RIVERSIDE COUNTY EMS AGENCY

POLICY 7701
ELECTRONIC PATIENT RECORD REPORT

FY 2022-2023

The 2022-2023 fiscal year displayed an overall increase in the volume of EMS responses which corresponded with a growth in volume of electronic patient care records. This followed the unique challenges and trends in the provision of Emergency Medical Services (EMS) from previous years. The COVID-19 shutdowns and stay at home orders implemented in 2020 led to an overall decline in EMS calls, and since then, the volume of EMS electronic patient care records and overall responses have increased. This report aims to create a comprehensive view into the EMS system from the perspective of electronic patient care report (ePCR) submission.

REMSA policy 7701 requires patient records to be completed in compliance with the California Code of Regulations Title 22, (Chapter 4, Article 7, Section §100170(6A); Article 8, Sections §100171) and uploaded in a timely manner following a response or patient transfer to an emergency department. To get a more in depth look at the efficiency of ePCR entry for the Riverside County EMS system, data was pulled in 1-day increments, and mean changes of ePCR totals were calculated and evaluated based on changes in record count. The data was also evaluated for total count of ePCR submissions, hour of day, day of week, transport type, location, validation score, and response type. Validation scores were analyzed to represent the quality of documentation for each record. For this analysis, records that did not involve patient contact were removed.

For the 2022-2023 fiscal year, a total of 574,685 ePCRs were generated. Approximately 96% of those records were entered within one day of the incident, 0.5% were entered the following day, and little change was observed beyond Day 3 (less than 1%) However, it was noted that there were a few reports that were delayed beyond the month mark (less than 0.3%), so the results of such delays are statistically negligible. It was found that the most common hour of day that delayed reports initiated from incidents at 2 PM (~13%). December 2022 displayed the greatest number of ePCRs generated for the 22-23 fiscal year with 50,333 reports in that month. 2PM was the busiest hour of day accounting for approximately 5.9% of all reports (33,654 reports). Fridays generated the greatest volume of incidents according to ePCR submissions with 15.1% (86,700 records) of total ePCRs occurring on that day. Ambulance transports made up most reports submitted throughout the year (30,582 records; 52%). Emergency responses compared to non-emergency transport (interfacility/medical) also accounted for most, nearly 87%, of all ePCRs for the year of 2022 (86.9%; 499,096 records). Riverside County Fire Department (34.7%) and AMR-Riverside (26.4%) combined account for more than 60% of all ePCRs submitted in FY 2022-2023 (60.9%; 341,738 reports). According to EMS zone analysis, the Northwest zone of Riverside County carried the highest number of responses with 27% (151,675 records) of all ePCRs generated within this zone.

METHOD

Data between July 1st, 2022, and June 30th, 2023, was extracted from the Riverside County Imagetrend® Elite system using Imagetrend® Reportwriter. Record fields extracted were Incident Date, Disposition (eDisposition.19), Agency Name (dAgency.03), Response Type of Service Requested (eResponse.05), Incident Patient Disposition (eDisposition.12), Scene Incident Location Type (eScene.09), Transport Type as determined by EMS Vehicle Unit Number (eResponse.13) and Agency Type, and Incident Patient Care Record Number (e.Record.01). Data was then de-duplicated by Patient Care Record Number. Incidents originating outside of Riverside County were excluded from the analyses. Additional categories were developed and collapsed as follows:

- Response Type
    - *Emergency* = 911 Response
    - *Non-Emergency* = Interfacility Transport & Medical Transport;
    - *Other* = Intercept, Mutual Aid, Public Assistance, and Standby)
- "Scene Incident Location Type" was collapsed based on variable consistencies and detailed in Appendix, Sections A-B

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Figure 1: Yearly Comparison of Total Number of ePCRs Generated

