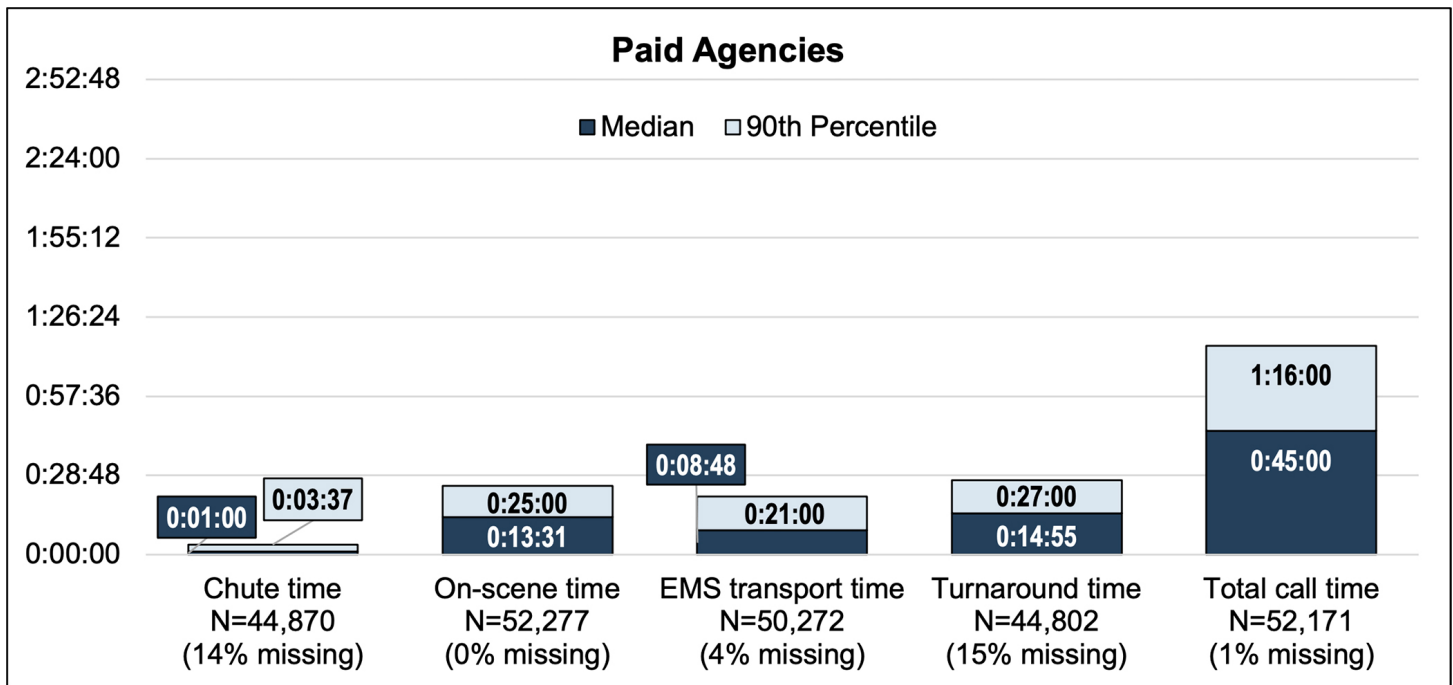
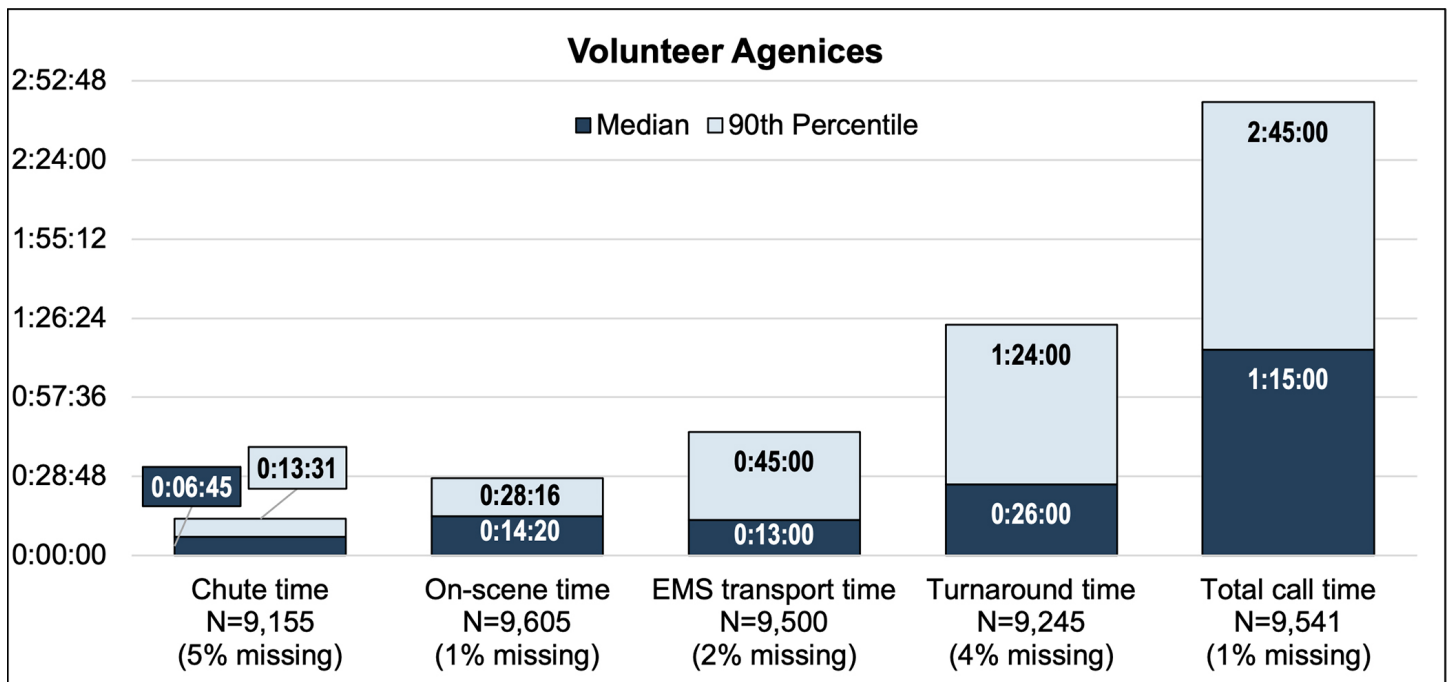


Figure 11. Median and 90th percentile response times, 911 transports (N=9,671), Volunteer GTAs, 2020



Of 62,127 GTA 911 transports, 84.4% (N=52,456) were by paid GTAs and 15.6% (N=9,671) by volunteer GTAs. 90th percentile chute time was almost four times longer for volunteer (13m 31s) compared to paid GTAs (3m 37s). 90th percentile on-scene time was comparable for both, around 25-28 minutes. 90th percentile EMS transport time was over twice as long for volunteer agencies (45m) versus paid (21m). Turnaround time was over three times as long for volunteer agencies (1h 24m) versus paid (27m). Total call time was 2.2 times longer for volunteer agencies (2h 45m) than paid (1h16m).

## DISTANCES TRAVELED, 911 TRANSPORTS

Table 7. Distance traveled to the scene, 911 transports, GTAs, 2020

	Median Distance (Miles)	90th Percentile Distance (Miles)	N	% Missing Data
<b>Paid or Volunteer Agency</b>				
Paid Agencies	2.0	17.0	8,554	83.7%
Volunteer Agencies	2.1	17.3	4,500	53.5%
<b>Scene County</b>				
Small Metro	3.5	22.0	257	99.0%
Micropolitan	2.0	9.0	4,220	72.2%
Non-core (Rural)	2.3	19.3	8,567	56.9%
<b>All</b>	<b>2.0</b>	<b>17.0</b>	<b>13,054</b>	<b>79.0%</b>

Table 8. Distance traveled from scene to destination, 911 transports, GTAs, 2020

	Median Distance (Miles)	90th Percentile Distance (Miles)	N	% missing data
<b>Paid or Volunteer Agency</b>				
Paid Agencies	3.0	13.8	47,287	9.9%
Volunteer Agencies	8.3	36.0	8,377	13.4%
<b>Scene County</b>				
Small Metro	3.1	7.7	22,772	9.5%
Micropolitan	3.9	15.8	14,229	6.4%
Non-core (Rural)	2.5	29.0	16,952	14.7%
<b>All</b>	<b>3.3</b>	<b>19.2</b>	<b>55,664</b>	<b>10.4%</b>

Most 911 transports (79.0%) were missing data on distance traveled to the scene. In contrast, distance traveled from scene to destination- patient transport distance- was missing in 10.4% of 911 transports. Volunteer agencies transport 911 patients nearly 3 times as far as paid agencies. The 90th percentile distance for volunteer agencies was 36.0 miles, and for paid agencies it was 13.8 miles. In addition, the 90th percentile 911 patient transport distance is longer when the incident location (scene) is in a rural county (29.0 miles) versus small metro county (7.7 miles).

## INTERFACILITY AND MEDICAL TRANSPORT RESPONSES

### DEMAND ANALYSIS, INTERFACILITY AND MEDICAL TRANSPORT RESPONSES

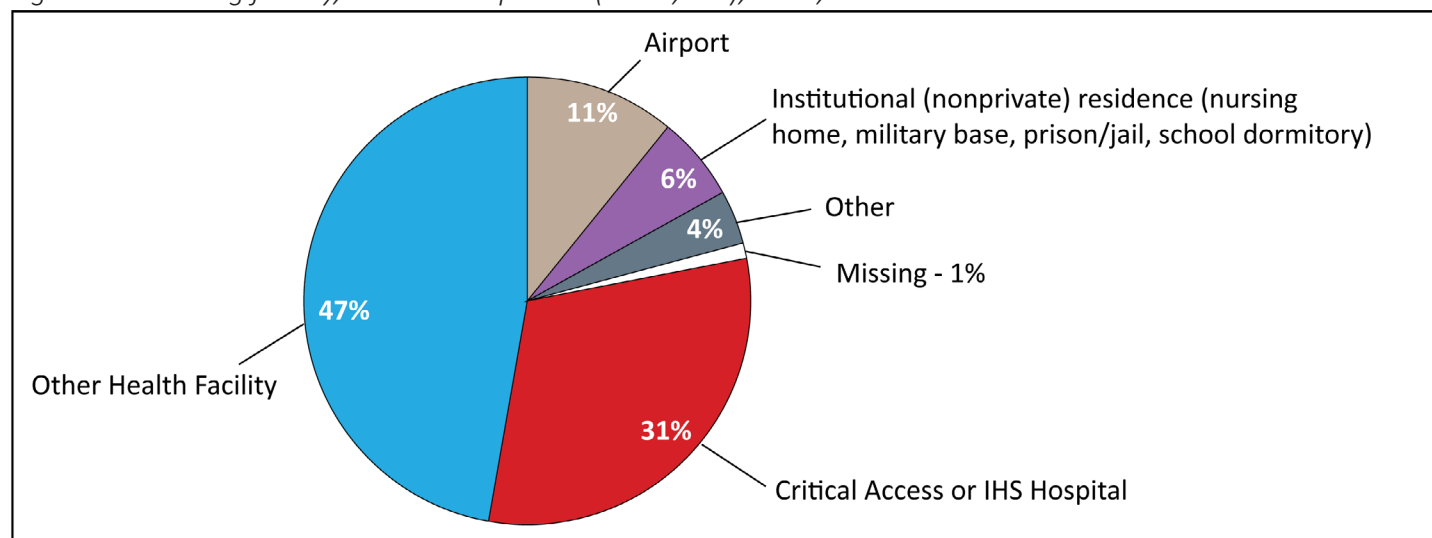
Table 9. IFMT response demand analysis showing percentage of total N=21,975, All IFMT responses, GTAs, 2020

Hour of Day	Day of Week							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0	0.38	0.27	0.33	0.41	0.38	0.32	0.42	2.50
1	0.32	0.40	0.32	0.31	0.29	0.27	0.28	2.18
2	0.26	0.24	0.28	0.28	0.27	0.26	0.27	1.86
3	0.21	0.23	0.22	0.24	0.20	0.32	0.23	1.65
4	0.25	0.19	0.15	0.18	0.20	0.18	0.24	1.37
5	0.18	0.15	0.36	0.18	0.41	0.19	0.38	1.85
6	0.17	0.24	0.21	0.23	0.28	0.23	0.24	1.60
7	0.23	0.41	0.35	0.37	0.42	0.37	0.29	2.45
8	0.32	0.39	0.54	0.55	0.67	0.55	0.30	3.33
9	0.38	0.83	1.03	1.06	0.98	1.03	0.48	5.80
10	0.49	0.96	1.27	1.06	1.27	1.10	0.85	7.01
11	0.55	1.11	1.20	1.05	1.14	1.01	0.69	6.74
12	0.62	1.07	1.11	1.22	1.21	1.39	0.71	7.33
13	0.71	1.16	1.16	1.28	1.16	1.29	0.65	7.41
14	0.60	1.11	1.25	1.27	1.13	1.11	0.74	7.20
15	0.51	1.14	1.02	1.07	0.98	1.04	0.61	6.38
16	0.63	1.05	0.76	0.86	0.91	1.01	0.51	5.72
17	0.57	0.82	0.71	0.83	0.81	0.86	0.62	5.22
18	0.55	0.71	0.68	0.67	0.61	0.75	0.49	4.47
19	0.53	0.68	0.65	0.67	0.59	0.67	0.51	4.31
20	0.51	0.59	0.56	0.50	0.55	0.52	0.53	3.76
21	0.47	0.46	0.56	0.53	0.53	0.54	0.54	3.62
22	0.43	0.40	0.47	0.47	0.48	0.54	0.38	3.17
23	0.43	0.43	0.40	0.45	0.41	0.52	0.44	3.07
Total	10.30	15.04	15.60	15.74	15.86	16.05	11.40	100.00

Table 9 presents the temporal pattern of demand for IFMT service among GTAs. Each cell represents the percentage of IFMT responses that occurred during that day of week and hour of day, with darker colors representing higher demand. Most GTA interfacility and medical transport responses occurred on weekdays, with Friday as the busiest day (16%). 54.6% of GTA interfacility and medical transport responses occurred between the hours of 9 AM to 5 PM.

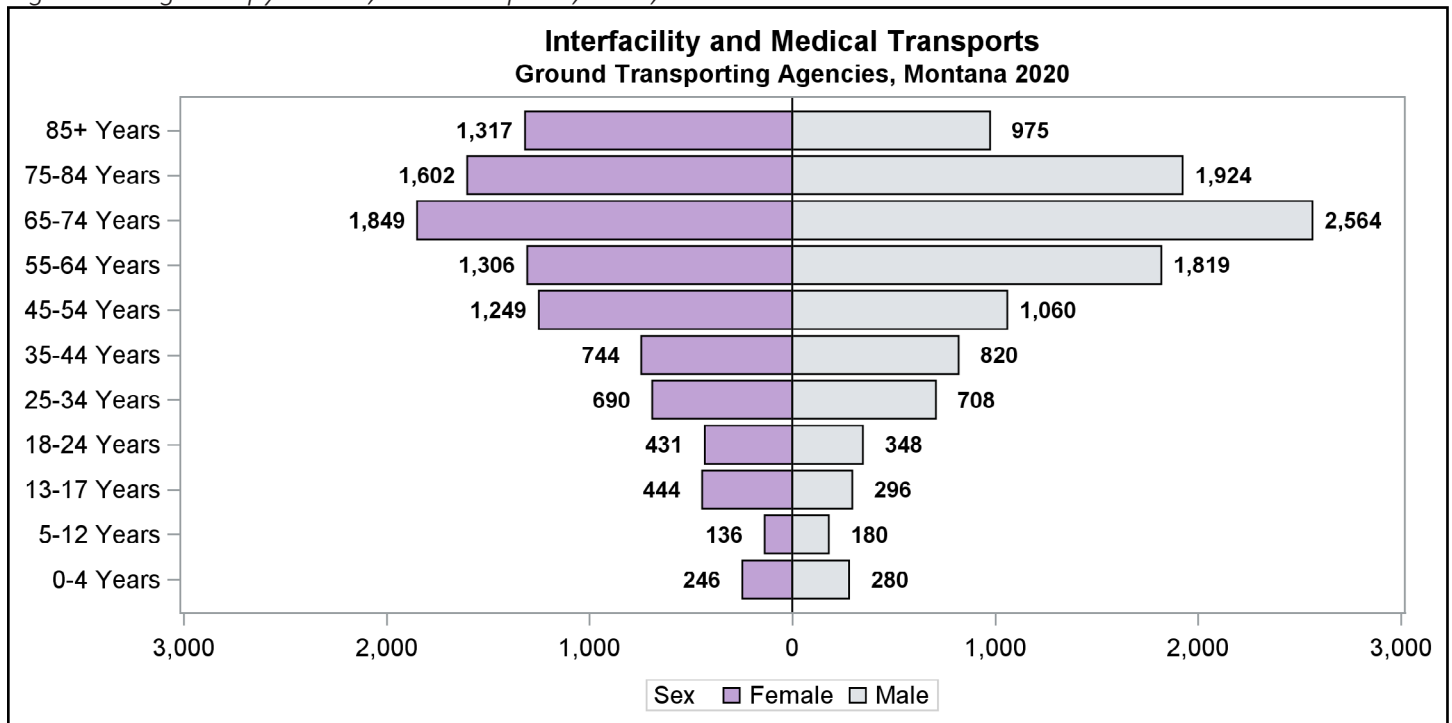
### SENDING FACILITY, INTERFACILITY AND MEDICAL TRANSPORT RESPONSES

Figure 12. Sending facility, All IFMT responses (N=21,975), GTAs, 2020



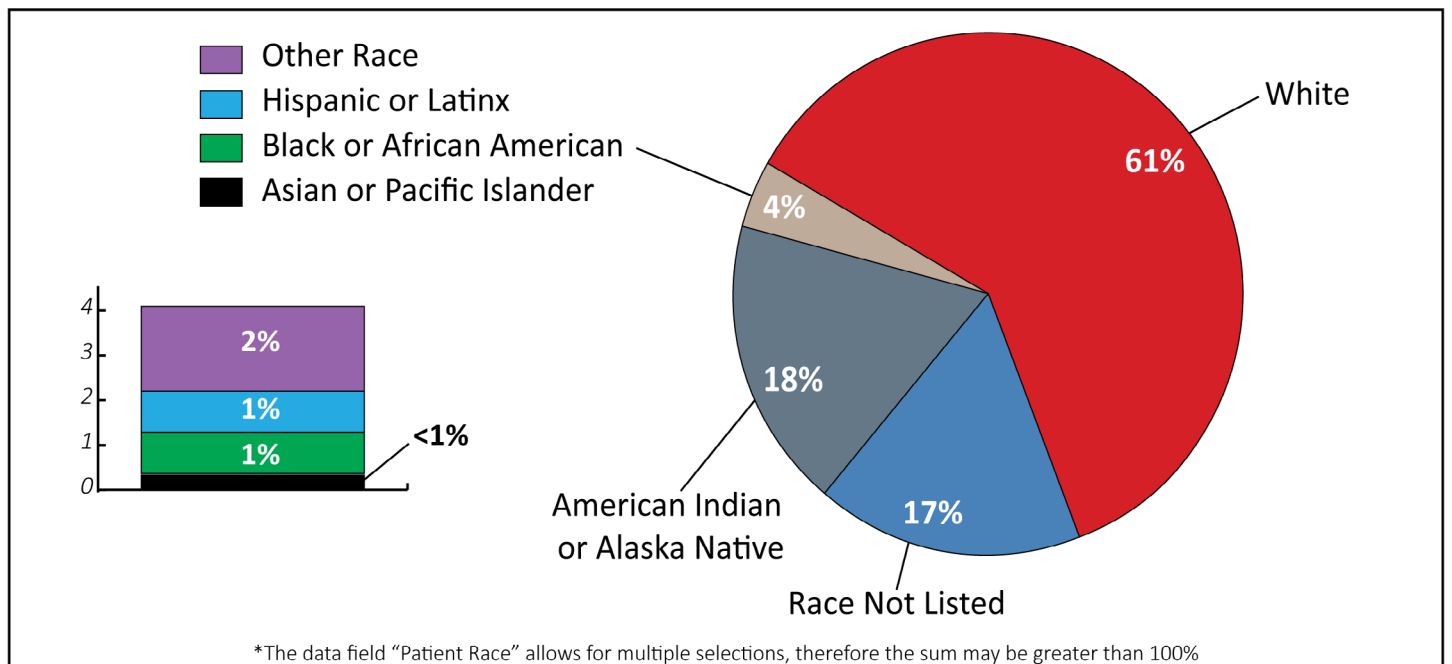
## PATIENT DEMOGRAPHICS, INTERFACILITY AND MEDICAL TRANSPORTS

Figure 13. Age-sex pyramid\*, IFM transports, GTAs, 2020



\*See Appendix 1. for comparison with Montana's population

Figure 14. Patient race/ethnicity distribution, IFM transports (N=21,222), GTAs, 2020





## PRIMARY IMPRESSION, INTERFACILITY AND MEDICAL TRANSPORTS

Table 10. Top 10 primary impressions, IFM transports, Sending facility=CAH and IHS hospitals (N=6,680)\*, GTAs, 2020

#	Primary Impression Pediatrics (Age 0-17)	N	%	Primary Impression Adults (Age 18 and Over)	N	%
1	Mental Health/Behavioral	126	26%	Cardiovascular/Circulatory	856	14%
2	Injury/Trauma	58	12%	Injury/Trauma	764	12%
3	Respiratory	46	9%	Abdominal	722	12%
4	Abdominal	42	9%	Respiratory	588	9%
5	Digestive/Gastrointestinal (GI)	25	5%	Illness and Infectious Disease	497	8%
6	Neurological	16	3%	Pain	384	6%
7	Illness and Infectious Disease	15	3%	Mental Health/Behavioral	368	6%
8	Endocrine, Nutritional, and Metabolic	13	3%	Digestive/Gastrointestinal (GI)	324	5%
9	Pain	12	2%	Malaise	314	5%
10	Alcohol, Drug, or Other Substance Exposure	10	2%	Neurological	272	4%
	<b>All Top 10</b>	<b>363</b>	<b>75%</b>	<b>All Top 10</b>	<b>5,089</b>	<b>82%</b>
	Other	35	7%	Other	943	15%
	Missing Impression	87	18%	Missing Impression	160	3%
	<b>Total (Patient Age 0-17)</b>	<b>485</b>	<b>100%</b>	<b>Total (Patient Age 18+)</b>	<b>6,192</b>	<b>100%</b>

\*Of 6,680 IFM ground transports sent from CAH or IHS facilities, 3 were missing age and were excluded from Table 10.



Table 11. Top 10 primary impressions, IFM transports, Sending facility=Other/Missing (N=14,542)\*, GTAs, 2020

#	Primary Impression Pediatrics (Age 0-17)	N	%	Primary Impression Adults (Age 18 and Over)	N	%
1	Mental Health/Behavioral	427	39%	Malaise	1,808	13%
2	Observation/Exam (No Patient Complaint)	63	6%	Dependence/Mobility	1,798	13%
3	Injury/Trauma	61	6%	Cardiovascular/Circulatory	1,241	9%
4	Respiratory	56	5%	Respiratory	1,136	8%
5	Cardiovascular/Circulatory	36	3%	Mental Health/Behavioral	996	7%
6	Pain	28	3%	Injury/Trauma	864	6%
7	Abdominal	25	2%	Pain	771	6%
8	Neurological	22	2%	Level of Consciousness	724	5%
9	Unspecific	20	2%	Observation/Exam (No Patient Complaint)	689	5%
10	Level of Consciousness	16	1%	Abdominal	544	4%
	<b>All Top 10</b>	<b>778</b>	<b>68%</b>	<b>All Top 10</b>	<b>10,571</b>	<b>79%</b>
	Other	96	8%	Other	2,660	20%
	Missing Impression	268	24%	Missing Impression	173	1%
	<b>Total (Patient Age 0-17)</b>	<b>1,142</b>	<b>100%</b>	<b>Total (Patient Age 18+)</b>	<b>13,404</b>	<b>100%</b>

\*Of 14,542 IFM ground transports sent from non-CAH, non-IHS, or missing facilities, 32 were missing age and were excluded from Table 11.

Of 21,222 IFM ground transports, 31.5% (N=6,680) were sent from CAH or IHS hospitals and 68.5% (N=14,542) were sent from other facilities (N=10,626) or were missing the sending facility name (N=3916). Mental Health/Behavioral complaints were the most common primary impression for pediatric patients, accounting for 35% of all IFM Transports regardless of what type of facility was sending the patient. For adults, when the sending facility was a CAH or IHS hospital, the most common primary impression was Cardiovascular/Circulatory (14%), followed by Injury/Trauma (12%). When the sending facility was not a CAH or IHS hospital, the most common primary impressions were Malaise (13%) and Dependence/Mobility (13%), which are likely non-acute medical transports.

## RESPONSE TIMES FOR PAID AND VOLUNTEER AGENCIES, IFM TRANSPORTS

Figure 15. Median and 90th percentile response times, IFM transports (N=18,655), Paid GTAs, 2020

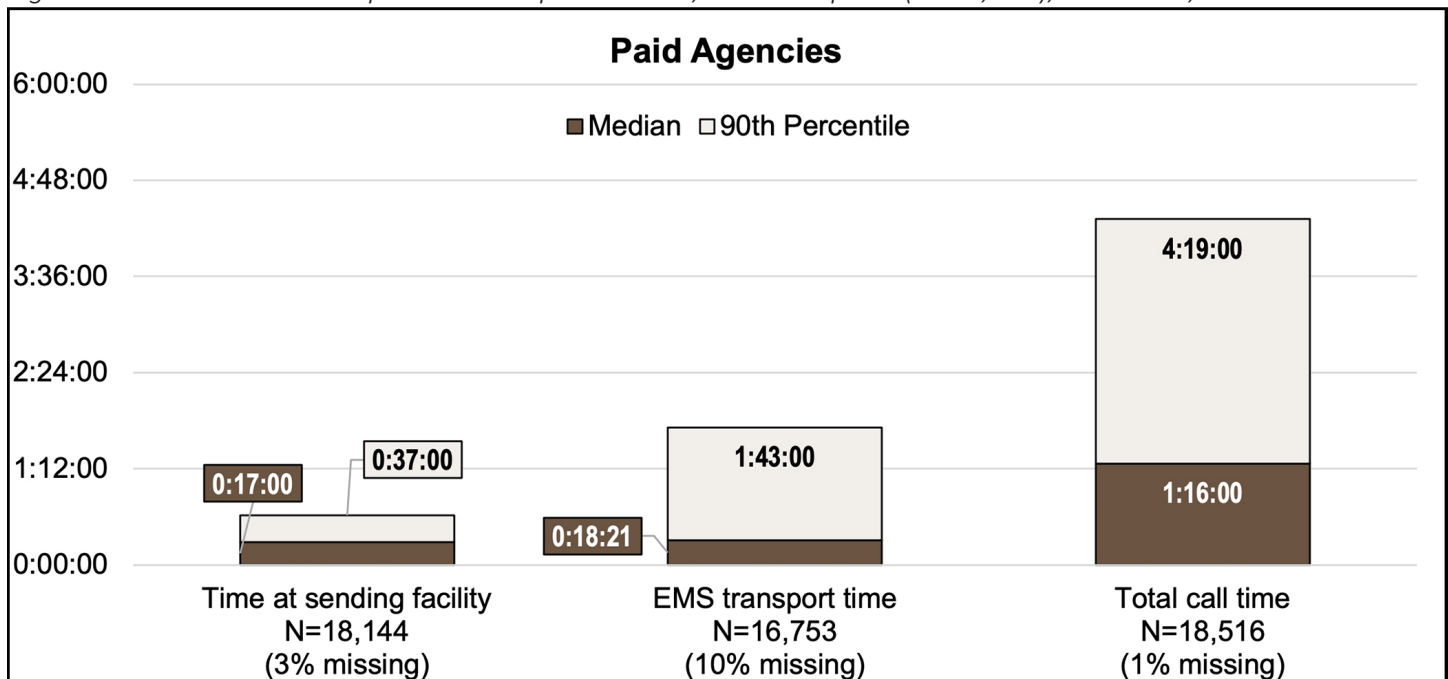
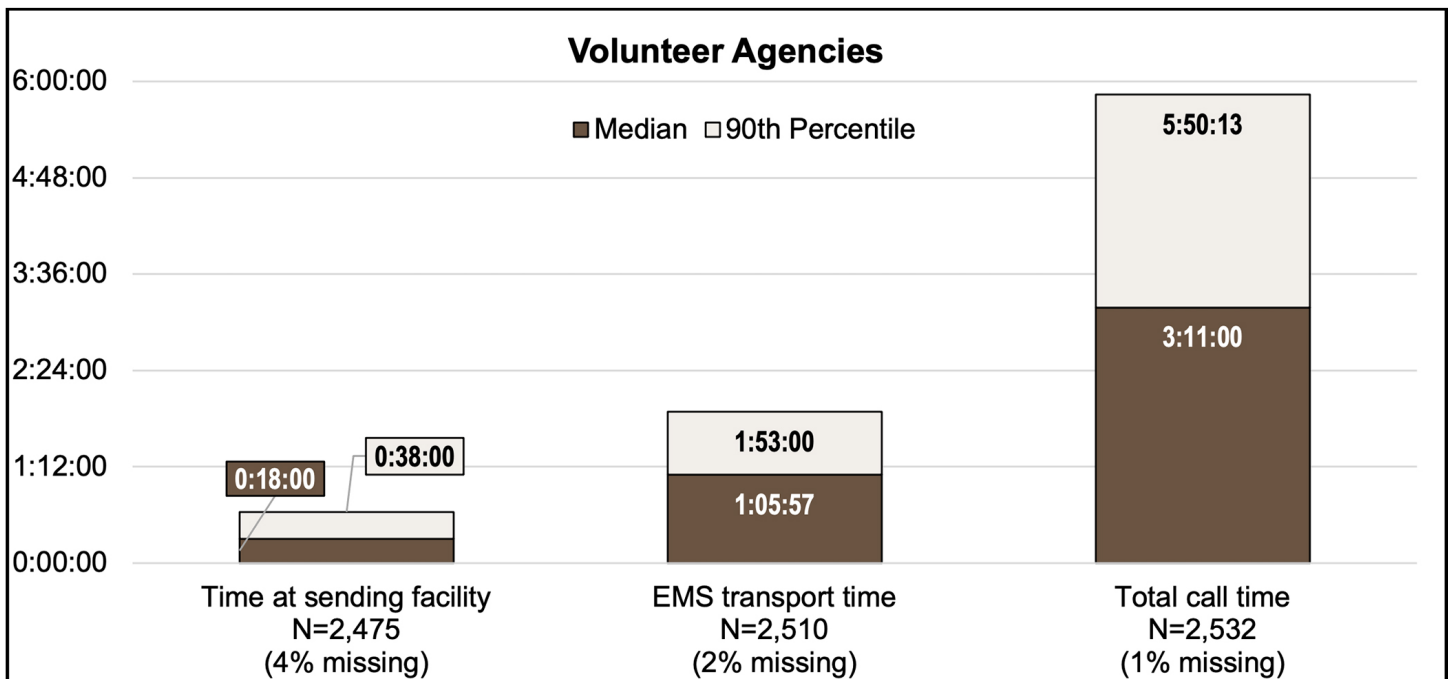


Figure 16. Median and 90th percentile response times, IFM transports (N=2,567), Volunteer GTAs, 2020



Of 21,222 IFM ground transports, 87.9% (N=18,655) were by paid GTAs and 12.1% (N=2,567) by volunteer GTAs. 90th percentile time spent at sending facility was comparable for both volunteer and paid GTAs, around 37-38 minutes. 90th percentile EMS transport time was also similar for both volunteer and paid GTAs, around 1h 50m. However, the median EMS transport time was considerably longer for volunteer agencies (1h 6m) versus paid (18m). This indicates that paid agencies skew towards shorter EMS transport times than volunteer agencies. 90th percentile total call time was 1.4 times longer for volunteer agencies and median total call time was 2.5 times longer for volunteer versus paid GTAs.

## DISTANCES TRAVELED, INTERFACILITY AND MEDICAL TRANSPORTS

Table 12. Distance traveled to the sending facility, Interfacility and medical transports, GTAs, 2020

	Median Distance (Miles)	90th Percentile Distance (Miles)	N	% Missing Data
<b>Paid or Volunteer Agency</b>				
Paid Agencies	2.0	41.0	2,572	86.2%
Volunteer Agencies	1.1	34.6	1,020	60.3%
<b>Sending Facility County</b>				
Small Metro	5.1	94.0	165	97.9%
Micropolitan	3.0	33.3	431	92.0%
Non-core (Rural)	1.0	33.0	2,990	61.7%
<b>All</b>	<b>1.2</b>	<b>38.0</b>	<b>3,592</b>	<b>83.1%</b>

Table 13. Distance traveled from sending facility to destination, Interfacility and medical transports, GTAs, 2020

	Median Distance (Miles)	90th Percentile Distance (Miles)	N	% Missing Data
<b>Paid or Volunteer Agency</b>				
Paid Agencies	7.7	102.0	16,944	9.2%
Volunteer Agencies	66.0	118.0	2,225	13.3%
<b>Sending Facility County</b>				
Small Metro	4.2	58.8	7,177	9.3%
Micropolitan	7.2	91.0	4,986	7.4%
Non-core (Rural)	61.0	117.0	6,896	11.7%
<b>All</b>	<b>11.0</b>	<b>103.0</b>	<b>19,169</b>	<b>9.7%</b>

Most agencies are not documenting the distance traveled to the sending facility for interfacility and medical transports (83.1% missing overall). Most agencies are documenting patient-loaded travel distance from the sending facility to destination for interfacility and medical transports (9.7% missing overall). The median distance is 8.6 times higher for volunteer agencies (66.0 miles) compared to paid agencies (7.7 miles). Patient transport distance is 14 times longer when the sending facility is located in a rural county (61.0 miles) versus a small metro county (4.2 miles).



# Non-Transporting Agencies

A total of 14 NTAs submitted data for this report, documenting 7,236 EMS activations during 2020. Nearly all (95.9%, N=6,942) of the records were submitted by paid NTAs and 4.1% (N=273) by volunteer NTAs. 81 of the 95 licensed NTAs in the state did not submit data. The NTAs that did not submit data largely represent small, rural volunteer agencies, therefore, data presented in this section is not representative and should be interpreted with caution.



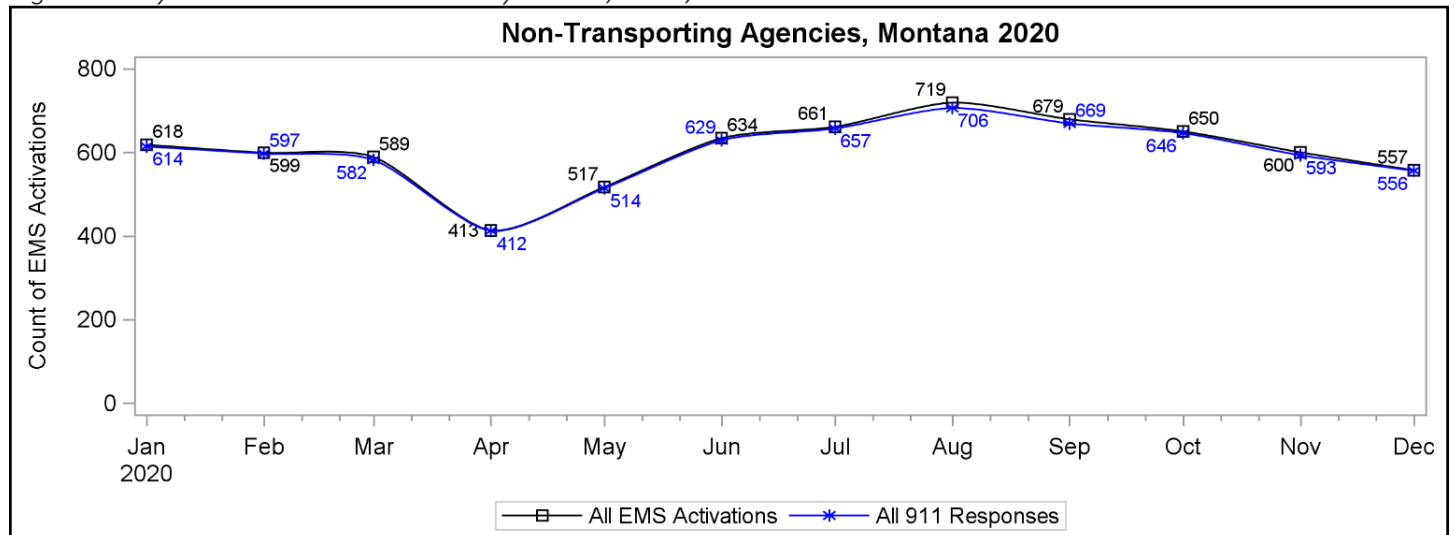
## SYSTEM UTILIZATION

Table 14. EMS activations by patient disposition and response type, NTAs, 2020

Patient Disposition	911 Response	Other	All
Patient Transported by this EMS Unit	82	1	83
Patient Treated, No Transport (per protocol)	2,711	13	2,724
Patient Evaluated, No Treatment/Transport Required	125	3	128
Patient Refusal/AMA, No Transport	230	2	232
Patient Dead at Scene, No Transport	86	0	86
Assist, Standby, or Non-patient Transport	3,917	41	3,958
Canceled Call	24	1	25
<b>All</b>	<b>7,175</b>	<b>5</b>	<b>7,236</b>

99% of NTA EMS activations (N=7,175) were 911 responses (Table 14). Over half (N=3,891) of the 911 responses had patient disposition of “Agency Assist”, which is defined as “This EMS unit only provided assistance (e.g., manpower, equipment) to another agency and did not provide treatment or primary patient care at any time during the incident.”<sup>2</sup>

Figure 17. System utilization volumes by month, NTAs, 2020



The decrease in utilization seen in April 2020 coincides with Montana’s COVID-19 stay-at-home order.



## 911 RESPONSES

### DEMAND ANALYSIS, 911 RESPONSES

Table 15. 911 Response demand analysis showing percentage of total N=7,175, NTAs, 2020

Hour of Day	Day of Week							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0	0.31	0.24	0.22	0.22	0.28	0.36	0.32	1.95
1	0.36	0.24	0.20	0.11	0.29	0.35	0.31	1.85
2	0.46	0.36	0.18	0.31	0.17	0.25	0.32	2.05
3	0.10	0.18	0.26	0.15	0.24	0.17	0.17	1.27
4	0.21	0.22	0.25	0.13	0.21	0.26	0.24	1.52
5	0.38	0.21	0.15	0.18	0.22	0.25	0.33	1.73
6	0.28	0.38	0.42	0.45	0.39	0.32	0.25	2.48
7	0.56	0.71	0.36	0.57	0.52	0.50	0.47	3.69
8	0.64	0.72	0.68	0.67	0.77	0.70	0.68	4.86
9	0.54	0.88	0.72	0.60	0.82	0.91	0.64	5.11
10	0.72	0.85	0.75	0.96	0.86	0.70	0.57	5.42
11	0.72	0.96	0.67	1.10	0.57	0.89	0.72	5.64
12	0.85	0.93	0.98	0.96	0.89	0.99	0.82	6.43
13	0.66	0.82	0.79	0.64	1.11	0.93	0.67	5.63
14	0.84	0.68	0.68	0.75	0.92	0.74	0.84	5.45
15	0.68	0.93	0.79	0.70	0.88	0.85	0.66	5.49
16	0.56	0.96	0.85	0.78	0.72	0.88	0.74	5.49
17	0.74	0.84	0.77	0.88	0.78	0.82	0.88	5.70
18	0.66	0.79	0.95	1.10	0.88	0.96	0.95	6.29
19	0.74	0.84	0.96	0.78	0.88	0.61	0.81	5.62
20	0.78	0.70	0.61	0.63	0.79	0.86	0.92	5.30
21	0.63	0.64	0.57	0.68	0.43	0.71	0.71	4.38
22	0.42	0.70	0.50	0.53	0.56	0.40	0.60	3.71
23	0.45	0.56	0.38	0.36	0.35	0.39	0.46	2.94
Total	13.27	15.34	13.71	14.24	14.54	14.82	14.08	100.00

Table 15 presents the temporal pattern of demand for 911 service among NTAs. Each cell represents the percentage of 911 responses that occurred during that day of week and hour of day, with darker colors representing higher demand. 15.3% of NTA 911 responses occurred on Mondays, which was the busiest day of the week. 57.2% of NTA 911 responses occurred between the hours of 10AM to 8PM.



## PRIMARY IMPRESSION, 911 RESPONSES

Table 16. Top 10 primary impressions, All 911 responses (N=7,175)\*, NTAs, 2020

#	Primary Impression Pediatrics (Age 0-17)	N	%	Primary Impression Adults (Age 18 and Over)	N	%
1	Injury/Trauma	43	13%	Injury/Trauma	539	9%
2	Neurological	18	5%	Cardiovascular/Circulatory	448	7%
3	Mental Health/Behavioral	18	5%	Respiratory	326	5%
4	Respiratory	10	3%	Neurological	323	5%
5	Level of Consciousness	9	3%	Malaise	254	4%
6	Alcohol, Drug, or Other Substance Exposure	8	2%	Level of Consciousness	242	4%
7	Pain	5	2%	Mental Health/Behavioral	206	3%
8	Observation/Exam (No Patient Complaint)	5	2%	Pain	186	3%
9	Illness and Infectious Disease	†		Alcohol, Drug, or Other Substance Exposure	160	3%
10	Digestive/Gastrointestinal (GI)	†		Abdominal	145	2%
	<b>All Top 10</b>	<b>124</b>	<b>37%</b>	<b>All Top 10</b>	<b>2,829</b>	<b>45%</b>
	Other	18	5%	Other	514	8%
	Missing Impression	190	57%	Missing Impression	2,909	47%
	<b>Total (Patient Age 0-17)</b>	<b>332</b>	<b>100%</b>	<b>Total (Patient Age 18+)</b>	<b>6,252</b>	<b>100%</b>

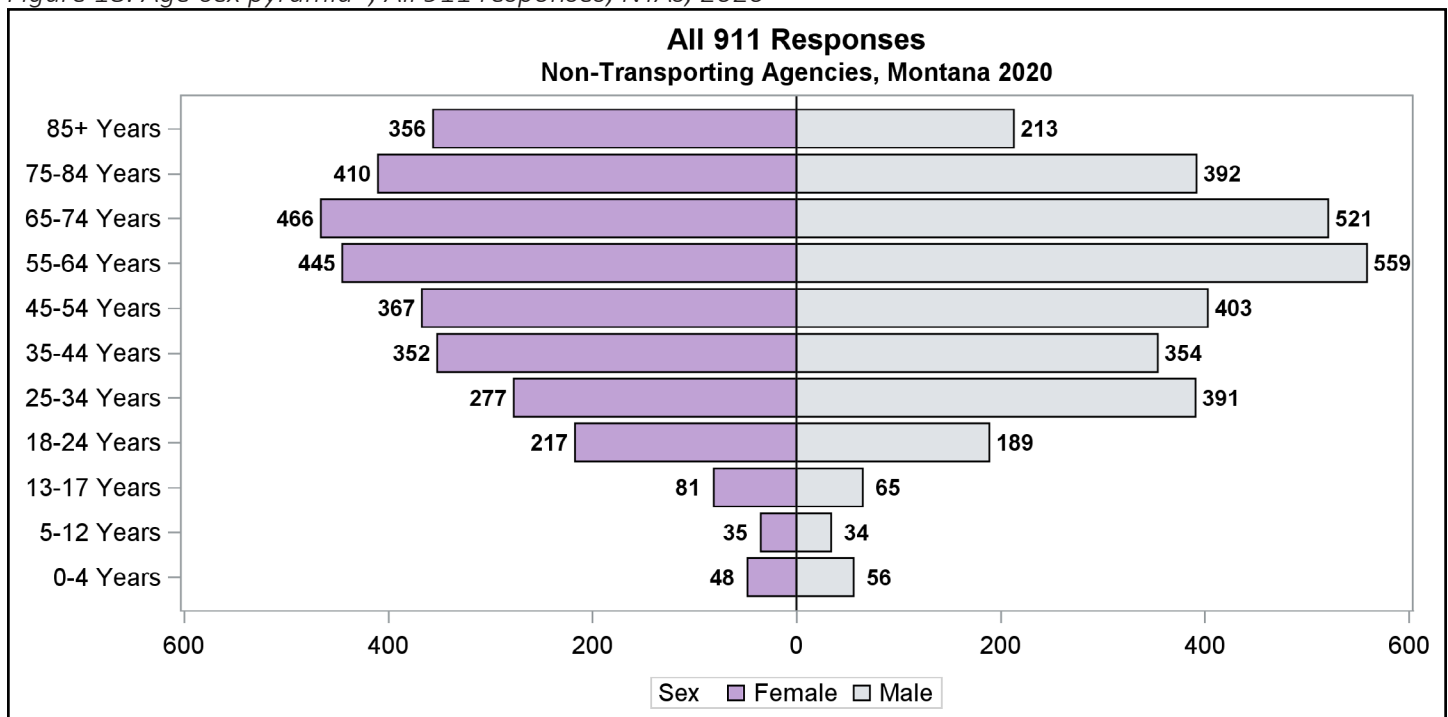
†= Suppressed value, count is <5; \*Of 7,175 NTA 911 responses, 591 were missing age and were excluded from Table 16





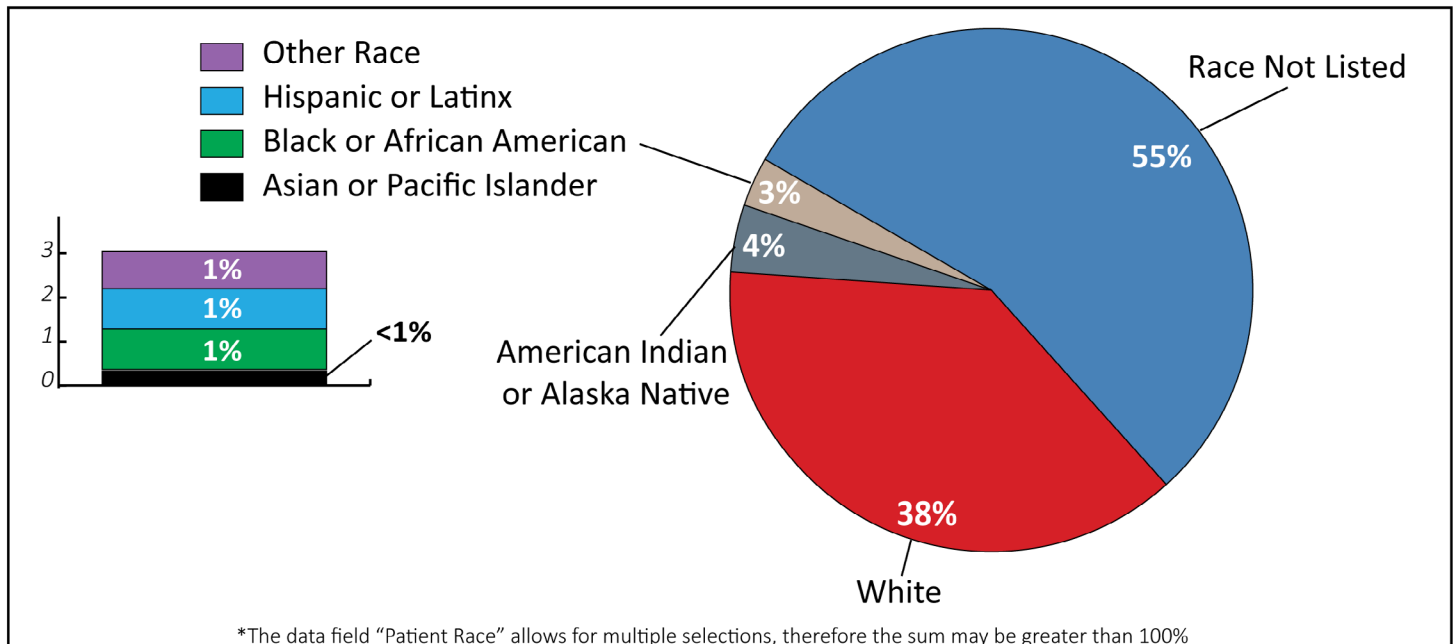
## PATIENT DEMOGRAPHICS, 911 RESPONSES

Figure 18. Age-sex pyramid\*, All 911 responses, NTAs, 2020



\*See Appendix 1. for comparison with Montana's population

Figure 19. Patient race/ethnicity distribution, All 911 responses (N=7,175), NTAs, 2020



## RESPONSE TIMES FOR PAID AND VOLUNTEER AGENCIES, 911 RESPONSES

Figure 20. Median and 90th percentile response times, All 911 responses (N=6,902), Paid NTAs, 2020

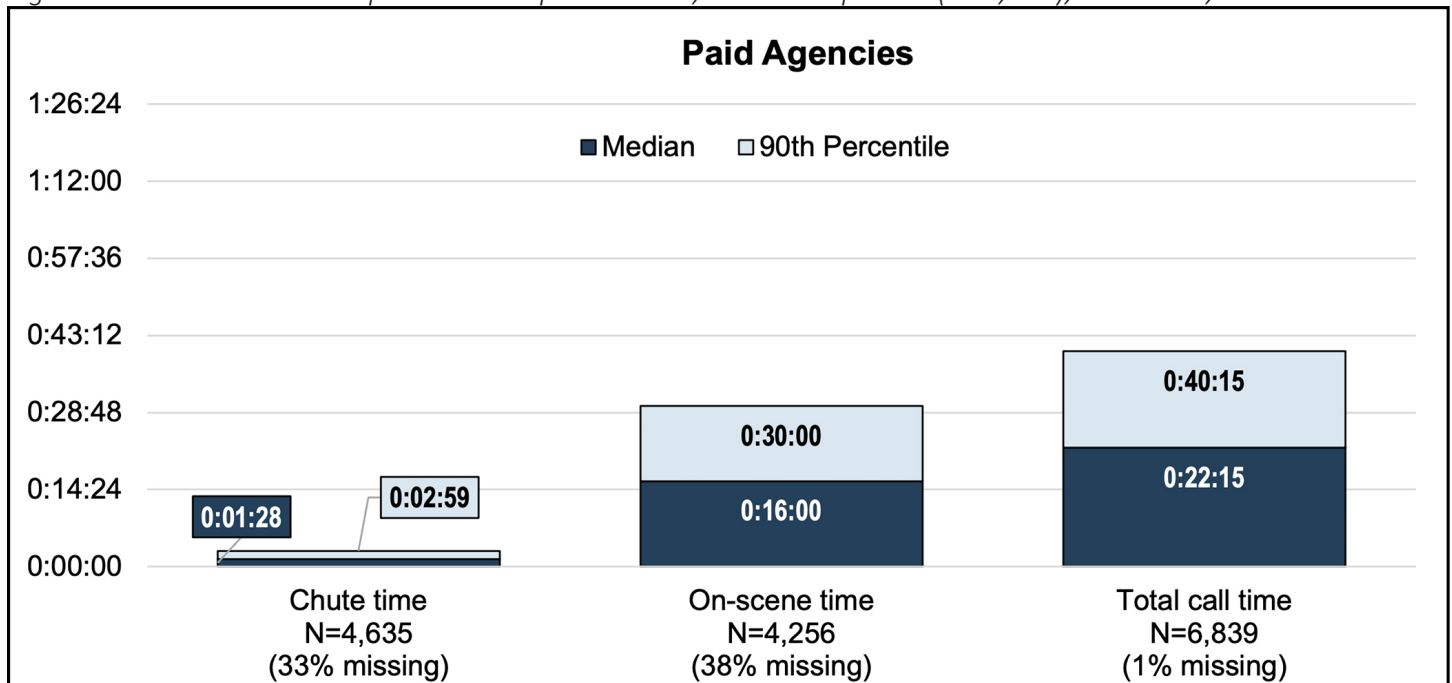
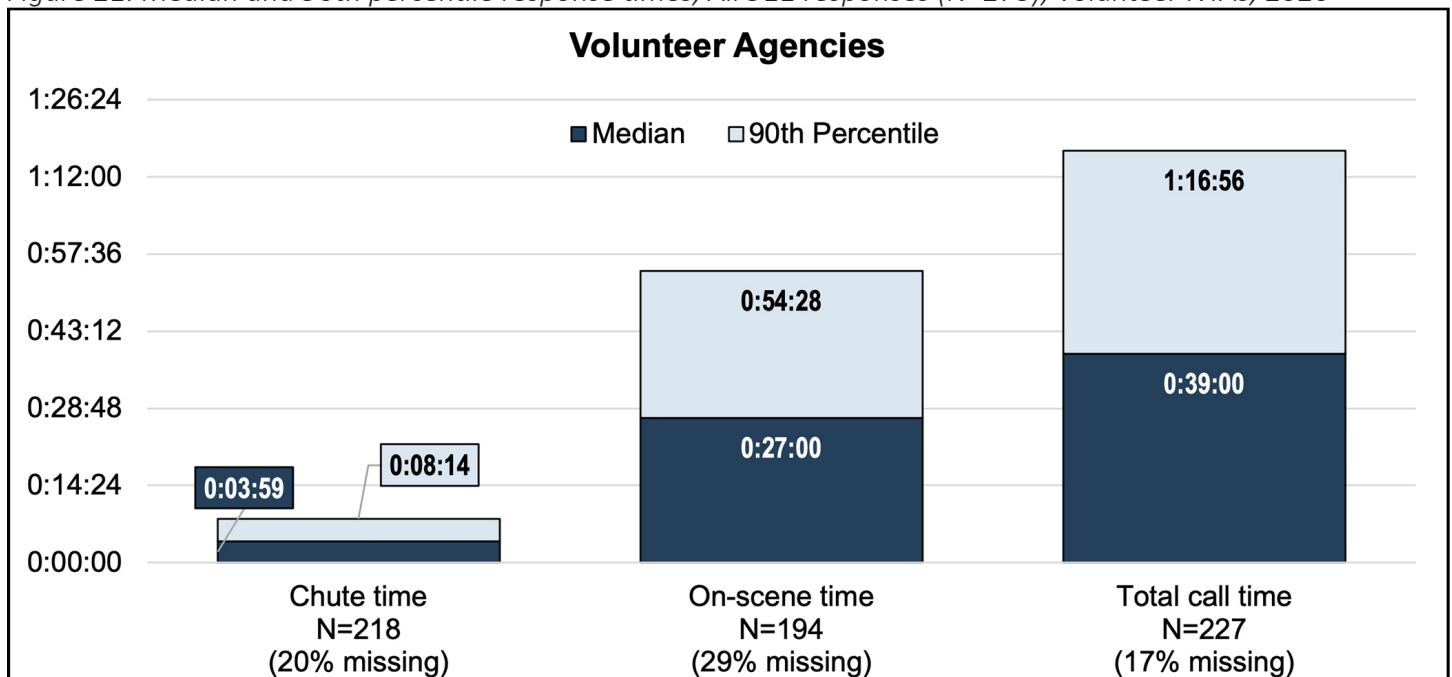


Figure 21. Median and 90th percentile response times, All 911 responses (N=273), Volunteer NTAs, 2020



Of 7,175 GTA 911 responses, 96.2% (N=6,902) were by paid agencies and 3.8% (N=273) by volunteer agencies. 90th percentile chute time was almost three times longer for volunteer (8m 14s) compared to paid NTAs (2m 59s). 90th percentile on-scene time was 1.8 times longer for volunteer NTAs (54m 28s) compared with paid (30m). Total call time was 1.9 times longer for volunteer NTAs (1h 16m 56s) than paid (40m 15s).



# Air Medical Agencies

A total of 12 AMAs (6 rotor wing and 6 fixed wing) submitted data for this report, documenting 5,102 EMS activations during 2020. 55% (N=2,821) of the records were submitted RWAs and 45% (N=2,281) by FWAs.



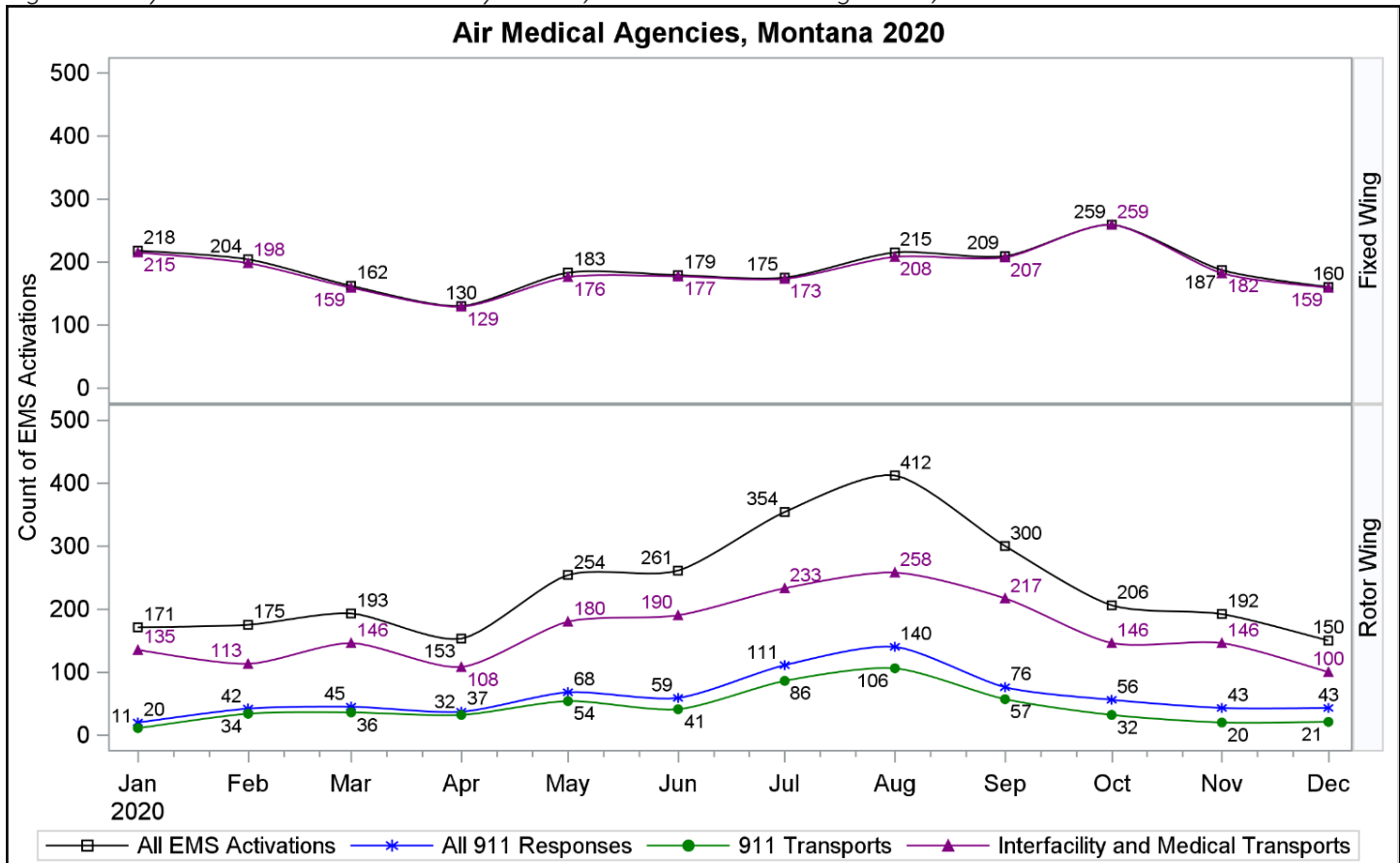
## SYSTEM UTILIZATION

Table 17. EMS activations by patient disposition and response type, Fixed and rotor wing AMAs, 2020

Patient Disposition	911 Response	IFMT Response	Other	All RWA	IFMT Response	Other	All FWA
Patient Transported by this EMS Unit	530	1,972	35	2,537	2,242	16	2,258
Patient Treated, No Transport (per protocol)	9	2	0	11	2	0	2
Patient Evaluated, No Treatment/Transport Required	0	0	0		1	0	1
Patient Refusal/AMA, No Transport	15	0	1	16	0	0	0
Patient Dead at Scene, No Transport	9	7	0	16	0	0	0
Assist, Standby, or Non-patient Transport	0	0	1	1	0	2	2
Canceled Call	177	52	11	240	18	0	18
<b>All</b>	<b>740</b>	<b>2,033</b>	<b>48</b>	<b>2,821</b>	<b>2,263</b>	<b>18</b>	<b>2,281</b>

Nearly all (99.2%, N=2,263) FWA activations were IFM transports. Among RWA activations, 72% (N=2,033) were IFMT responses and 26% (N=740) were 911 responses. 71% (N=530) of RWA 911 responses resulted in patient transport (Table 17). Table 19 details why the remaining 210 patients were not transported following 911 responses.

Figure 22. System utilization volumes by month, Fixed and rotor wing AMAs, 2020





The decrease in utilization seen in April 2020 coincides with Montana's COVID-19 stay-at-home order. Rotor wing utilization increased during the summer months. On average there were 190 fixed wing and 235 rotor wing EMS activations per month in 2020.

## 911 RESPONSES

### DEMAND ANALYSIS, ROTOR WING 911 RESPONSES

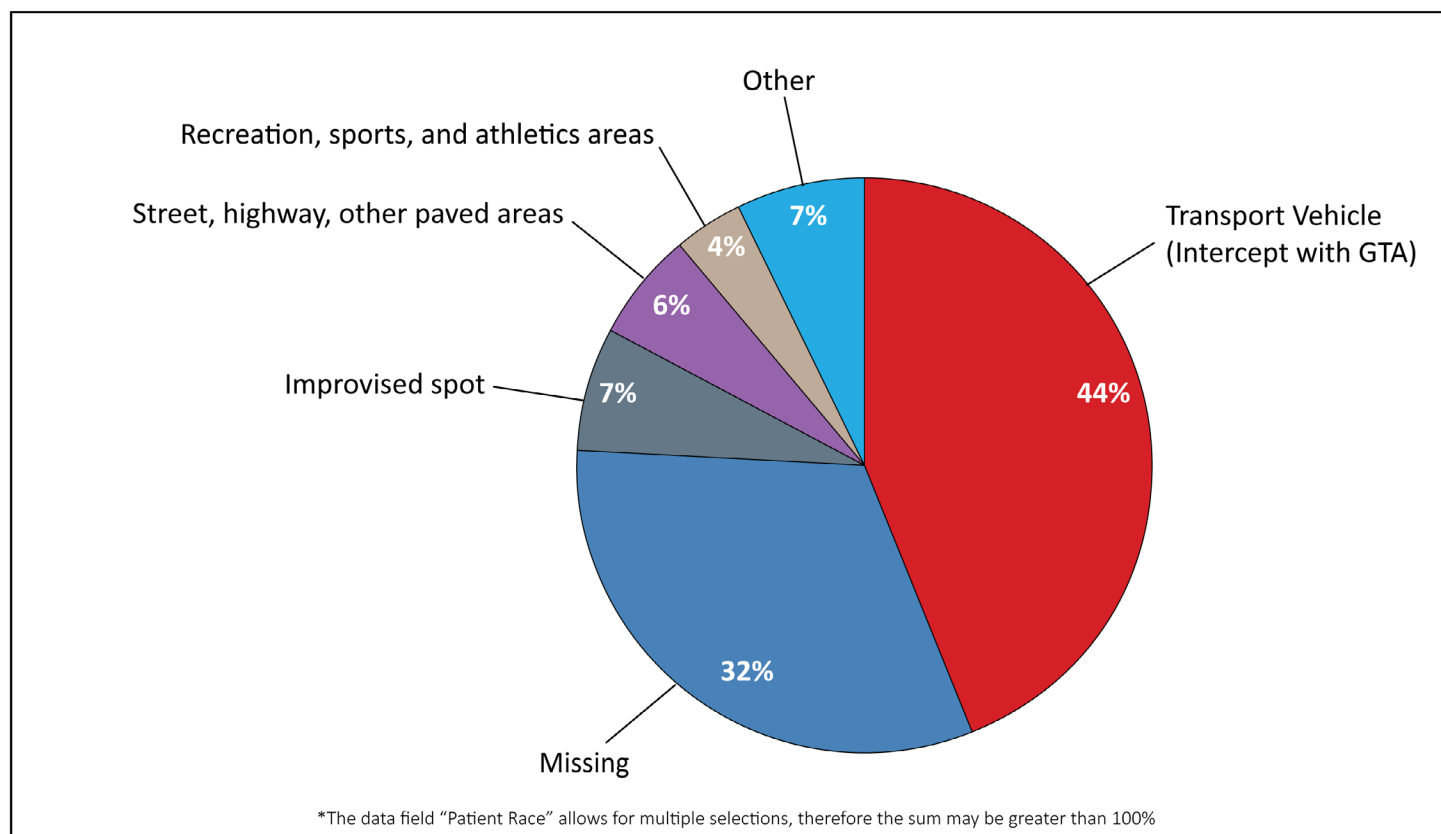
Table 18. 911 response demand analysis showing percentage of total N=740, RWAs, 2020

Hour of Day	Day of Week							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0	0.27	0.14	0.14	0.27	0.27	0.27	0.27	1.62
1	0.41	0.00	0.27	0.41	0.54	0.00	0.54	2.16
2	0.27	0.14	0.27	0.00	0.14	0.14	0.68	1.62
3	0.41	0.00	0.14	0.14	0.00	0.41	0.41	1.49
4	0.00	0.00	0.14	0.14	0.27	0.41	0.14	1.08
5	0.14	0.14	0.27	0.14	0.27	0.14	0.27	1.35
6	0.14	0.54	0.68	0.14	0.14	0.41	0.41	2.43
7	0.41	0.54	0.54	0.27	0.27	0.27	0.54	2.84
8	0.14	0.41	0.41	0.27	0.68	0.81	0.81	3.51
9	0.81	0.27	0.27	0.54	0.41	0.27	0.68	3.24
10	0.41	0.41	0.41	1.08	0.81	0.54	0.68	4.32
11	0.81	0.81	0.81	0.81	0.81	0.54	1.22	5.81
12	1.08	1.08	0.54	1.08	0.81	0.81	0.81	6.22
13	0.95	1.22	0.68	0.27	0.41	0.81	1.22	5.54
14	1.49	0.54	1.22	0.95	1.22	1.08	2.16	8.65
15	1.08	0.81	0.81	0.41	1.62	0.95	1.76	7.43
16	2.16	0.95	0.68	0.54	0.81	0.68	1.76	7.57
17	1.08	0.27	0.54	0.54	0.68	0.54	1.76	5.41
18	1.22	0.54	1.08	0.68	0.14	1.22	1.22	6.08
19	0.81	1.08	0.81	1.08	0.81	1.08	0.27	5.95
20	1.08	0.81	0.68	0.41	0.68	0.81	0.54	5.00
21	0.81	0.41	0.54	1.08	0.81	0.68	0.54	4.86
22	1.22	0.27	0.00	0.27	0.41	0.41	0.41	2.97
23	0.14	0.41	0.41	0.41	0.81	0.27	0.41	2.84
Total	17.30	11.76	12.30	11.89	13.78	13.51	19.46	100.00

Table 18 presents the temporal pattern of demand for 911 service among RWAs. Each cell represents the percentage of 911 responses that occurred during that day of week and hour of day, with darker colors representing higher demand. Saturdays (19.5%) and Sundays (17.3%) were the busiest days of the week for rotor wing 911 responses. 52.9% of rotor wing 911 responses occurred between the hours of 12PM-8PM.

## SCENE LOCATION, ROTOR WING 911 RESPONSES

Figure 23. Scene location, All 911 responses (N=740), RWAs, 2020



## ROTOR WING 911 RESPONSES WITH NO TRANSPORT

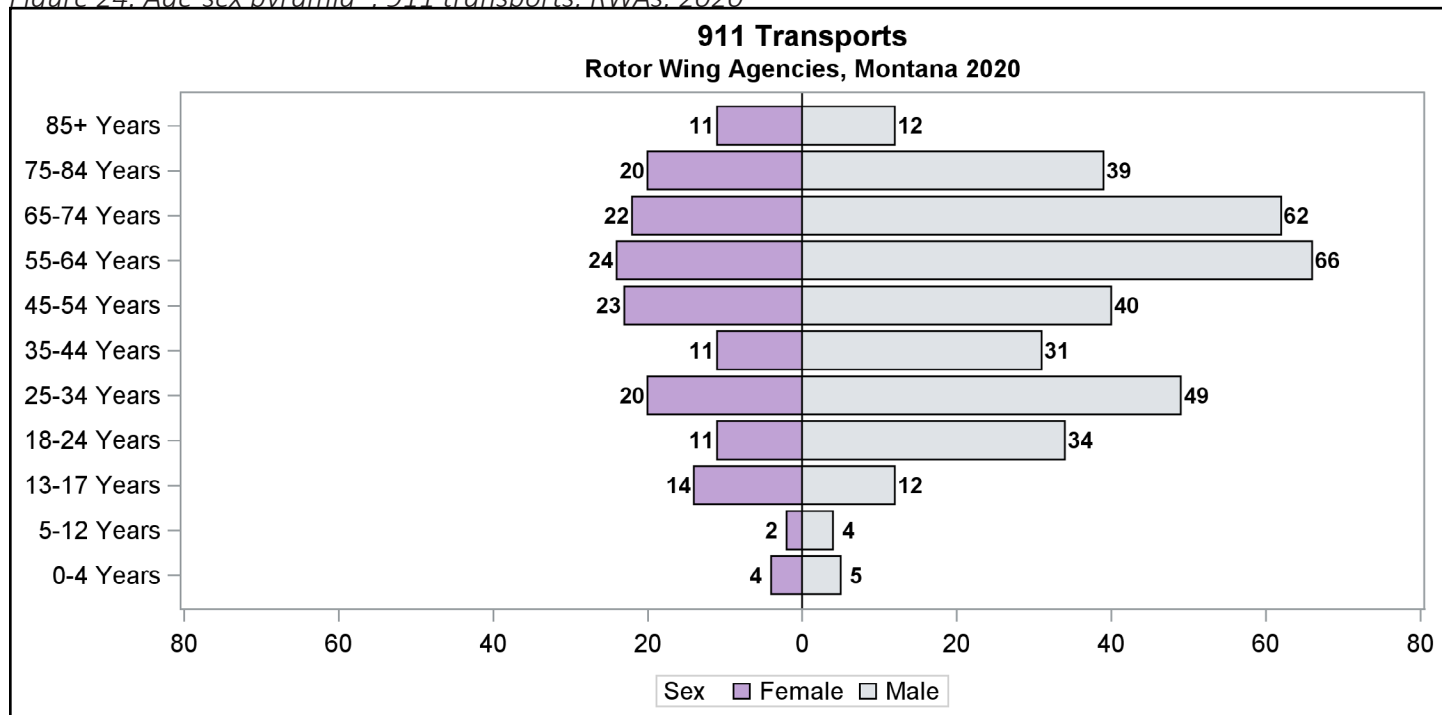
Table 19. Reason for 911 responses with no patient transport, RWAs, 2020

Reason for no patient transport	N	%
Canceled call	177	84.3%
Patient refusal	15	7.1%
Patient treated, transferred care to another EMS unit	9	4.3%
Patient dead at scene	9	4.3%
<b>All</b>	<b>210</b>	<b>100.0%</b>

There were 210 RWA 911 responses that did not result in patient transport. Canceled calls accounted for 84% (Table 19).

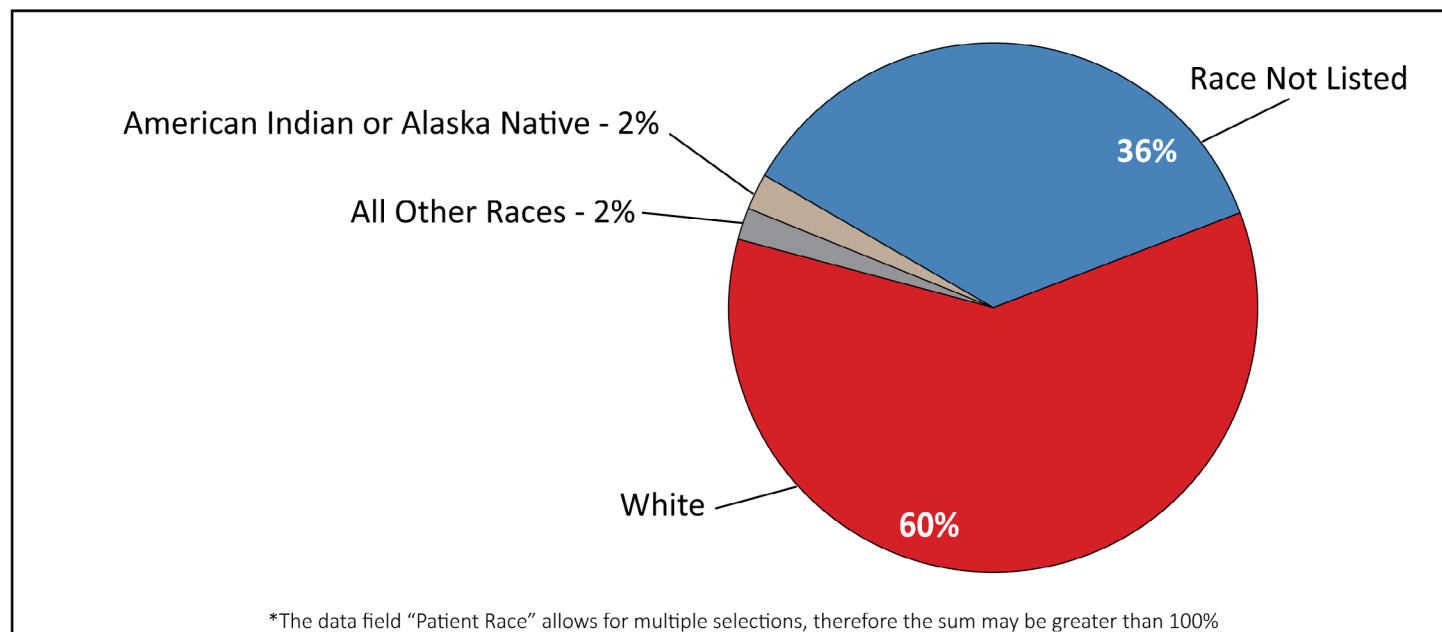
## PATIENT DEMOGRAPHICS, ROTOR WING 911 TRANSPORTS

Figure 24. Age-sex pyramid\*: 911 transports, RWAs, 2020



\*See Appendix 1. for comparison with Montana's population

Figure 25. Patient race/ethnicity distribution, 911 transports (N=530), RWAs 2020



## PRIMARY IMPRESSIONS, ROTOR WING 911 TRANSPORTS

Table 20. Top 10 primary Impressions, 911 transports (N=530)\*, RWAs, 2020

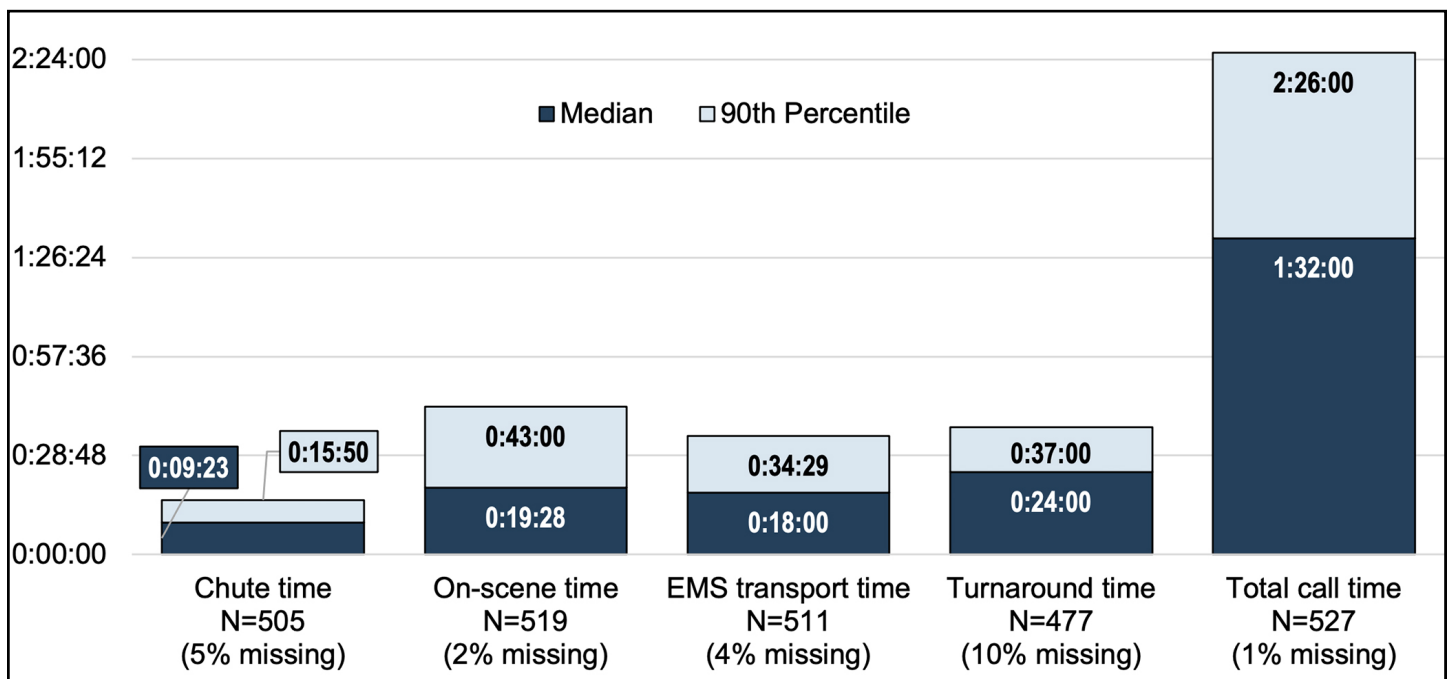
#	Primary Impression Pediatrics (Age 0-17)	N	%	Primary Impression Adults (Age 18 and Over)	N	%
1	Injury/Trauma	35	81%	Injury/Trauma	195	40%
2	Level of Consciousness	†		Cardiovascular/Circulatory	64	13%
3	Allergic Reaction	†		Neurological	31	6%
4	Neurological	†		Level of Consciousness	25	5%
5	Mental Health/Behavioral	†		Respiratory	17	4%
6	Pain	†		Abdominal	15	3%
7				Pain	13	3%
8				Endocrine, Nutritional, and Metabolic	6	1%
9				Mental Health/Behavioral	5	1%
10				Illness and Infectious Disease	5	1%
	<b>All Top 10</b>	<b>40</b>	<b>93%</b>	<b>All Top 10</b>	<b>376</b>	<b>78%</b>
	Other	0	0%	Other	14	3%
	Missing Impression	3	7%	Missing Impression	95	20%
	<b>Total (Patient Age 0-17)</b>	<b>43</b>	<b>100%</b>	<b>Total (Patient Age 18+)</b>	<b>485</b>	<b>100%</b>

†= Suppressed value, count is <5

\*Of 530 rotor wing 911 transports, 2 were missing age and were excluded from Table 20.

## RESPONSE TIMES, ROTOR WING 911 TRANSPORTS

Figure 26. Median and 90th percentile response times, 911 transports (N=530), RWAs, 2020





## INTERFACILITY AND MEDICAL TRANSPORT RESPONSES

### DEMAND ANALYSIS, AIR MEDICAL INTERFACILITY AND MEDICAL TRANSPORT RESPONSES

Table 21. IFMT response demand analysis showing percentage of total N=4,296, Fixed and rotor wing AMAs, 2020

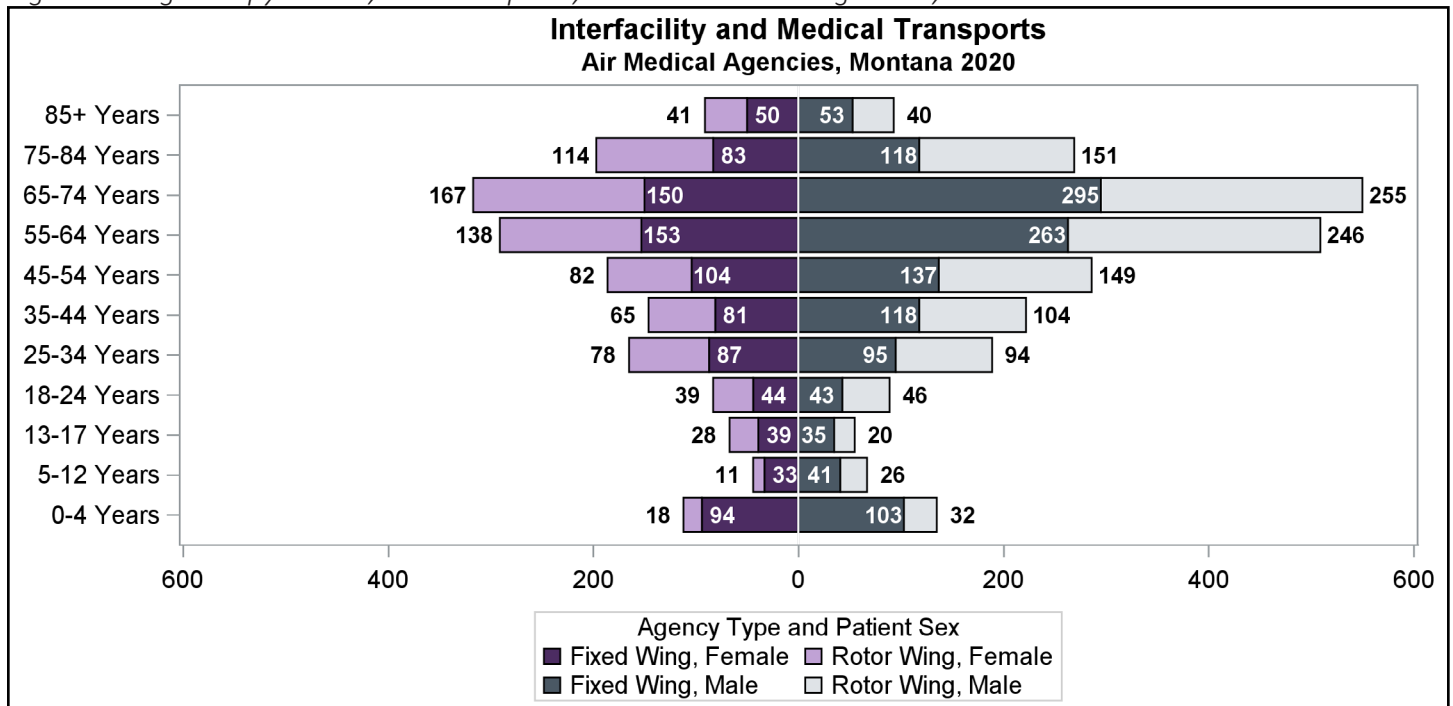
Hour of Day	Day of Week							Total
	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	
0	0.54	0.19	0.44	0.44	0.47	0.49	0.33	2.89
1	0.42	0.40	0.30	0.23	0.30	0.30	0.68	2.63
2	0.42	0.28	0.26	0.26	0.28	0.14	0.40	2.03
3	0.28	0.21	0.28	0.35	0.37	0.19	0.19	1.86
4	0.30	0.19	0.23	0.44	0.28	0.26	0.40	2.09
5	0.23	0.14	0.14	0.26	0.14	0.23	0.33	1.47
6	0.33	0.23	0.16	0.09	0.40	0.40	0.42	2.03
7	0.28	0.47	0.35	0.40	0.47	0.37	0.21	2.54
8	0.30	0.30	0.47	0.51	0.47	0.37	0.37	2.79
9	0.47	0.65	0.54	0.49	0.56	0.49	0.77	3.96
10	0.56	0.84	0.86	0.49	0.72	0.81	0.61	4.89
11	0.68	0.58	0.74	0.98	0.88	0.61	0.98	5.45
12	0.77	0.74	0.91	0.81	0.98	0.81	1.00	6.03
13	0.58	0.91	0.72	0.93	1.00	1.05	0.88	6.08
14	0.61	1.19	0.63	1.05	0.88	0.86	0.74	5.96
15	0.81	0.98	0.91	0.98	1.05	1.05	0.68	6.45
16	1.07	1.28	0.77	1.19	0.93	1.02	0.63	6.89
17	0.88	0.95	0.84	0.84	0.58	0.95	0.47	5.52
18	0.93	0.79	0.63	0.72	0.81	0.93	0.61	5.42
19	0.56	0.68	0.93	0.79	0.86	0.98	0.81	5.61
20	0.58	0.51	0.72	0.68	0.88	0.65	0.84	4.86
21	0.70	0.49	0.58	0.51	0.74	0.77	0.95	4.75
22	0.49	0.63	0.56	0.58	0.81	0.63	0.70	4.40
23	0.65	0.35	0.63	0.49	0.51	0.33	0.47	3.42
Total	13.43	13.97	13.59	14.50	15.39	14.69	14.43	100.00

Table 21 presents the temporal pattern of demand for IFM service among AMAs. Each cell represents the percentage of IFMT responses that occurred during that day of week and hour of day, with darker colors representing higher demand. Thursdays (15.39%) were the busiest day of the week for air medical interfacility and medical transports. 53.4% of air medical interfacility and medical transports occurred between the hours of 11AM and 8 PM.



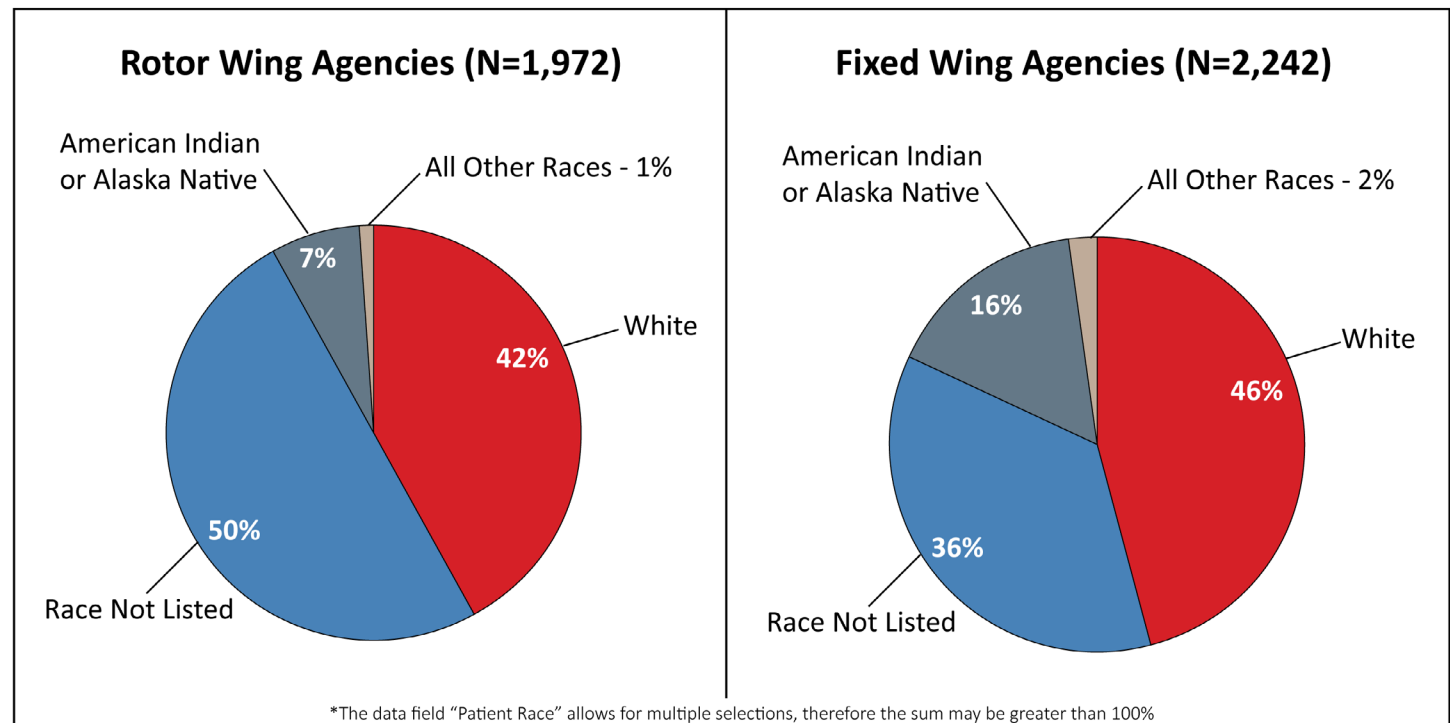
## PATIENT DEMOGRAPHICS, AIR MEDICAL INTERFACILITY AND MEDICAL TRANSPORTS

Figure 27. Age-sex pyramid\*, IFM transports, Fixed and rotor wing AMAs, 2020



\*See Appendix 1. for comparison with Montana's population

Figure 28. Patient race/ethnicity distribution, IFM transports (N=4,214), Fixed and rotor wing AMAs, 2020



## PRIMARY IMPRESSION, AIR MEDICAL INTERFACILITY AND MEDICAL TRANSPORTS

Table 22. Top 10 primary impressions, IFM transports (N=1,972)\*, RWAs, 2020

#	Primary Impression Pediatrics (Age 0-17)	N	%	Primary Impression Adults (Age 18 and Over)	N	%
1	Injury/Trauma	41	30%	Cardiovascular/Circulatory	390	21%
2	Endocrine, Nutritional, and Metabolic	11	8%	Injury/Trauma	276	15%
3	Respiratory	6	4%	Illness and Infectious Disease	144	8%
4	Illness and Infectious Disease	6	4%	Abdominal	144	8%
5	Alcohol, Drug, or Other Substance Exposure	6	4%	Neurological	141	8%
6	Cardiovascular/Circulatory	†		Respiratory	126	7%
7	Pain	†		Level of Consciousness	79	4%
8	Level of Consciousness	†		Endocrine, Nutritional, and Metabolic	45	2%
9	Abdominal	†		Obstetric/Gynecological (OB/GYN)	37	2%
10	Neurological	†		Pain	21	1%
	<b>All Top 10</b>	<b>87</b>	<b>64%</b>	<b>All Top 10</b>	<b>1,403</b>	<b>76%</b>
	Other	†		Other	65	4%
	Missing Impression	48	35%	Missing Impression	367	20%
	<b>Total (Patient Age 0-17)</b>	<b>136</b>	<b>100%</b>	<b>Total (Patient Age 18+)</b>	<b>1,835</b>	<b>100%</b>

†= Suppressed value, count is <5

\*Of 1,972 rotor wing IFM transports, 1 patient was missing age and was excluded from Table 22.

Table 23. Top 10 primary impressions, IFM transports (N=2,242)\*, FWAs, 2020

#	Primary Impression Pediatrics (Age 0-17)	N	%	Primary Impression Adults (Age 18 and Over)	N	%
1	Injury/Trauma	42	12%	Cardiovascular/Circulatory	263	14%
2	Abdominal	24	7%	Injury/Trauma	182	10%
3	Neurological	13	4%	Respiratory	175	9%
4	Pain	13	4%	Abdominal	150	8%
5	Illness and Infectious Disease	12	3%	Neurological	139	7%
6	Endocrine, Nutritional, and Metabolic	11	3%	Illness and Infectious Disease	115	6%
7	Respiratory	9	3%	Level of Consciousness	88	5%
8	Obstetric/Gynecological (OB/GYN)	8	2%	Pain	81	4%
9	Cardiovascular/Circulatory	8	2%	Mental Health/Behavioral	39	2%
10	Burn	7	2%	Digestive/Gastrointestinal (GI)	28	1%
	<b>All Top 10</b>	<b>147</b>	<b>42%</b>	<b>All Top 10</b>	<b>1,260</b>	<b>67%</b>
	Other	20	6%	Other	152	8%
	Missing Impression	180	52%	Missing Impression	479	25%
	<b>Total (Patient Age 0-17)</b>	<b>347</b>	<b>100%</b>	<b>Total (Patient Age 18+)</b>	<b>1,891</b>	<b>100%</b>

\*Of 2,242 fixed wing IFM transports, 4 were missing age and were excluded from Table 23.

Of 4,214 air medical IFM transports, 47% (N=1,972) were rotor wing and 53% (N=2,242) were fixed wing. Injury/Trauma was the most common primary impression for pediatric patients for both agency types, accounting for 17% (N=83) of air medical IFM transports overall. Among adult patients, Cardiovascular/Circulatory complaints were the most common primary impression, accounting for 18% overall (N=653), followed by Injury/Trauma (12%, N=458).

## RESPONSE TIMES, AIR MEDICAL INTERFACILITY AND MEDICAL TRANSPORTS

Figure 29. Median and 90th percentile response times, IFM transports, Sending facility= CAH and IHS hospitals (N=2,118), Fixed and rotor wing AMAs, 2020

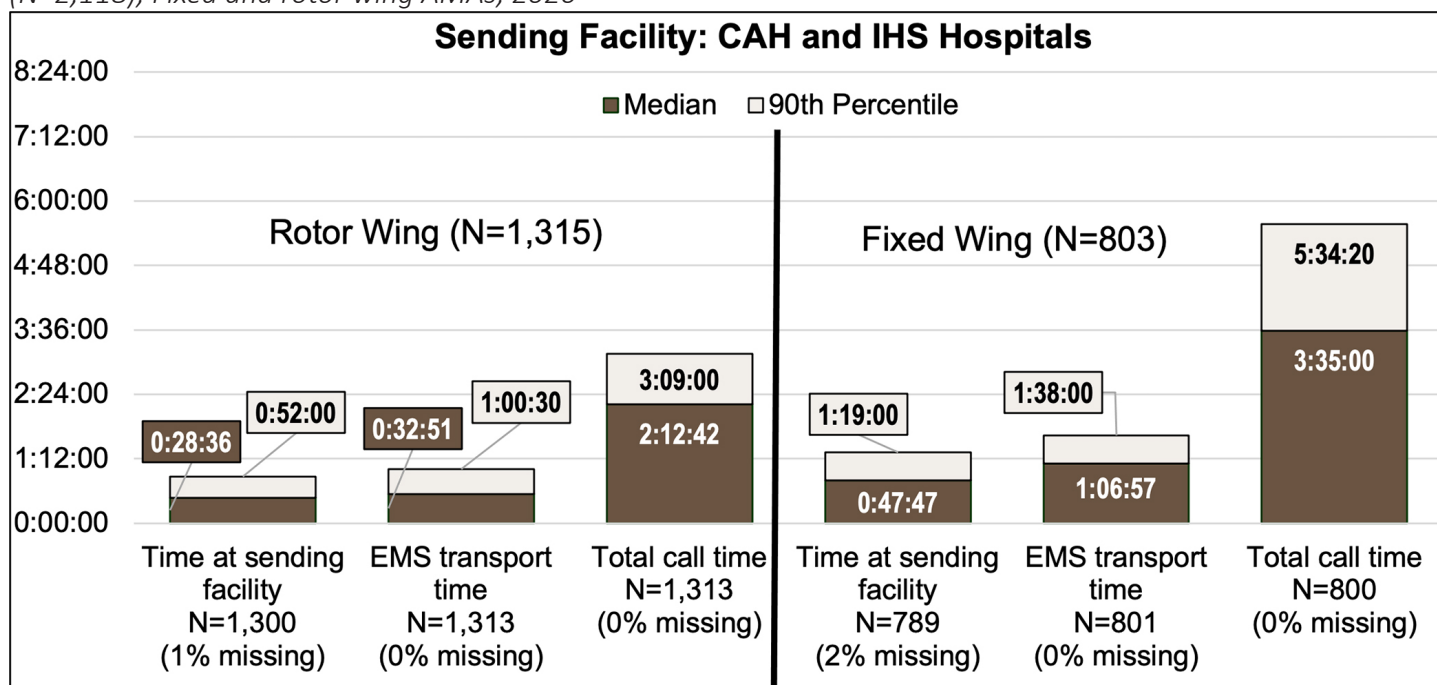
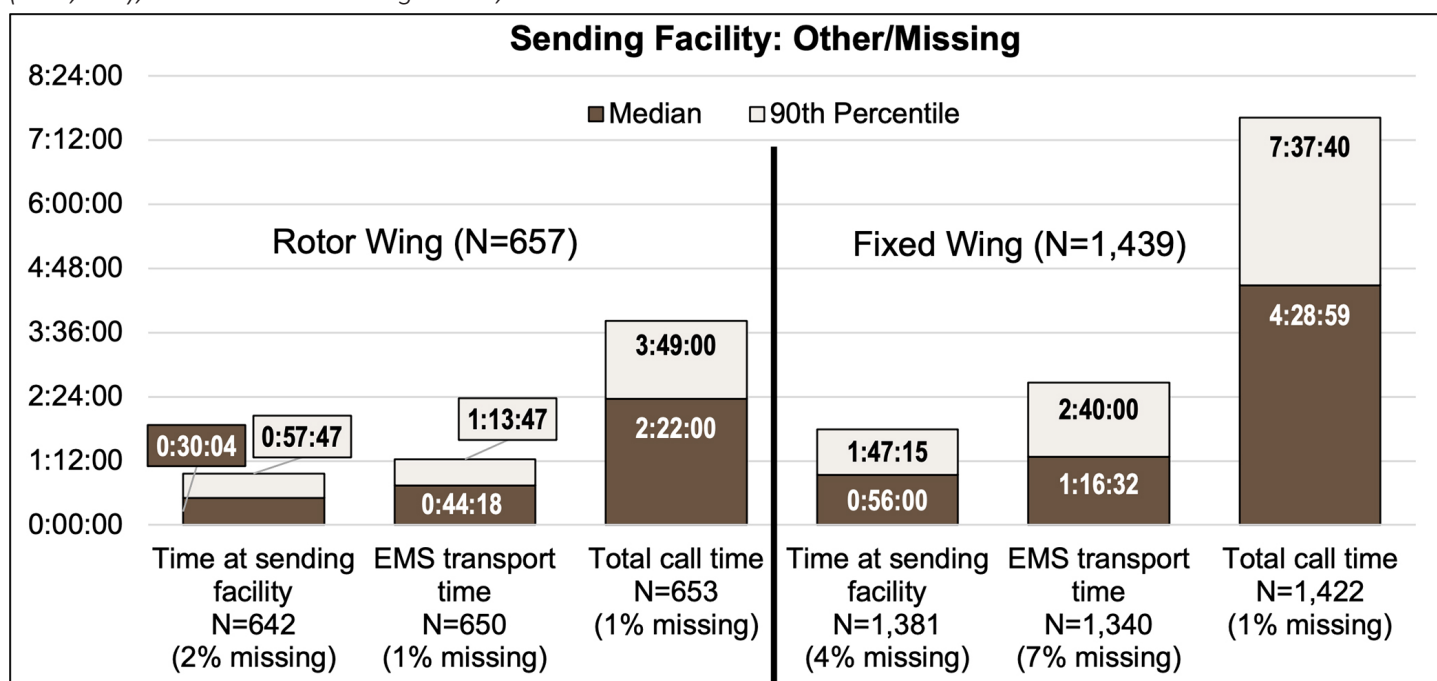


Figure 30. Median and 90th percentile response times, IFM transports, Sending facility= Other/Missing (N=2,096), Fixed and rotor wing AMAs, 2020





Of 1,972 rotor wing IFM transports, 66.7% originated from CAH or IHS hospitals and 33.3% were sent from other facilities or were missing the sending facility name. Among RWAs, 90th percentile time spent at sending facility was comparable for all facility types (52-58 min). RWA EMS transport time was also similar for all facility types, around 1h to 1h 14 min.

Of 2,242 fixed wing IFM transports, 35.8% were sent from CAH or IHS hospitals, and 64.2% from other or missing facilities. Among FWAs, the 90th percentile EMS transport time and total call time were longer when the sending facility was not a CAH or IHS hospital. This reflects transports going out-of-state originating from larger hospitals



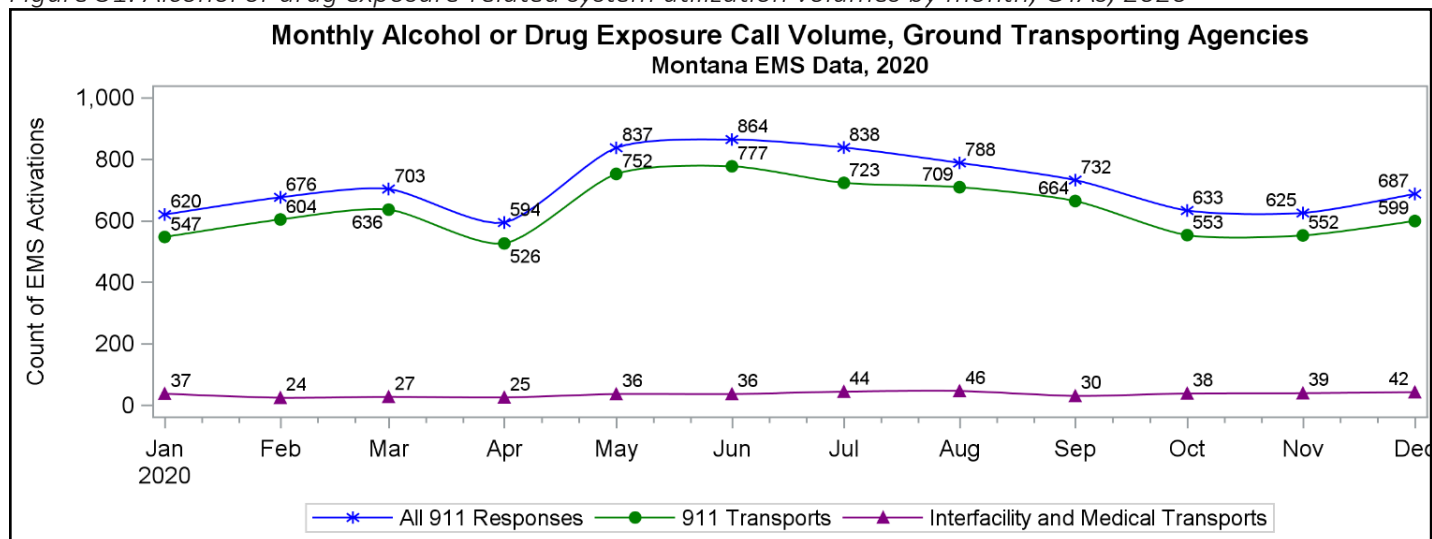


# Time-Sensitive Illness and Injury



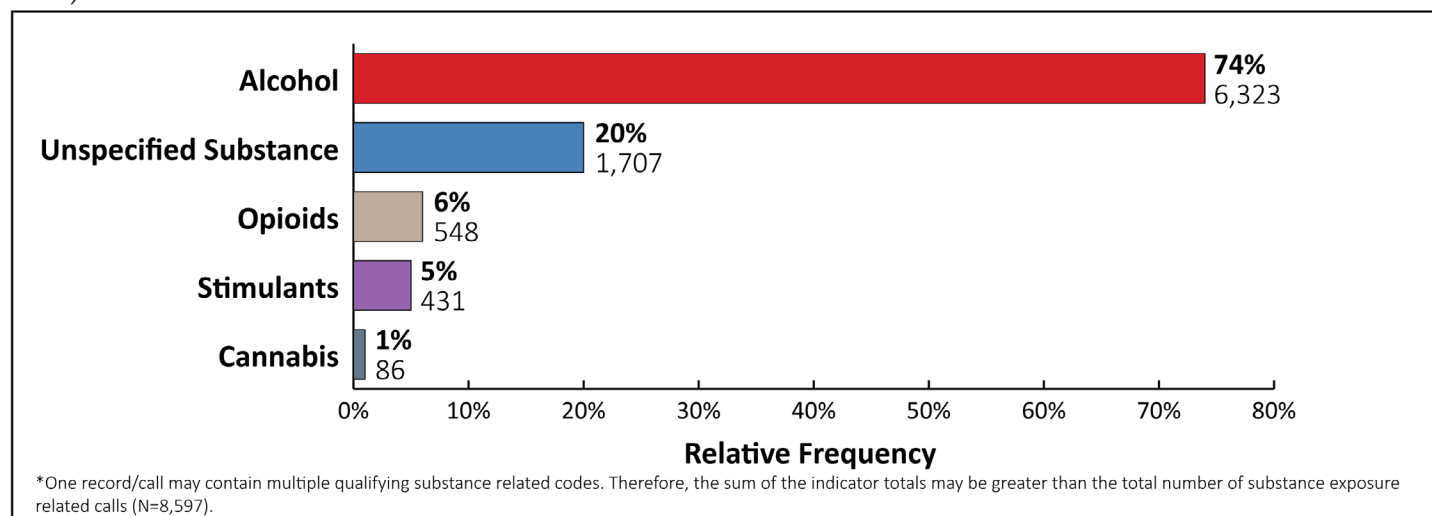
## ALCOHOL/DRUG EXPOSURE\*

Figure 31. Alcohol or drug exposure-related system utilization volumes by month, GTAs, 2020



There were a total of 8,597 alcohol or drug exposure related 911 responses by GTAs in 2020. 89% (N=7,642) resulted in patient transport. There were 424 interfacility and medical transports related to alcohol or drug exposure.

Figure 32. Relative frequency of substances involved, alcohol/drug exposure-related 911 responses (N=8,597), GTAs, 2020



Alcohol was involved in 74% (N=6,323) of all substance-related 911 responses. The “Unspecified Substance” category refers to cases where a specific substance was not noted. Opioids were involved in 6% (N=548) of substance exposure-related 911 responses, and stimulants were involved in 5% (N=431).

Table 24. Alcohol/drug exposure-related 911 responses, GTAs, 2020

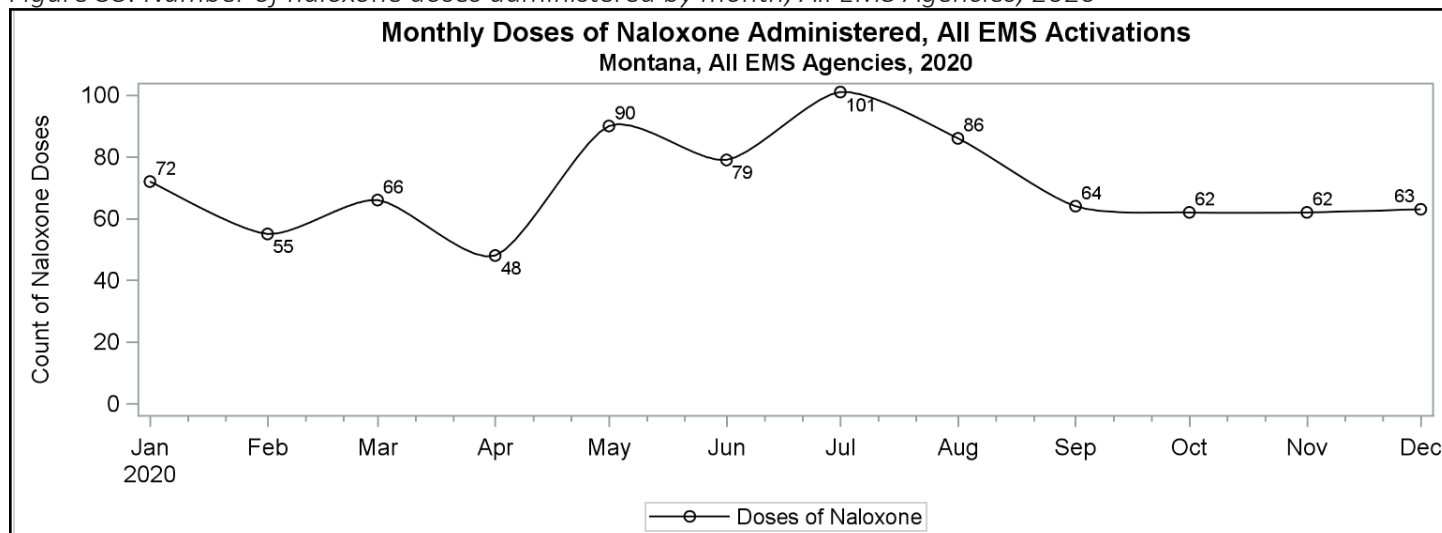
Patient Disposition	N	%
Patient Transported by this EMS Unit	7,642	88.9%
Patient Treated/Evaluated, No Transport (per protocol)	431	5.0%
Patient Refusal/AMA, No Transport	473	5.5%
Patient Dead at Scene, No Transport	12	0.1%
Other (No Patient Contact)	39	0.5%
<b>Patient Sex</b>		
Female	3,018	35.1%
Male	5,523	64.2%
Not Reported	56	0.7%
<b>Patient Age</b>		
0-17 Years	349	4.1%
18-44 Years	4,355	50.7%
45-64 Years	3,211	37.4%
65+ Years	625	7.3%
Not Reported	57	0.7%
<b>Incident County NCHS Urban-Rural Classification</b>		
Small Metro	4,623	53.8%
Micropolitan	1,605	18.7%
Non-core (Rural)	2,008	23.4%
Not Reported	361	4.2%
<b>Self-Harm Indicated</b>		
Self-harm code	627	7.3%
No self-harm code	7,970	92.7%
<b>Total</b>	<b>8,597</b>	<b>100.0%</b>



## NALOXONE REPORT

Naloxone is an opioid antagonist medication indicated for the complete or partial reversal of opioid overdose, as well as for unresponsive patients where opioid overdose is not known but is possible. There were 848 doses of naloxone administered during 675 EMS activations in Montana during 2020, by all EMS agencies in the state. The average number of naloxone doses given per EMS activation was 1.26.

Figure 33. Number of naloxone doses administered by month, All EMS Agencies, 2020



## INJURY/TRAUMA\*

### INJURY/TRAUMA-RELATED 911 TRANSPORTS

Trauma (injury) is the main reason for 911 transport, accounting for approximately 1 in 5 ground 911 transports and 2 in 5 air medical 911 transports. During 2020, there were 22,556 GTA 911 responses for trauma and 75% (N=16,909) resulted in transport of the patient. There were 326 rotor wing 911 responses for trauma and 94% (N=306) resulted in transport of the patient.

Figure 34. Trauma-related 911 response volumes by month, GTAs/RWAs, 2020

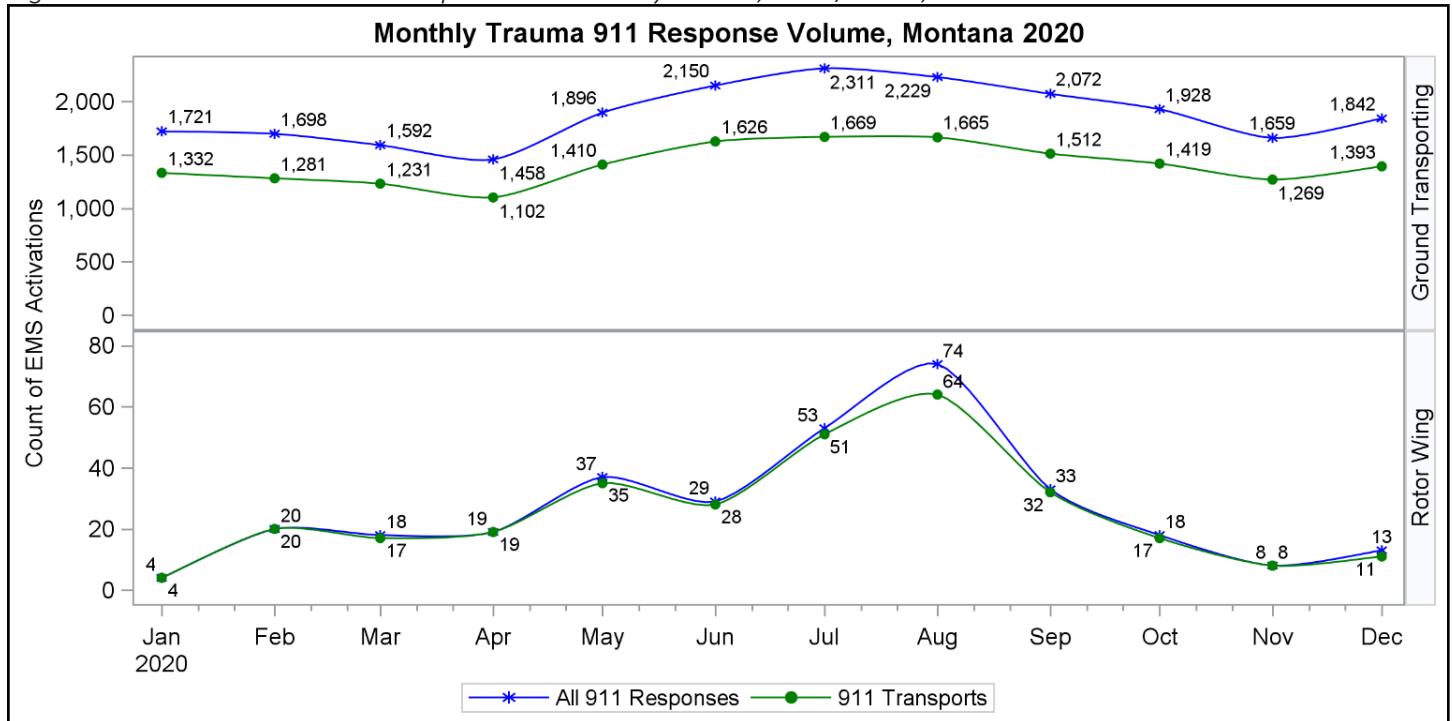
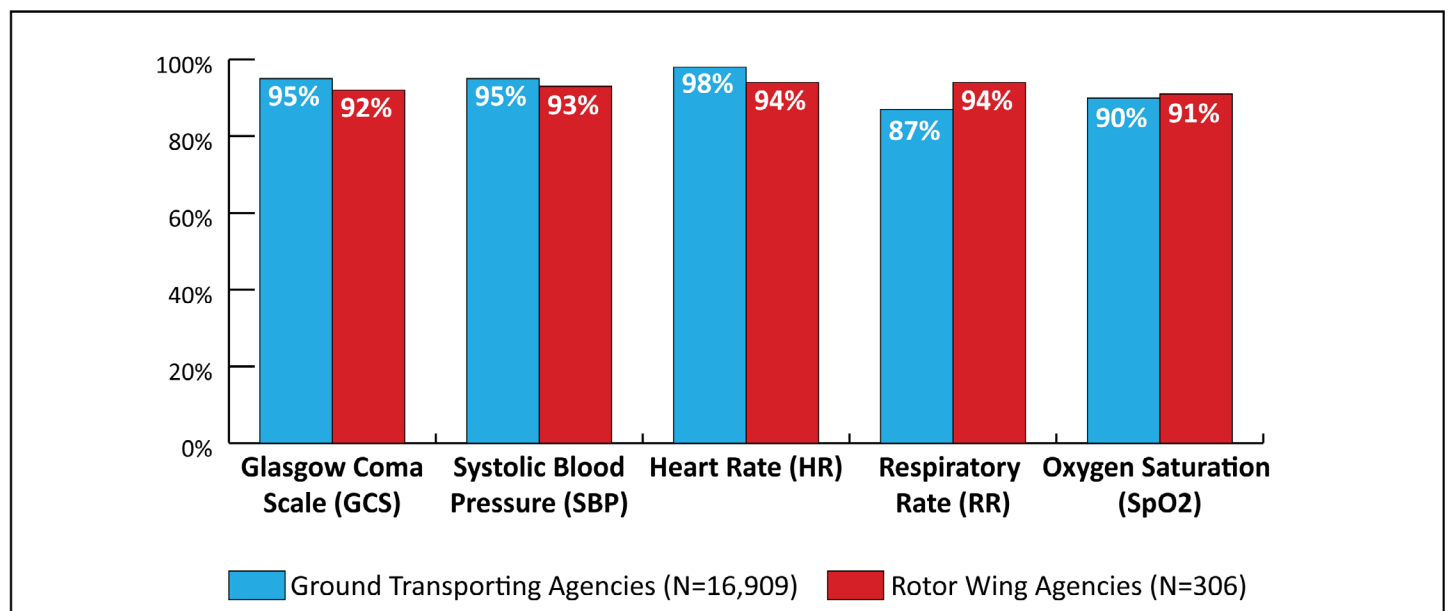


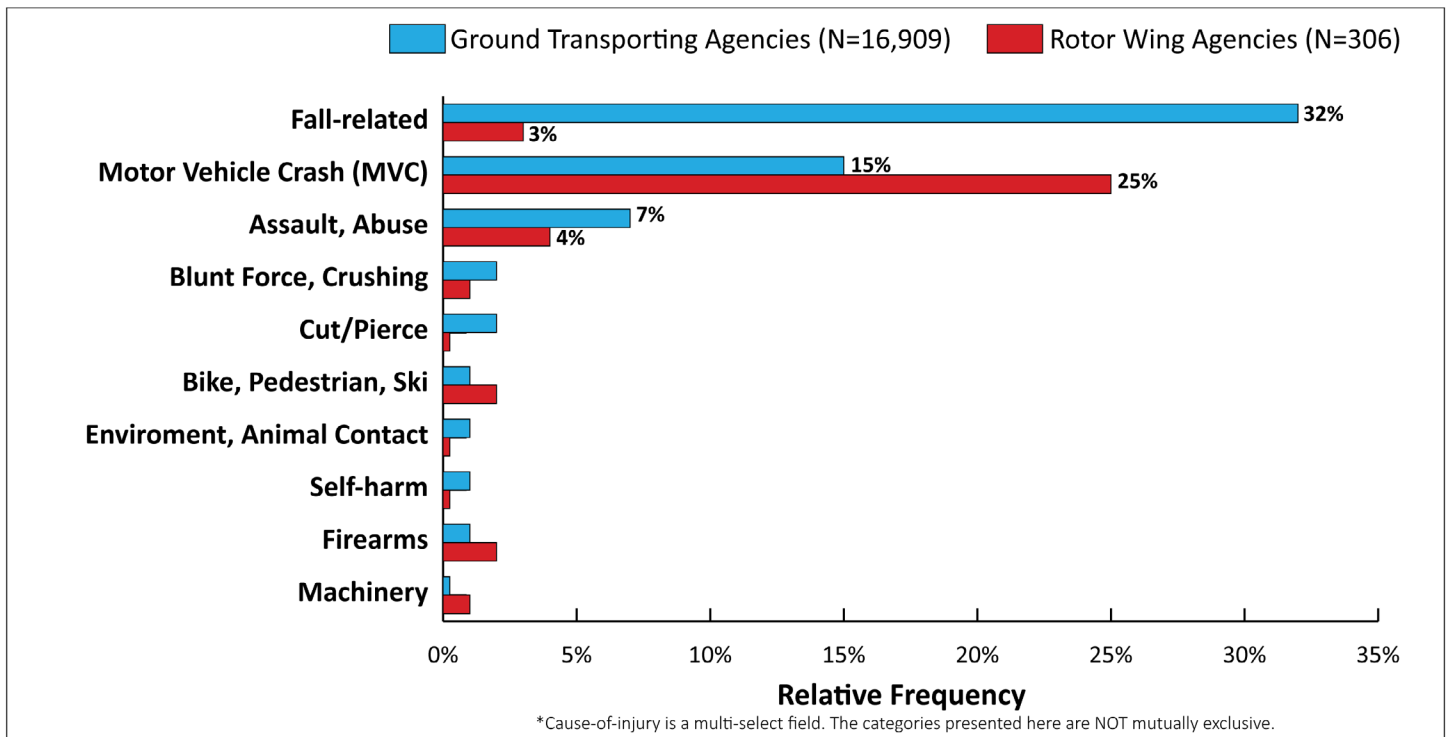
Figure 35. Completion rate of initial vital sign documentation, Trauma-related 911 transports, GTAs/RWAs, 2020



\*Trauma case definition: Possible Injury (eSituation.02) = "Yes"; OR Cause of Injury (eInjury.01) is not blank; OR Provider primary or secondary impression (eSituation.11/eSituation.12) of Any S Code, R58, T07, G89.11, T14.90, T79.4, L55.0-L55.2, T30.0, O71.9, T14, T30.0, T79.9.

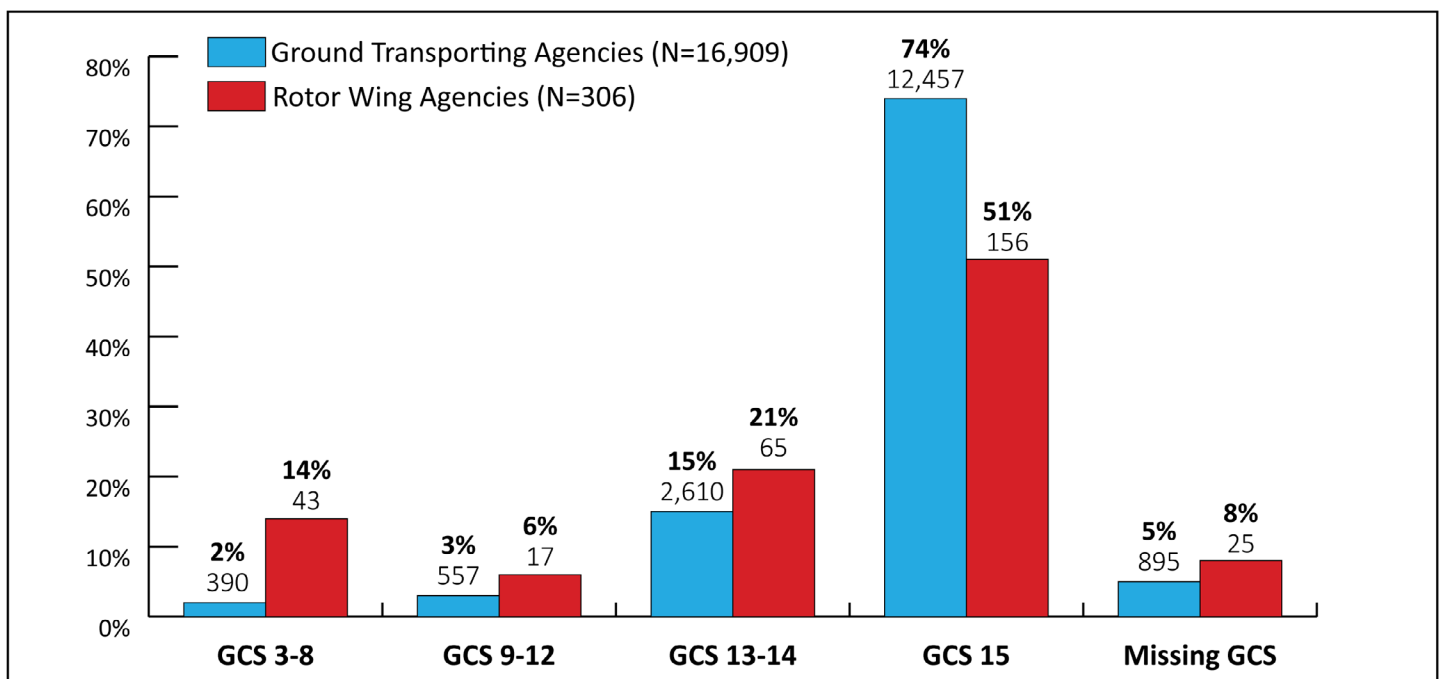
Vital sign measurement is of paramount importance for trauma patients, in order to keep the patient stable and provide life-saving interventions. RWAs have above a 90% completion rate (at least one measurement) for all the vital signs. GTAs have above a 90% completion rate for all the vital signs except respiratory rate, which was completed in 87% of patient care records.

Figure 36. Relative frequency of top causes of injury\*, Trauma-related 911 transports, GTAs/RWAs, 2020



Falls were the most commonly documented cause of injury for GTA trauma-related 911 transports (32%), followed by MVCs (15%). Among RWA trauma 911 transports, 25% were MVC-related followed by assault/abuse (4%).

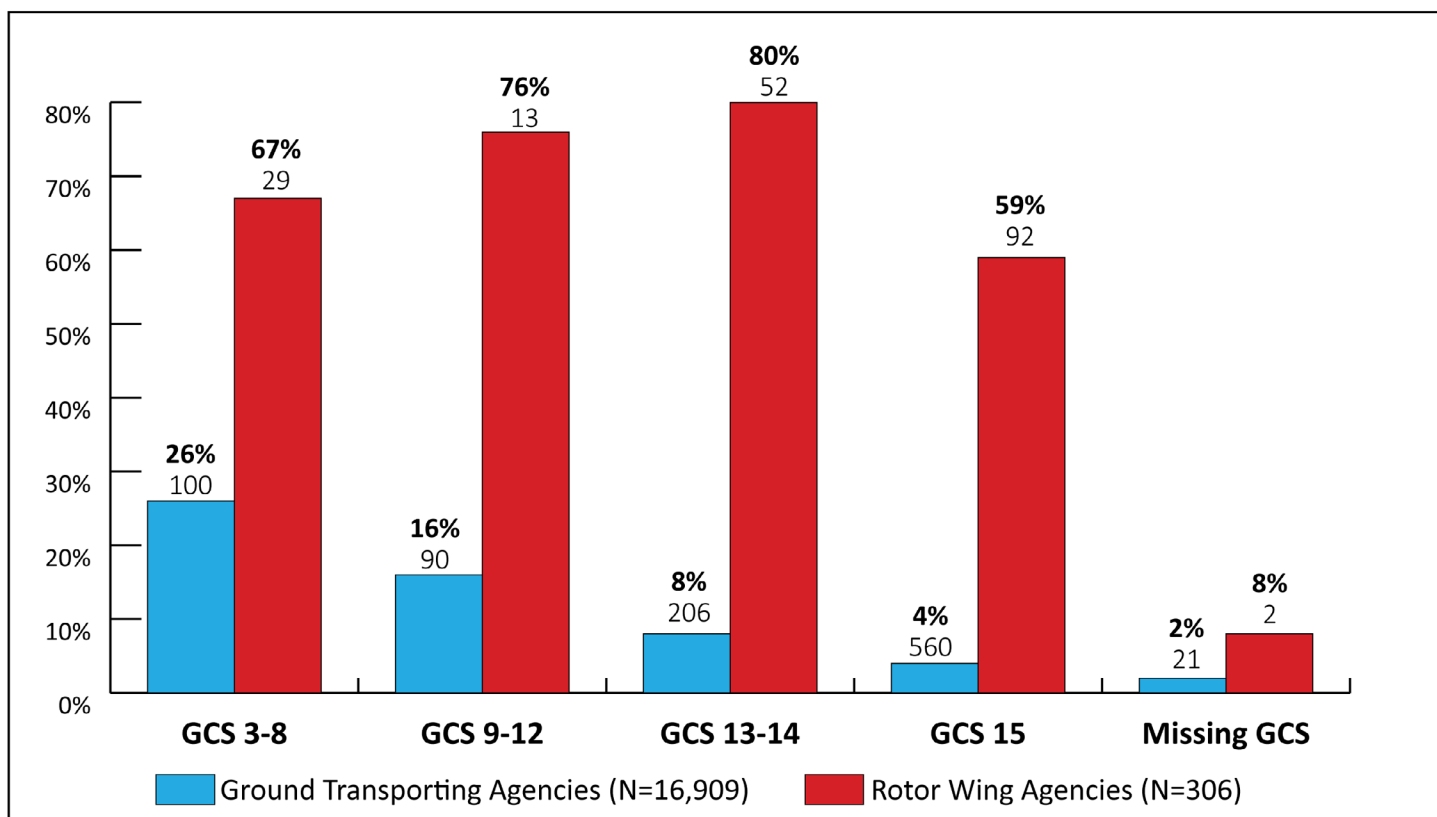
Figure 37. Number and percentage of trauma-related 911 transports by GCS category, GTAs/RWAs, 2020



The Glasgow Coma Scale (GCS) is used to objectively describe the extent of a patient’s impaired consciousness according to three aspects of responsiveness: eye-opening, motor, and verbal responses. Scores range from 3 (completely unconscious) to 15 (fully conscious). Figure 37 compares the distribution of patient GCS scores for GTAs versus RWAs. 1 in 5 (20%, N=60) RWA trauma patients had a GCS score of 12 or lower, versus 1 in 20 (5%, N=947) for GTA trauma patients. 74% of GTA trauma 911 transports were for fully conscious patients (GCS 15), versus 51% for RWAs.

**TRAUMA TEAM ACTIVATION (TTA)** involves paging specific hospital staff to report to the emergency department as quickly as possible, including a surgeon, anesthesiologist, respiratory therapist, critical care nurse, operating room nurse, x-ray and lab technicians, chaplain, and others depending on the level of the activation (partial or full). As the first line of medical providers assessing a trauma patient, EMS plays a crucial role in ensuring that the patient receives appropriate and efficient care. The *Montana Field Trauma Decision Scheme/Trauma Team Activation Criteria* outlines how EMS providers should decide whether to activate the trauma team of a receiving facility. Activation criteria fall into four areas: physiologic, anatomic, mechanism of injury, and special considerations.<sup>3</sup>

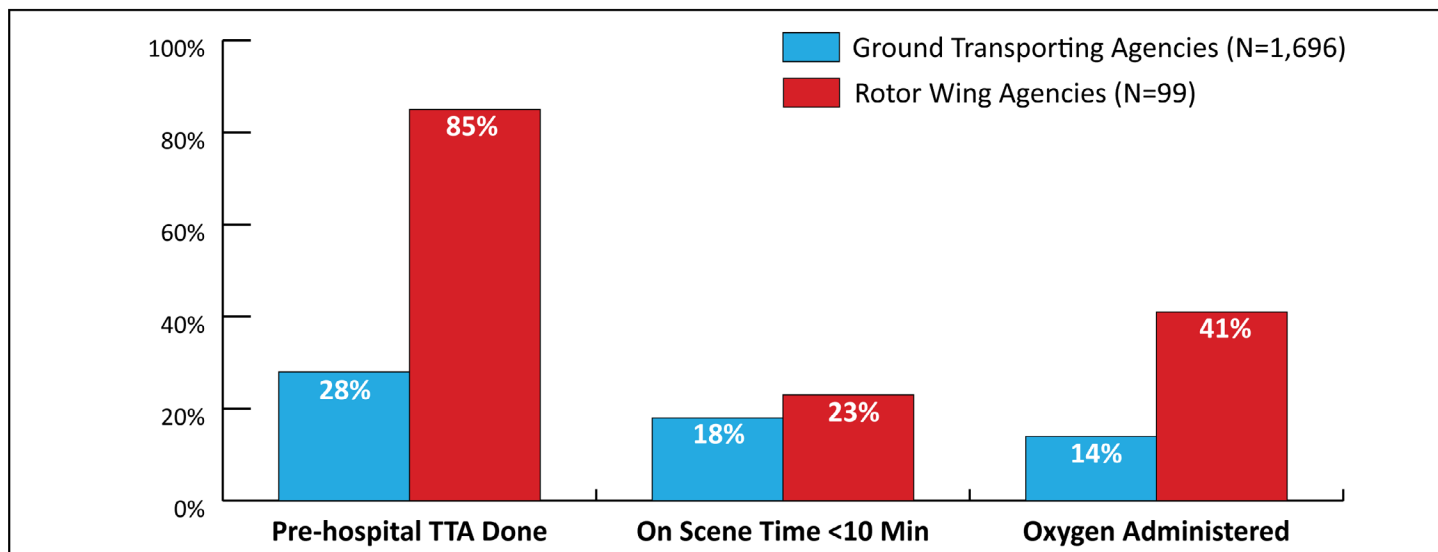
Figure 38. Rate of pre-hospital trauma team activation by GCS category, Trauma-related 911 transports, GTAs/ RWAs, 2020



Pre-hospital TTA is indicated for trauma patients with a GCS score  $\leq 13.3$ . Among 911 transports with GCS 3-8, GTAs documented pre-hospital TTA in 26% and RWAs did so in 67%. Documentation of pre-hospital alert or lack thereof was missing for 69% of GTA trauma related 911 transports, and 16% for rotor wing.



Figure 39. EMS performance improvement indicators, Trauma-related 911 transports meeting activation criteria, GTAs/RWAs, 2020



Montana’s State Trauma Care Committee (STCC) regularly reviews EMS and hospital-based performance improvement (PI) indicators to assess how the trauma system impacts patient care, morbidity, and mortality. The EMS-specific PI indicators shown in Figure 39 are measured only among the injured patients that met pre-hospital TTA criteria in any of the four areas (physiologic, anatomic, mechanism of injury, and special considerations). 10% (N=1,696) of trauma-related 911-transports by GTAs and 32% (N=99) by RWAs met pre-hospital activation criteria.

1. **Pre-hospital TTA Done**

Pre-hospital TTA was documented in 28% of trauma 911 ground transports that met activation criteria, and 85% for rotor wing. Trauma team activation has been shown to fundamentally improve trauma patients’ outcomes.

2. **On-scene time <10 minutes**

Patients with serious trauma require rapid assessment, treatment, and transportation to a designated trauma center; the goal is EMS scene time under 10 minutes. 18% of GTA and 23% of RWA 911 transports met this goal.

3. **Oxygen administered**

14% of GTA and 41% of RWA trauma 911 transports that met activation criteria received oxygen.

## TRAUMA-RELATED INTERFACILITY AND MEDICAL TRANSPORTS

Interfacility transport plays an important role in a rural trauma system. Ground transporting agencies completed 3,080 interfacility and medical transports for trauma and air medical completed 954 interfacility and medical transports for trauma. 55% (N=525) were rotor wing and 45% (N=429) were fixed wing.

Figure 40. Trauma-related IFM transport volumes by month, GTAs and AMAs, 2020

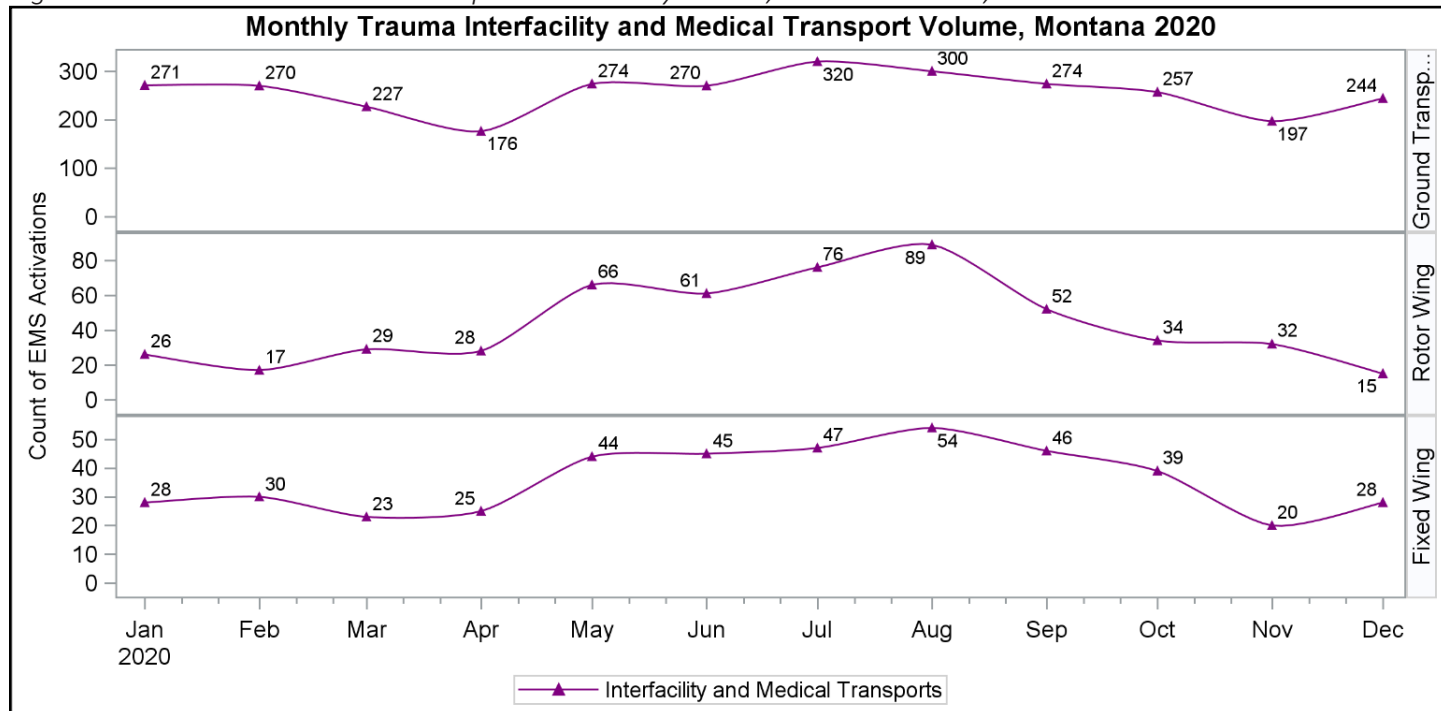
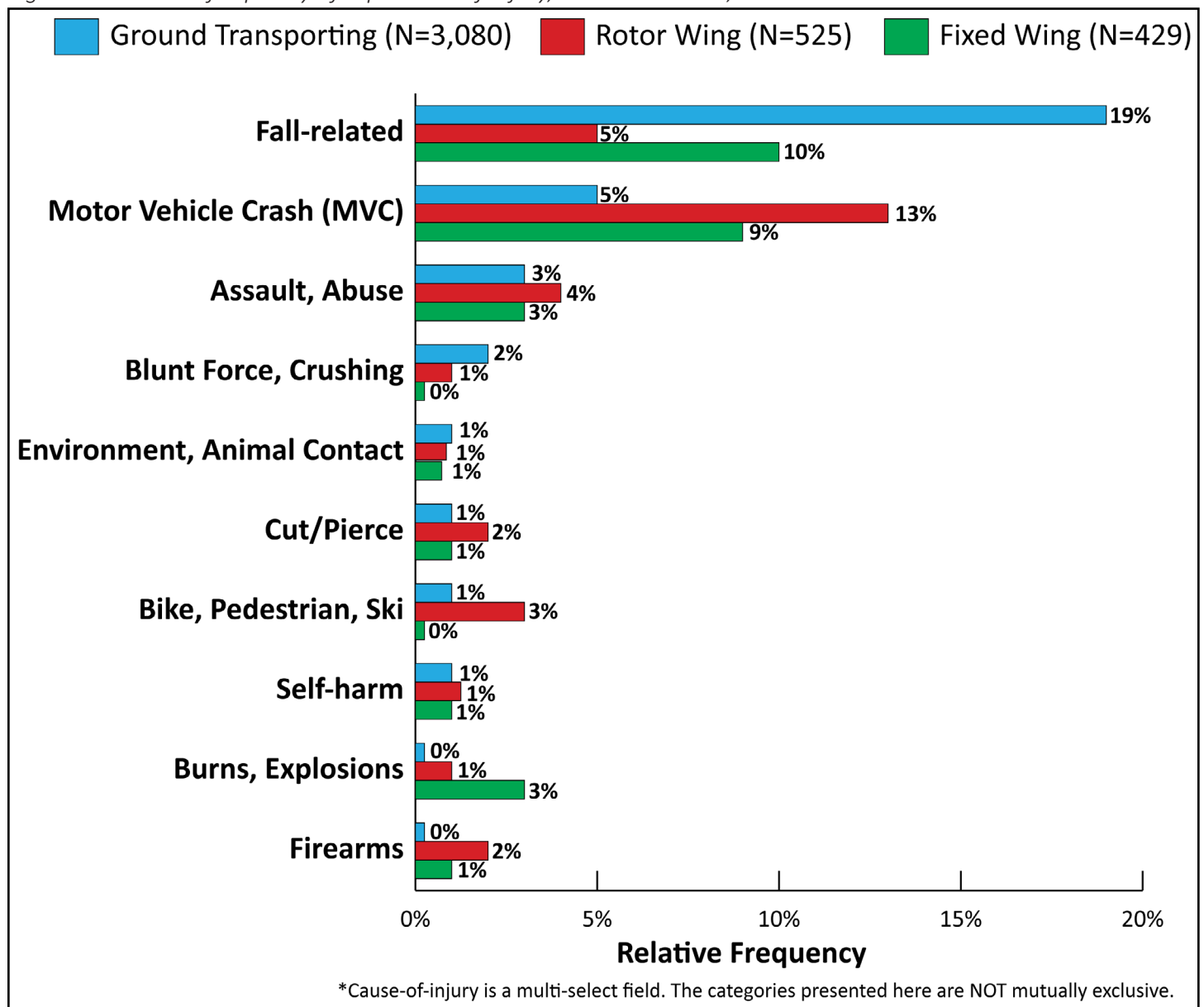


Figure 41. Relative frequency of top causes of injury, GTAs and AMAs, 2020



## TRAUMATIC BRAIN INJURY (TBI)\*

There were 3,249 GTA 911 responses for TBI in 2020. 80% (N=2,616) resulted in transport of the patient.

Figure 42. TBI-related 911 response volume by month, GTAs, 2020

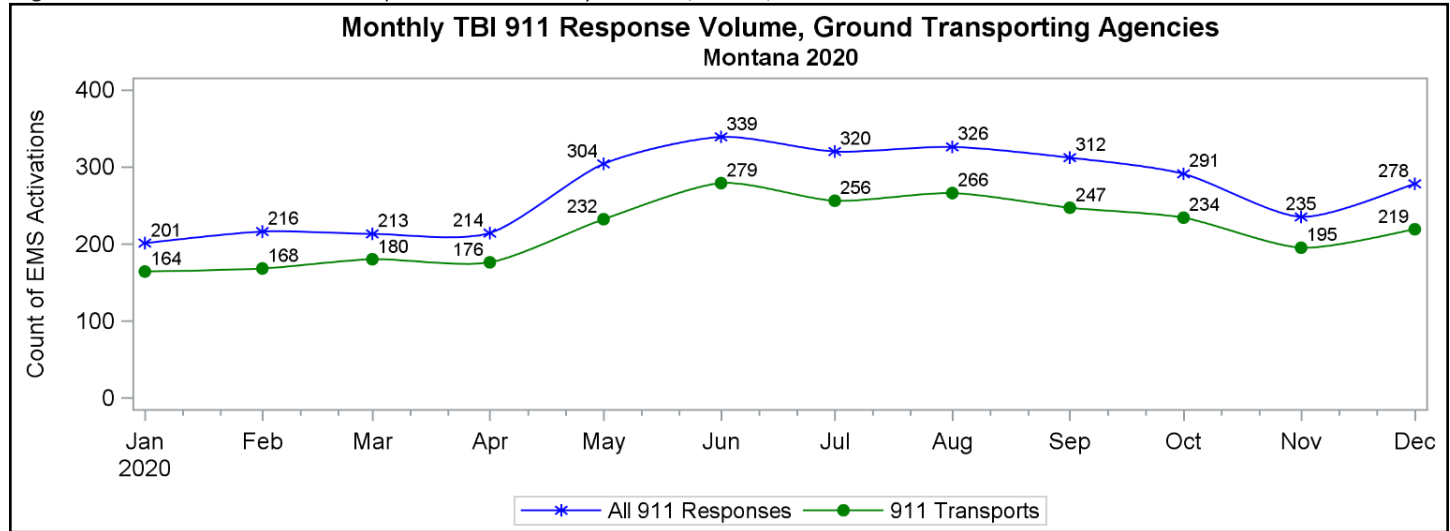
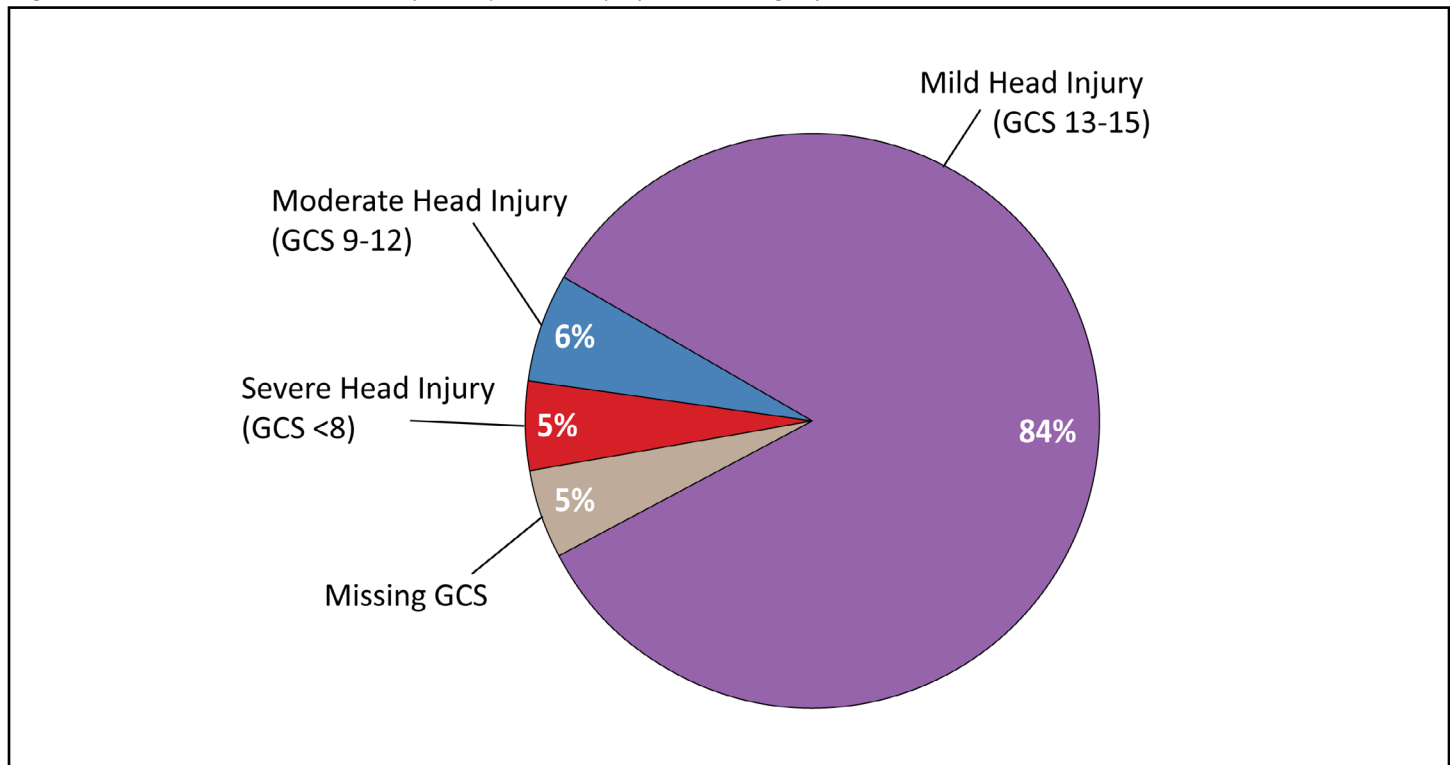


Figure 43. TBI-related 911 transports (N=2,616) by GCS category, GTAs, 2020



\*TBI case definition: Provider primary or secondary impression (eSituation.11/eSituation.12) of S09.90, S02.0, S02.1, S02.8, S02.91, S04.02, S04.03, S04.04, S06, S07.1, T74.4



Figure 44. Percent of TBI-related 911 transports with at least 1 instance of hypotension or hypoxia, GTAs, 2020

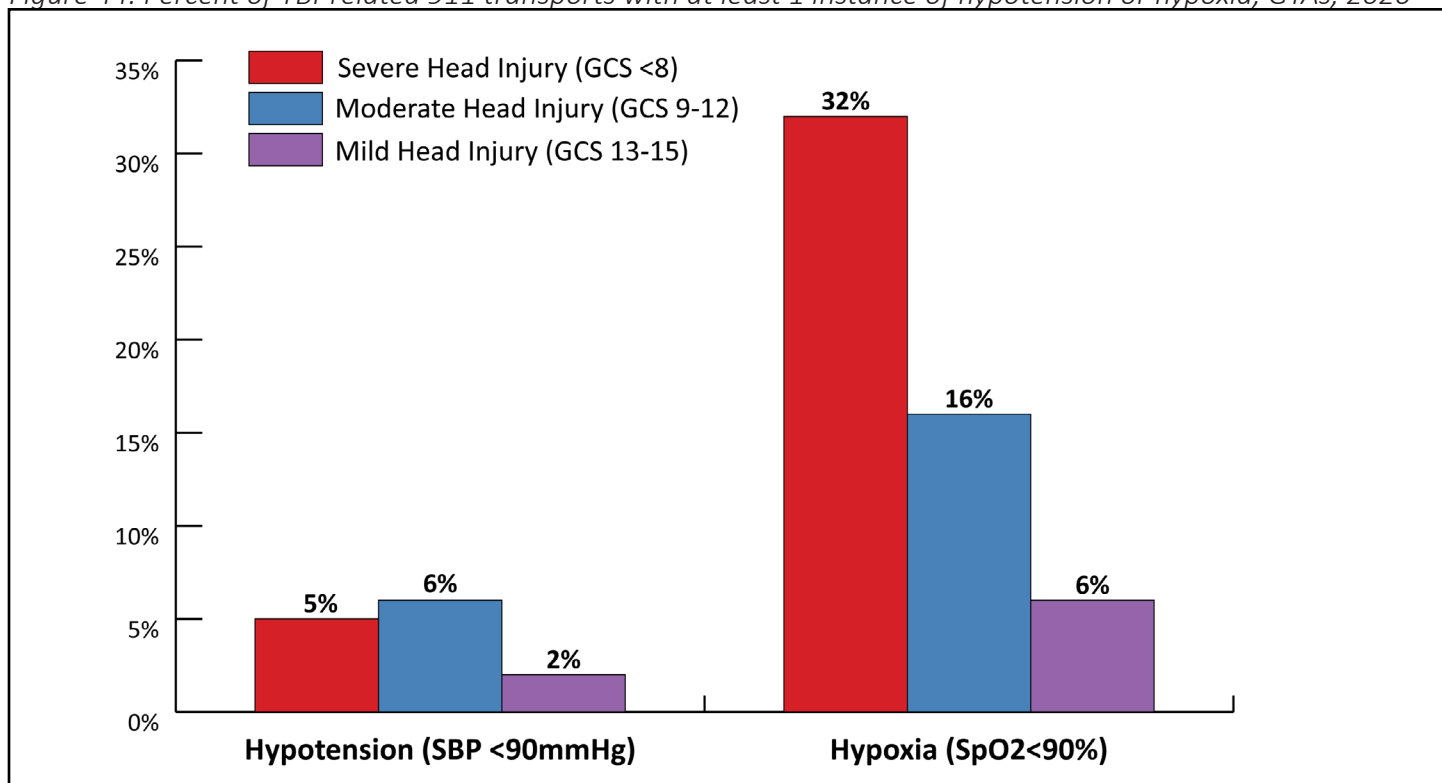
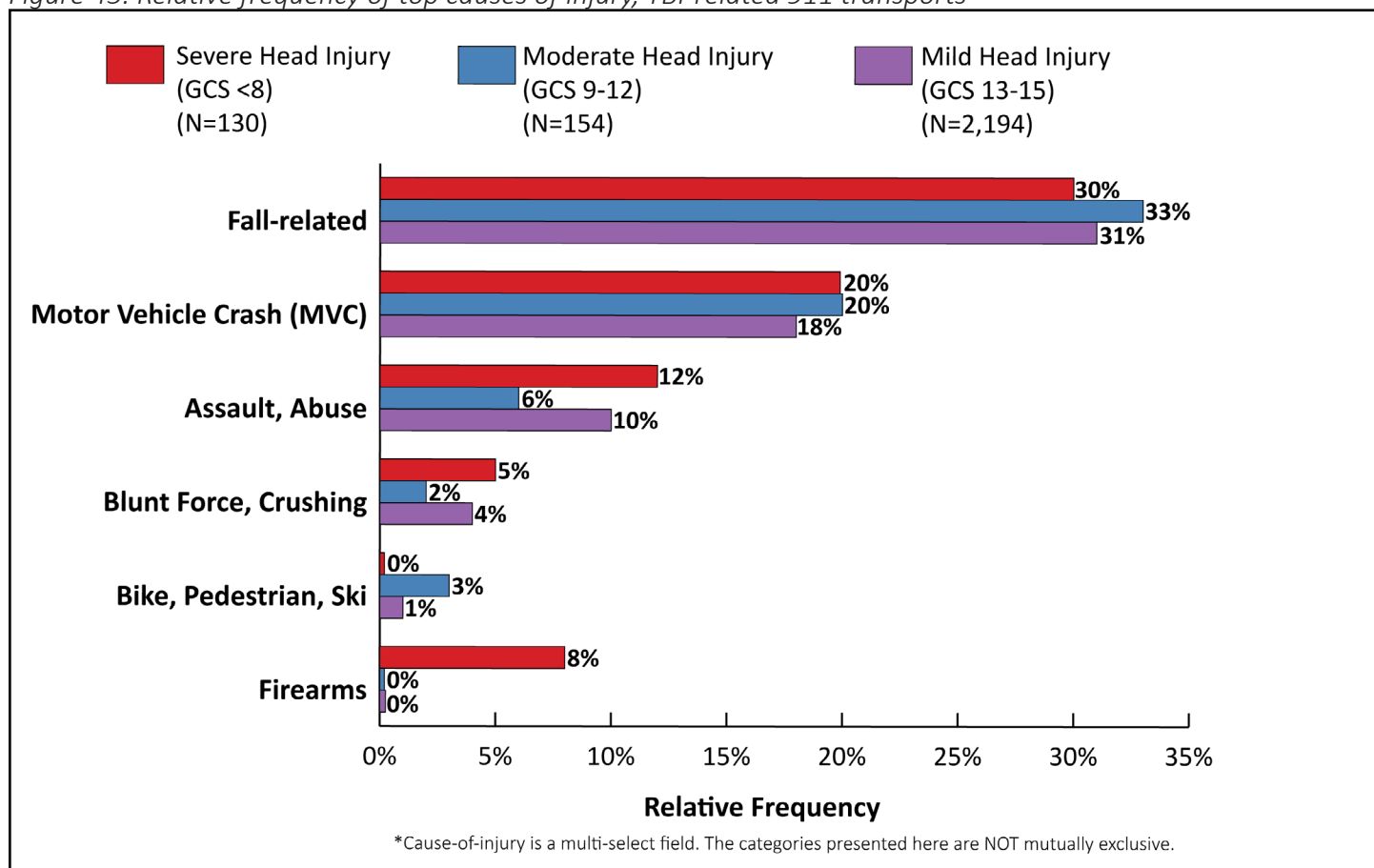


Figure 45. Relative frequency of top causes of injury, TBI-related 911 transports



## SUSPECTED STROKE\*

There were 1,522 GTA 911 responses for suspected stroke in 2020. 89% (N=1,356) resulted in transport of the patient.

Figure 46. Suspected stroke-related 911 response volume by month, GTAs, 2020

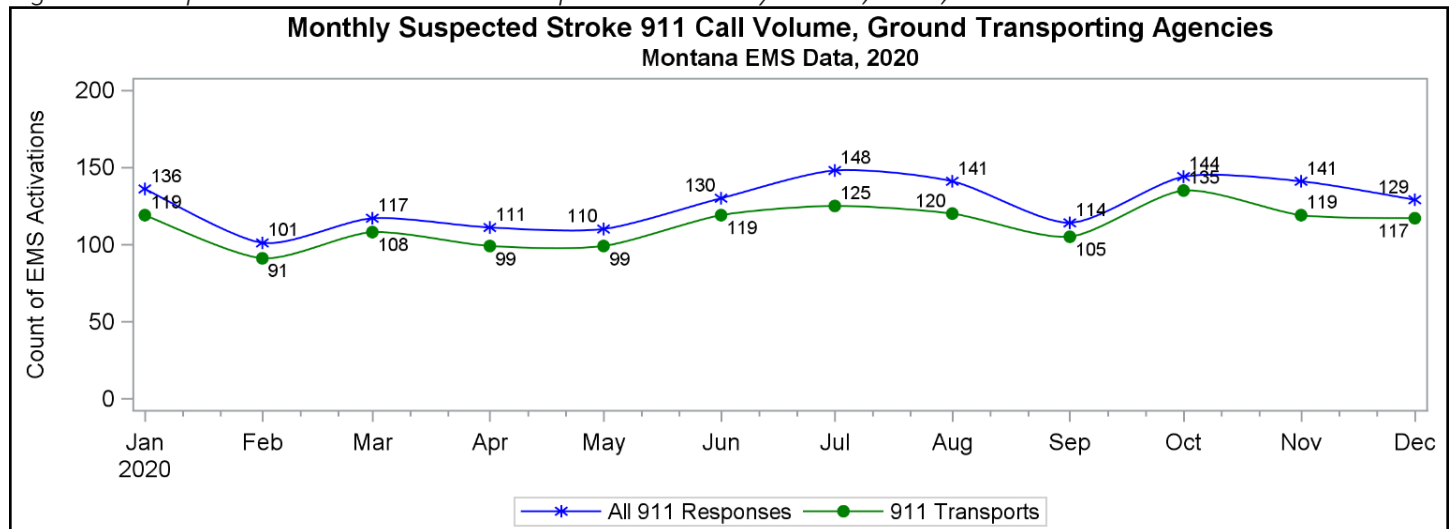
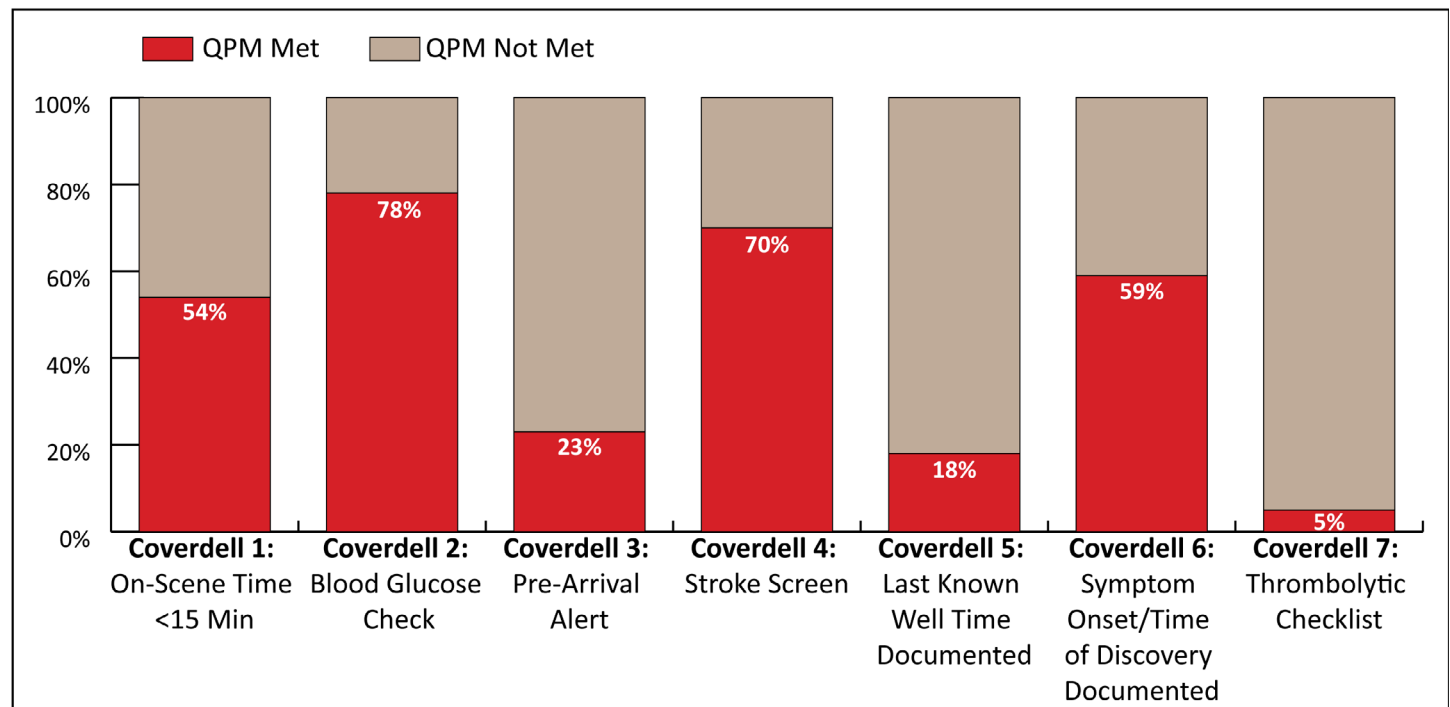


Figure 47. Paul Coverdell National Acute Stroke Program EMS quality performance measures, Suspected stroke 911 transports (N=1,356), GTAs, 2020



\*Suspected stroke case definition: Provider primary or secondary impression (eSituation.11/eSituation.12) of I60, I61, I63, G45, G46.3, G46.4; OR Stroke scale score (eVitals.19) = "Positive"

### **1. On-Scene Time <15 Min**

54% of suspected-stroke 911 transports had an on-scene time less than 15 minutes. The median on-scene time for stroke 911 transports was 14:01 and the 90th percentile was 24:00. American Heart Association/American Stroke Association recommends an on-scene time of less than 15 minutes because timeliness of pre-hospital care is an important link in the stroke chain of survival.

### **2. Blood Glucose Check**

78% of suspected-stroke 911 transports had at least one blood glucose level checked and recorded. Assessment of blood glucose as an important pre-hospital intervention in the stroke chain of survival. Hypoglycemia is frequently found in patients with stroke-like symptoms; administering glucose may resolve neurological deficits.

### **3. Pre-Arrival Alert**

23% of suspected-stroke 911 transports had documentation of EMS calling in a stroke pre-arrival alert to the receiving facility. In 10% of stroke 911 transport records, the EMS provider documented that no pre-arrival alert was provided. Documentation was missing in 67% of records. Stroke pre-notification is an important factor in reducing elapsed time before treatment and ensuring appropriate hospital resources are mobilized before patient arrival to the hospital.

### **4. Stroke Screen**

70% of suspected-stroke 911 transports had a stroke screen (stroke scale) completed and recorded. Use of stroke screening tools in the pre-hospital is important to ensure priority triage of suspected stroke patients.

### **5. Last Known Well Time Documented**

18% of suspected-stroke 911 transports had a documented last known well time that was prior to the documented incident date and time. This information is critical to determining next treatment steps, including eligibility for thrombolytic therapy.

### **6. Symptom Onset/Time of Discovery Documented**

59% of suspected-stroke 911 transports had a documented time of discovery (symptom onset) that was prior to the documented incident date and time. This information is critical to determining next treatment steps, including eligibility for thrombolytic therapy.

### **7. Thrombolytic Checklist Used**

5% of suspected-stroke 911 transports had a thrombolytic stroke checklist completed. Use of thrombolytic stroke checklist tools in the pre-hospital setting may help determine next treatment steps, including eligibility for thrombolytic therapy.

## SUSPECTED CARDIAC CHEST PAIN AND STEMI\*

There were 2,535 911 transports and 838 IFM transports by GTAs for suspected cardiac chest pain and STEMI among patients aged 35 and older in 2020.

Figure 48. Suspected cardiac chest pain and STEMI system utilization volumes by month (Patients aged 35 and older), GTAs, 2020

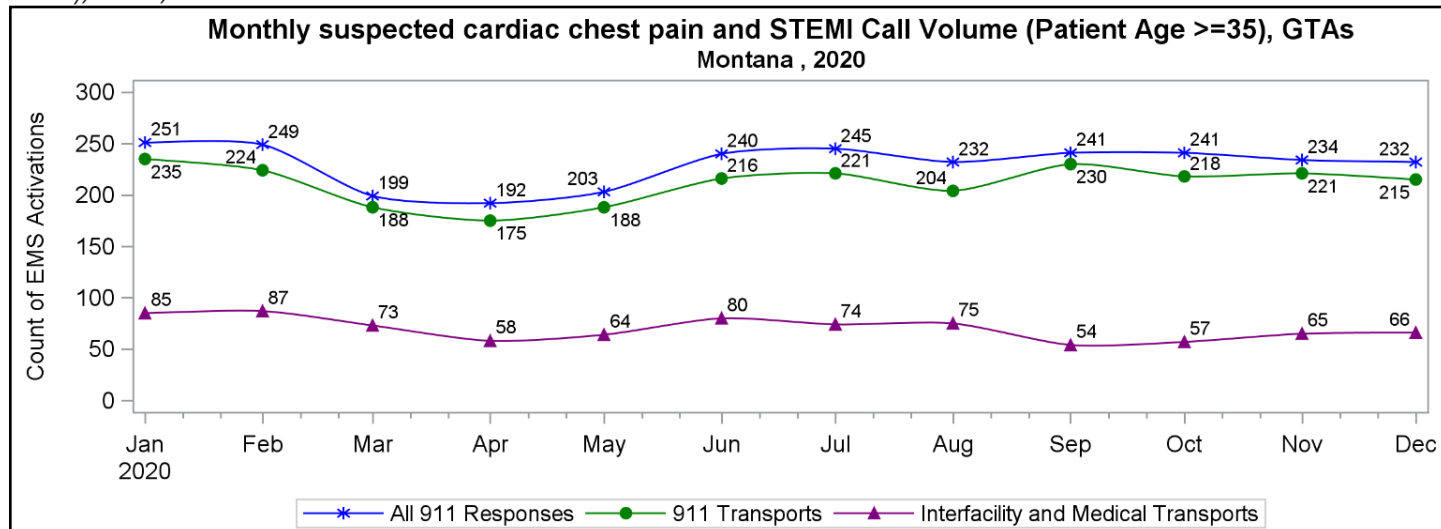
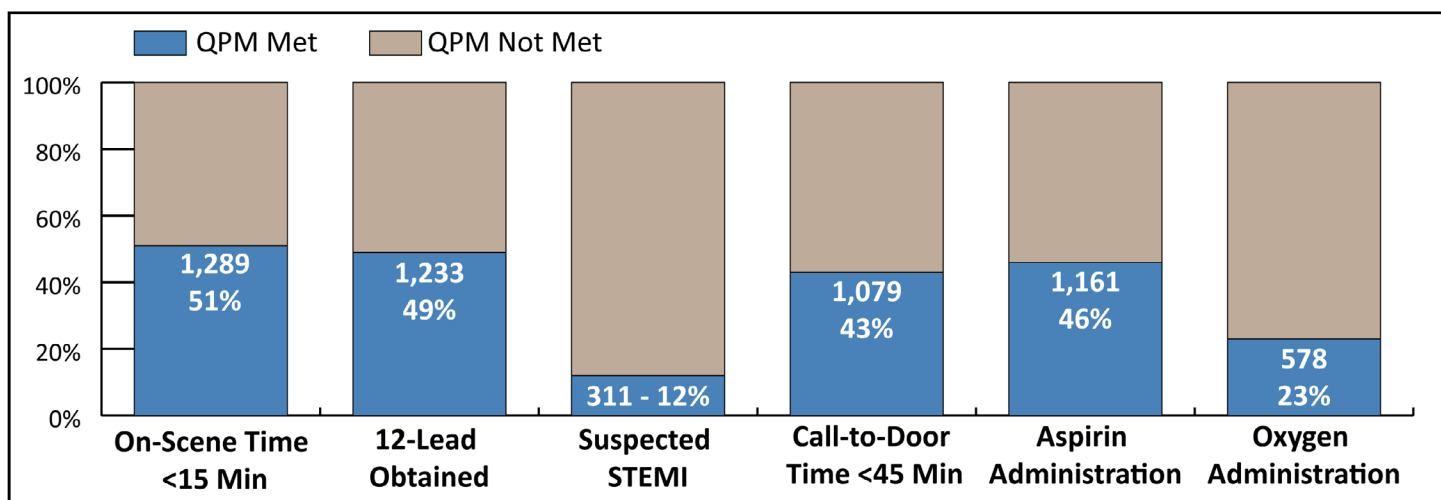


Figure 49. EMS PI indicators, Suspected cardiac chest pain and STEMI 911 transports (N=2,535), GTAs, 2020



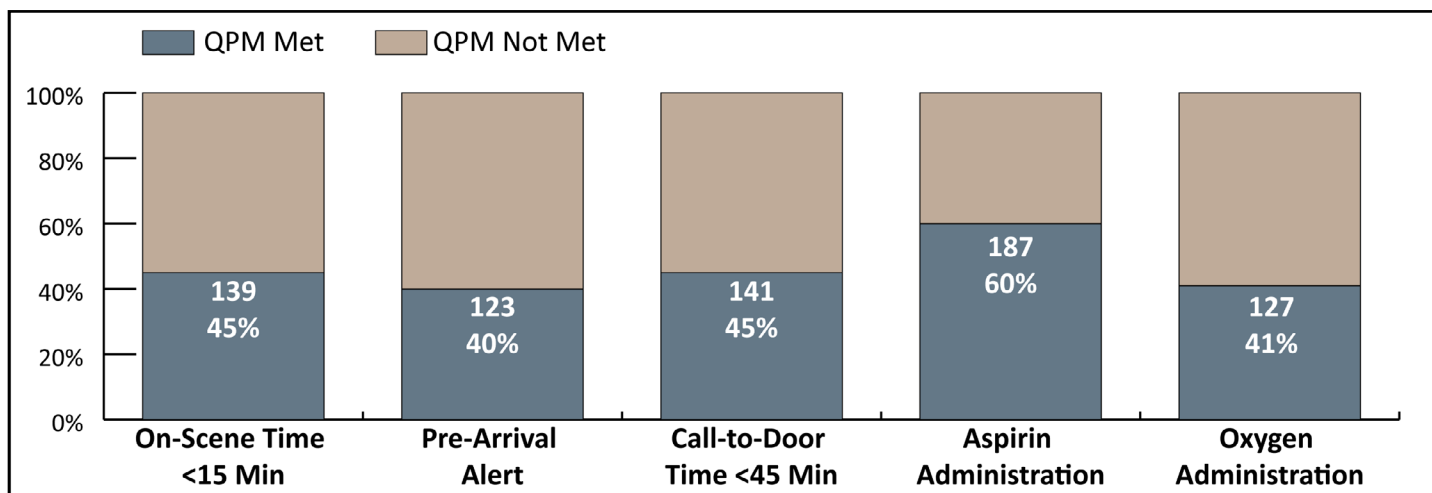
Of the 2,535 GTA 911 transports with suspected cardiac chest pain or STEMI, 12% (N=311) met the case definition for suspected STEMI.

\*Suspected cardiac chest pain case definition: Provider primary or secondary impression (eSituation.11/eSituation.12) of I20-I25

Suspected STEMI case definition: Provider primary or secondary impression (eSituation.11/eSituation.12) of I21.0-I21.3; OR ECG finding (eVitals.03) = "9901051", "9901053", "9901055", "9901057"



Figure 50. EMS PI indicators, Suspected STEMI 911 transports (N=311), GTAs, 2020



#### 1. On-Scene Time <15 Min

51% of suspected cardiac chest pain and STEMI 911 transports had an on-scene time less than 15 minutes. The median on-scene time was 14:45 and the 90th percentile was 25:00. 45% of suspected STEMI 911 transports had an on-scene time less than 15 minutes. AHA recommends an on-scene time of less than 15 minutes because timeliness of pre-hospital care is an important link in the cardiac chain of survival.

#### 2. 12-Lead Obtained

49% of suspected cardiac chest pain and STEMI 911 transports had documentation that a 12-Lead was obtained.

#### 3. Suspected STEMI

12% (N=311) of suspected cardiac chest pain and STEMI 911 transports were classified as suspected STEMI based on ECG results or provider primary/secondary impression of STEMI.

#### 4. Pre-Arrival Alert for STEMI

40% of suspected STEMI 911 transports had documentation of EMS calling in a STEMI pre-arrival alert to the receiving facility. 15% had documentation that no pre-arrival alert was provided. Documentation was missing in 43% of records. Pre-notification is an important factor in reducing elapsed time before treatment and ensuring appropriate hospital resources are mobilized before patient arrival to the hospital.

#### 5. Call-to-Door Time

Call-to-door time measures the time from when 911 was called until patient arrival at the destination facility- it does not capture care given in the hospital setting. 43% of suspected cardiac chest pain and STEMI 911 transports had a call-to-door time less than 45 minutes. 46% (N=1,154) records were missing or had excluded call-to-door time values. The median call-to-door time was 34:51 and the 90th percentile was 55:00. AHA recommends less than 90 minutes from first medical contact to STEMI intervention by the hospital.

#### 6. Aspirin Administration

46% of suspected cardiac chest pain and STEMI 911 transports received aspirin. 60% of suspected STEMI patients received aspirin. Aspirin inhibits platelet aggregation and can slow damage to the heart muscle and has a Class I indication for use in STEMI patients by the AHA meaning there is strong evidence and /or agreement that it helpful and good for the patient.

#### 7. Oxygen Administration

23% of suspected cardiac chest pain and STEMI 911 transports and 41% of suspected STEMI 911 transports received oxygen.

## OUT-OF-HOSPITAL CARDIAC ARREST (OHCA)\*

There were 1,005 GTA 911 responses for OHCA with presumed cardiac etiology in 2020. 39% (N=390) resulted in transport of the patient. Resuscitation was attempted for 97% (N=379) of the 390 patient transports, and 72% (N=728) of all 911 responses for presumed cardiac OHCA (Table 25).

Figure 51. Presumed cardiac OHCA 911 response volume by month, GTAs, 2020

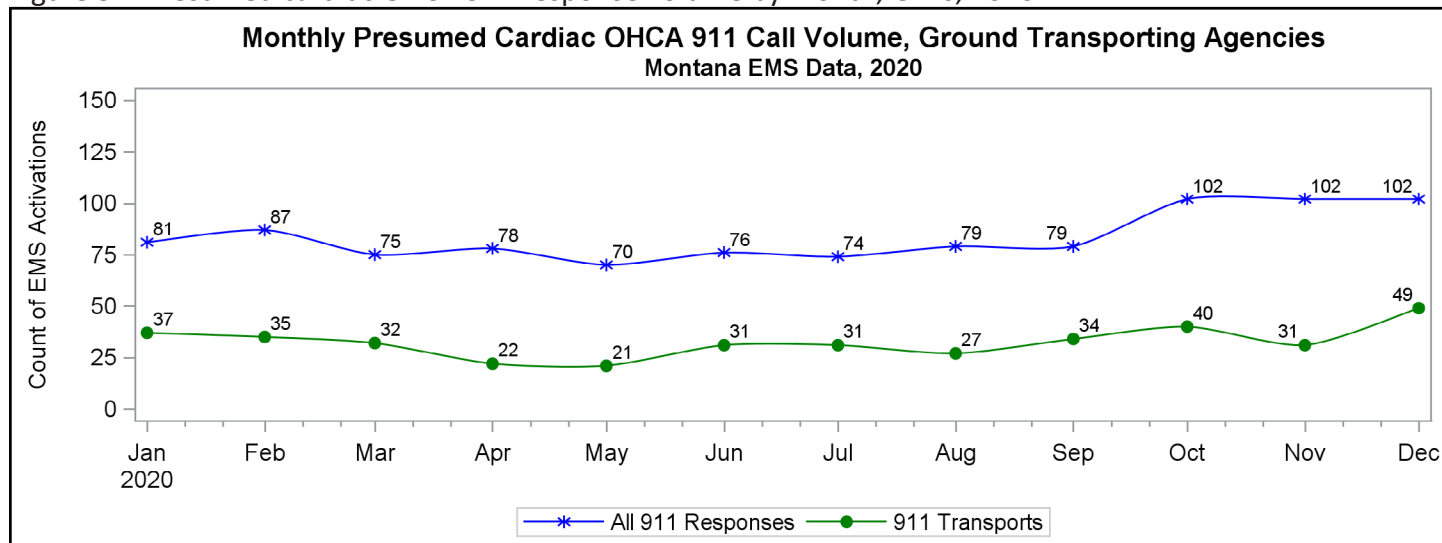


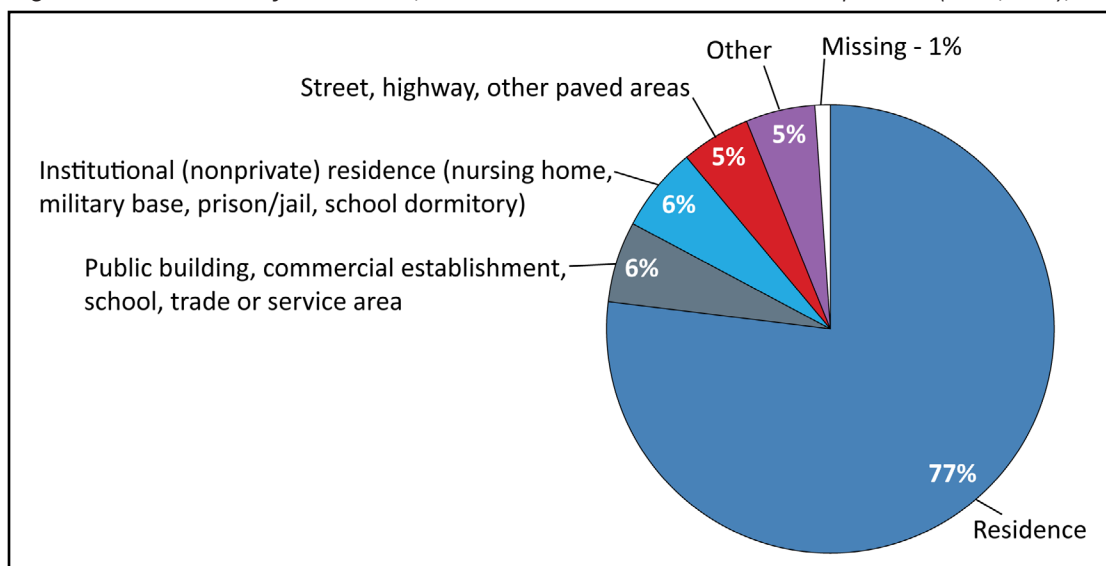
Table 25. Presumed Cardiac OHCA 911 Responses by Patient Disposition, GTAs, 2020

	Patient Not Transported	Patient Transported	All
Resuscitation attempted by Responding EMS Unit	349	379	728
No resuscitation attempted by Responding EMS Unit	255	11	266
Other	11	0	11
<b>All</b>	<b>615</b>	<b>390</b>	<b>1,005</b>



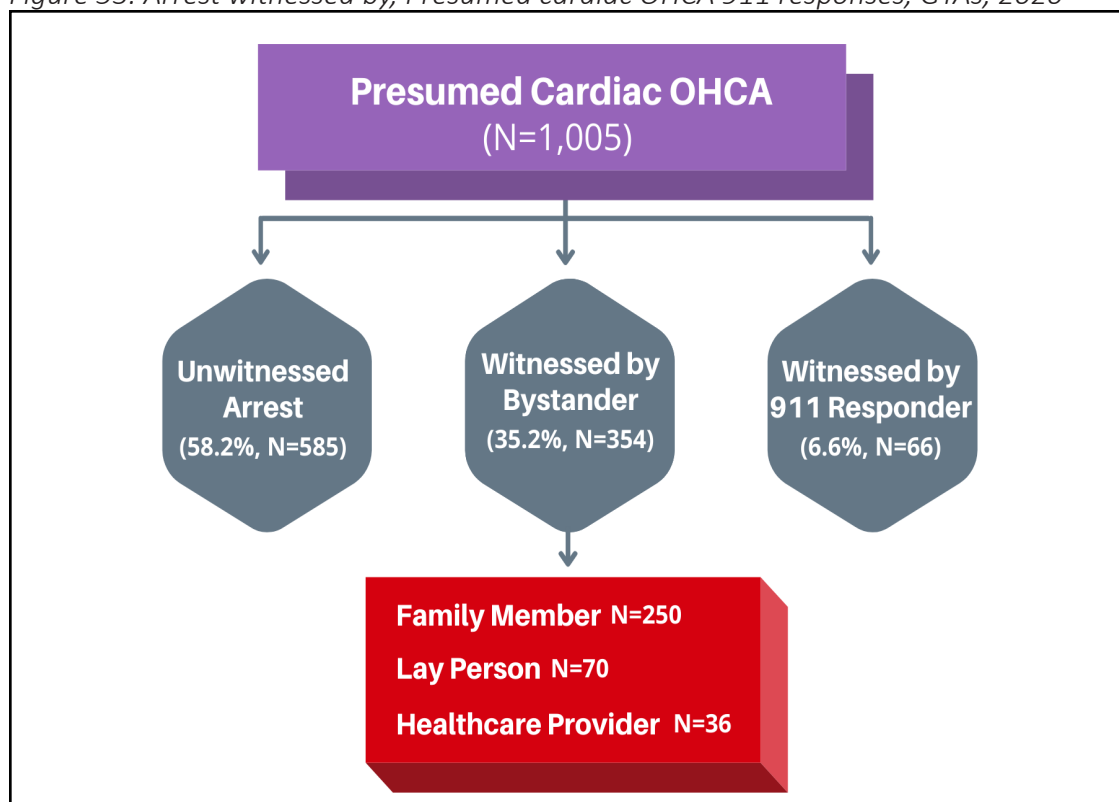
\*Presumed cardiac OHCA case definition: Cardiac Arrest (eArrest.01) = "Yes, Prior to EMS Arrival" or "Yes, After EMS Arrival" AND Cardiac arrest etiology (eArrest.02) = "Cardiac (Presumed)"

Figure 52. Location of the arrest, Presumed cardiac OHCA 911 responses (N=1,005), GTAs, 2020



The majority of OHCA occurred in residences (77%), followed by public places, and institutional residences.

Figure 53. Arrest witnessed by, Presumed cardiac OHCA 911 responses, GTAs, 2020



\*The data field "Arrest witnessed by" allows multiple selections, therefore the sum may be greater than the total number of OHCA (N=1,005).

Of 1,005 GTA 911 responses for presumed cardiac etiology OHCA, 58% were unwitnessed, 35% were witnessed by a bystander, and 7% were witnessed by EMS personnel (Figure 53). Table 26 reports unwitnessed, bystander witnessed, and 911 responder witnessed OHCA by initial arrest rhythm as well as bystander intervention, which forms the basis for the Utstein style OHCA reporting framework.<sup>4</sup>

Table 26. Presumed cardiac OHCA 911 responses by initial rhythm and bystander intervention, GTAs, 2020

	Cardiac Arrest Unwitnessed/ Not Recorded		Cardiac Arrest Witnessed by Bystander		Cardiac Arrest Witnessed by 911 Responder		All	
	N	%	N	%	N	%	N	%
<b>Initial Arrest Rhythm</b>								
Asystole	344	59%	138	39%	18	27%	500	50%
Shockable Initial Rhythm*	44	8%	90	25%	16	24%	150	15%
Other Initial Rhythm^	73	12%	101	29%	28	42%	202	20%
Not Recorded/Not Applicable	124	21%	25	7%	4	6%	153	15%
<b>CPR provided prior to EMS arrival?</b>								
Yes	223	38%	218	62%	0	0%	441	44%
No	306	52%	117	33%	37	56%	460	46%
Not Recorded	56	10%	19	5%	29	44%	104	10%
<b>AED used prior to EMS arrival?</b>								
Yes, with defibrillation	14	2%	30	8%	0	0%	44	4%
Yes, Applied without defibrillation	68	12%	40	11%	1	2%	109	11%
No	498	85%	282	80%	50	76%	830	83%
Not Recorded	5	1%	2	1%	15	23%	22	2%
<b>Total</b>	<b>585</b>	<b>100%</b>	<b>354</b>	<b>100%</b>	<b>66</b>	<b>100%</b>	<b>1,005</b>	<b>100%</b>

\*VF, TF, Unknown shockable rhythm; ^PEA, Unknown Non-Shockable rhythm

The Utstein framework allows for identification of the following important subgroups that highlight the contribution of cardiac rhythm and bystander actions as key determinants of resuscitation outcome:

**1. Overall**

All presumed cardiac OHCA

**2. Unwitnessed**

Unwitnessed presumed cardiac OHCA

**3. Bystander Witnessed**

Presumed cardiac OHCA witnessed by a bystander (anyone, including healthcare providers, who was not part of the dispatched response)

**4. Utstein**

Bystander witnessed and found in shockable rhythm (Shockable rhythms include: Ventricular tachycardia, Ventricular fibrillation, Supraventricular tachycardia, AED-advised unknown shockable rhythm)

**5. Utstein Bystander**

Bystander witnessed, found in shockable rhythm, and received some bystander intervention prior to EMS arrival (CPR and/or AED)

**6. 911 responder witnessed**

Presumed cardiac OHCA witnessed by EMS personnel who were part of the dispatched response. This refers to cardiac arrests that occurred after EMS arrival.

**7. 911 responder witnessed and found in shockable rhythm**

Witnessed by EMS personnel, found in shockable rhythm



A successful resuscitation outcome is defined by return of spontaneous circulation (ROSC), signs of which may include breathing (more than an occasional gasp), coughing, movement, a palpable pulse or a measurable blood pressure. “Any ROSC” refers to a brief (approximately >30 seconds) restoration of spontaneous circulation that provides evidence of more than an occasional gasp, occasional fleeting palpable pulse, or arterial waveform. “Sustained ROSC” is deemed to have occurred when chest compressions are not required for 20 consecutive minutes and signs of circulation persist. Table 27 shows the rate of “Any ROSC” as well as “Sustained ROSC” by subgroup.

Table 27. Rates of Any ROSC and Sustained ROSC of presumed cardiac OHCA 911 responses, GTAs, 2020

Utstein Subgroup	Any ROSC		Sustained ROSC >20 Min		Total Denominator
	N	%	N	%	
<b>Overall:</b>	177	18%	44	4%	1,005
<b>Unwitnessed</b>	51	9%	15	3%	585
<b>Bystander Witnessed</b>	103	29%	22	6%	354
<b>Utstein</b>	38	42%	10	11%	90
<b>Utstein Bystander</b>	33	54%	10	16%	61
<b>911 responder witnessed</b>	23	35%	7	11%	66
<b>911 responder witnessed and found in shockable rhythm</b>	9	56%	4	25%	16

25% of presumed cardiac OHCA 911 responses resulted in sustained ROSC, and 56% resulted in any ROSC, when the arrest was witnessed by EMS personnel and the patient’s initial cardiac rhythm was shockable. In comparison, when the arrest was unwitnessed, 3% resulted in sustained ROSC and 9% any ROSC.



## MEDICATION ADMINISTRATION TABLE (TOP 50)

Medication Name with RxNORM Code			Count of EMS Activations	Count of Doses
1	7806	Oxygen	10,949	11,548
2	4337	Fentanyl	4,083	7,221
3	26225/66981	Ondansetron (Zofran)	3,874	4,071
4	125464	Normal saline	3,332	3,494
5	1191	Aspirin	1,725	1,728
6	4917	Nitroglycerin	1,041	1,375
7	435	Albuterol (Proventil)	970	1,166
8	6960/11177	Midazolam (Versed)	920	1,430
9	35629/ 1008377	Lactated Ringer's Solution	897	929
10	285059/ 214199/ 542137	Albuterol/Ipratropium (DuoNeb)	813	872
11	7052	Morphine	763	1,120
12	6470/202479	Lorazepam (Ativan)	757	991
13	6130	Ketamine (Ketalar)	649	1,228
14	7242	Naloxone (Narcan)	623	768
15	317361	Epinephrine 1:10,000	621	1,903
16	237653	Dextrose 50 % Injectable Solution	375	392
17	4850/377980	Glucose (Oral Forms)	326	390
18	5224	Heparin	290	301
19	224913/ 3423	Hydromorphone (Dilaudid)	273	508
20	7512/227559	Norepinephrine (Levophed)	267	345
21	237648/1795480	Dextrose 10 % Injectable Solution	190	195
22	6902/ 203856	Methylprednisolone (Solu-MEDROL)	178	179
23	3498	Diphenhydramine (Benadryl)	163	174
24	8782	Propofol (Diprivan)	154	212
25	373902	Sodium Chloride Irrigation Solution	153	172
26	8745	Promethazine (Phenergan)	149	162
27	328316	Epinephrine 1:1000	140	252
28	703	Amiodarone (Cordarone)	134	170
29	36676	Sodium Bicarbonate	133	150
30	4832	Glucagon (Glucagen)	125	133
31	1223/ 370624	Atropine	90	130
32	68139	Rocuronium (Zemuron)	88	107
33	296	Adenosine (Adenocard)	87	132
34	7213	Ipratropium (Atrovent)	76	79
35	71535	Vecuronium (Norcuron)	76	121
36	7486	Nitrous Oxide	67	68
37	7396/ 151490	Nicardipine (Cardene)	66	98

38	11124	Vancomycin	65	67
39	309778	Dextrose 5 % Injectable Solution	59	59
40	3322	Diazepam (Valium)	59	84
41	5093	Haloperidol (Haldol)	58	64
42	3992	Epinephrine Auto-Injector	52	74
43	6585	Magnesium Sulfate	50	56
44	10691	Tranexamic Acid	47	56
45	10154	Succinylcholine (Anectine)	47	50
46	9863	Sodium Chloride	46	48
47	3628	Dopamine	44	46
48	8591	Potassium Chloride	44	46
49	5856	Insulin	42	43
50	7617	Octreotide	38	42



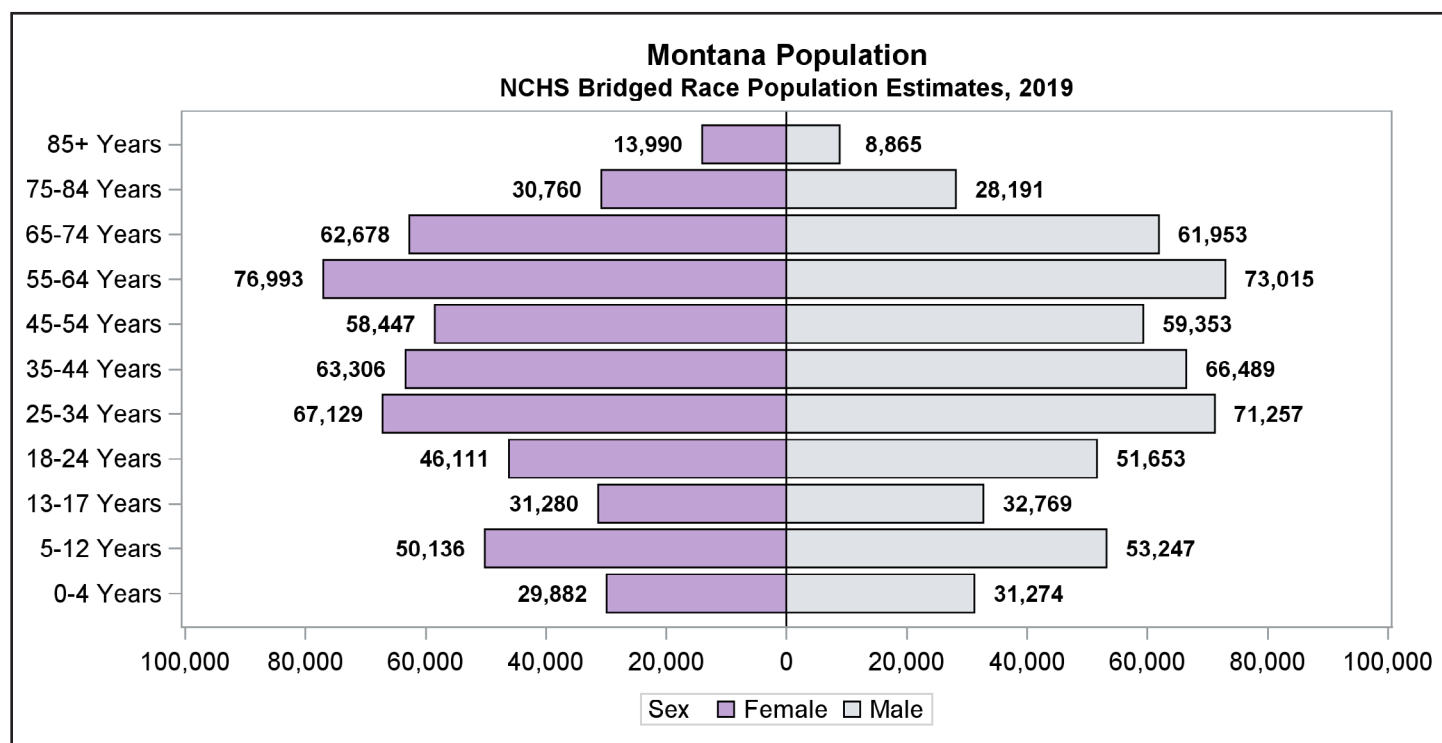


# Appendix





# MONTANA POPULATION CHARACTERISTICS<sub>1</sub>



## ACRONYMS

Acronym	Meaning
AED	Automatic External Defibrillator
AMA	Air Medical Agency
CAH	Critical Access Hospital
CPR	Cardio-pulmonary Resuscitation
EMS	Emergency Medical Services
ePCR	Electronic Patient Care Report
FWA	Fixed Wing Agency
GCS	Glasgow Coma Scale
GTA	Ground Transporting Agency
HR	Heart Rate
IFMT	Interfacility and Medical Transport
IHS	Indian Health Service
MVC	Motor Vehicle Crash
NEMSIS	National Emergency Medical Services Information System
NTA	Non-Transporting Agency
OHCA	Out-of-Hospital Cardiac Arrest
PCR	Patient Care Report
ROSC	Return of Spontaneous Circulation
RR	Respiratory Rate
RWA	Rotor Wing Agency
SBP	Systolic Blood Pressure
SpO2	Oxygen Saturation
STCC	State Trauma Care Committee
STEMI	ST-segment Elevated Myocardial Infarction
TBI	Traumatic Brain Injury
TTA	Trauma Team Activation

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