Total ePCRs Generated by Year

$R^2 = 0.9595$

+16%

+7%

462,859

538,679
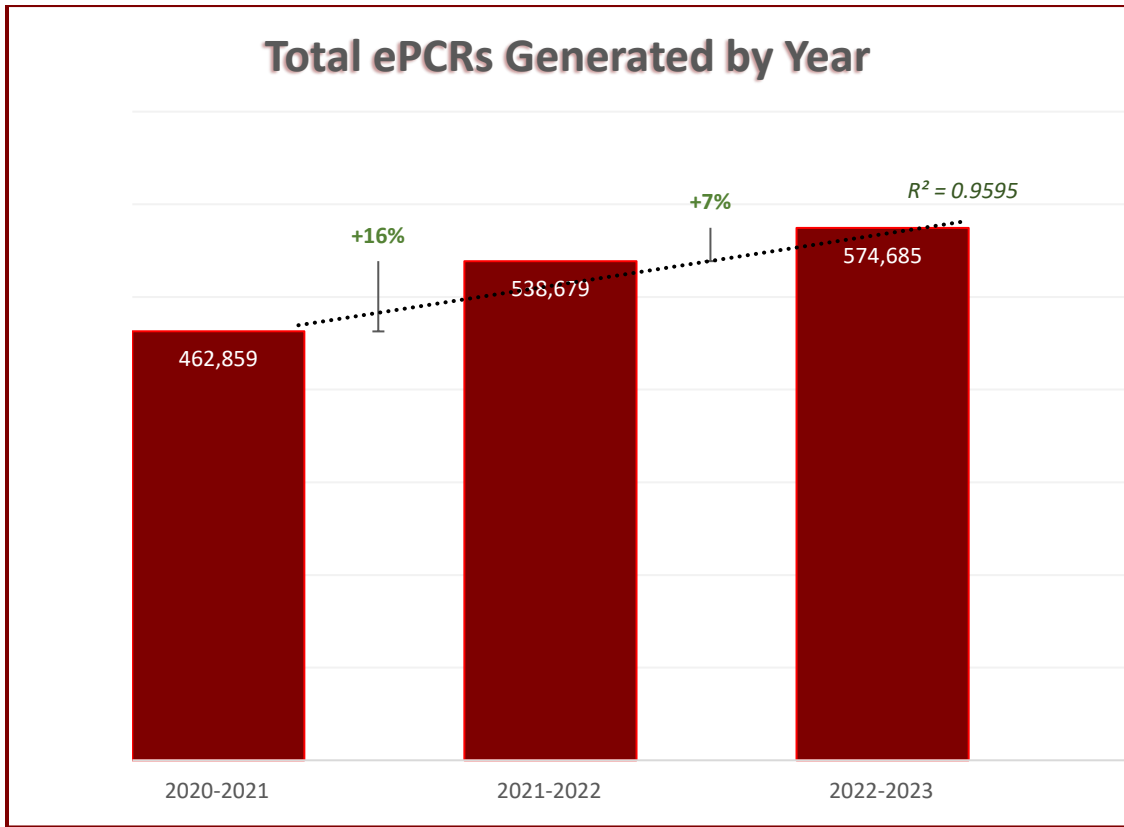
574,685

2020-2021

2021-2022

2022-2023

Figure 1 above displays the counts of ePCRs that were generated each year and the variation from year to year. The volume of ePCRs submitted has been steadily increasing each year. The greatest increase in ePCR volume occurred from the 2020-2021 fiscal year (462,859 records) to the 2021-2022 fiscal year (538,679 records). This was a proportionate increase of nearly 16%. The R^2 value indicates that there is evidence of an expected predictable increase in the relationship of the volume of ePCRs generated for each passing year.

*An ANOVA test was run to determine that the volume of ePCRs each year were statistically different ($p \ll 0.05$).

ANOVA						
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	4.14E+11	1	4.14E+11	254.1626	9.04943E-05	7.708647
Within Groups	6.52E+09	4	1.63E+09			
Total	4.21E+11	5				

Figure 2: Total Number of ePCRs Generated in 2022-2023 Fiscal Year by Month

Total ePCRs Generated by Month

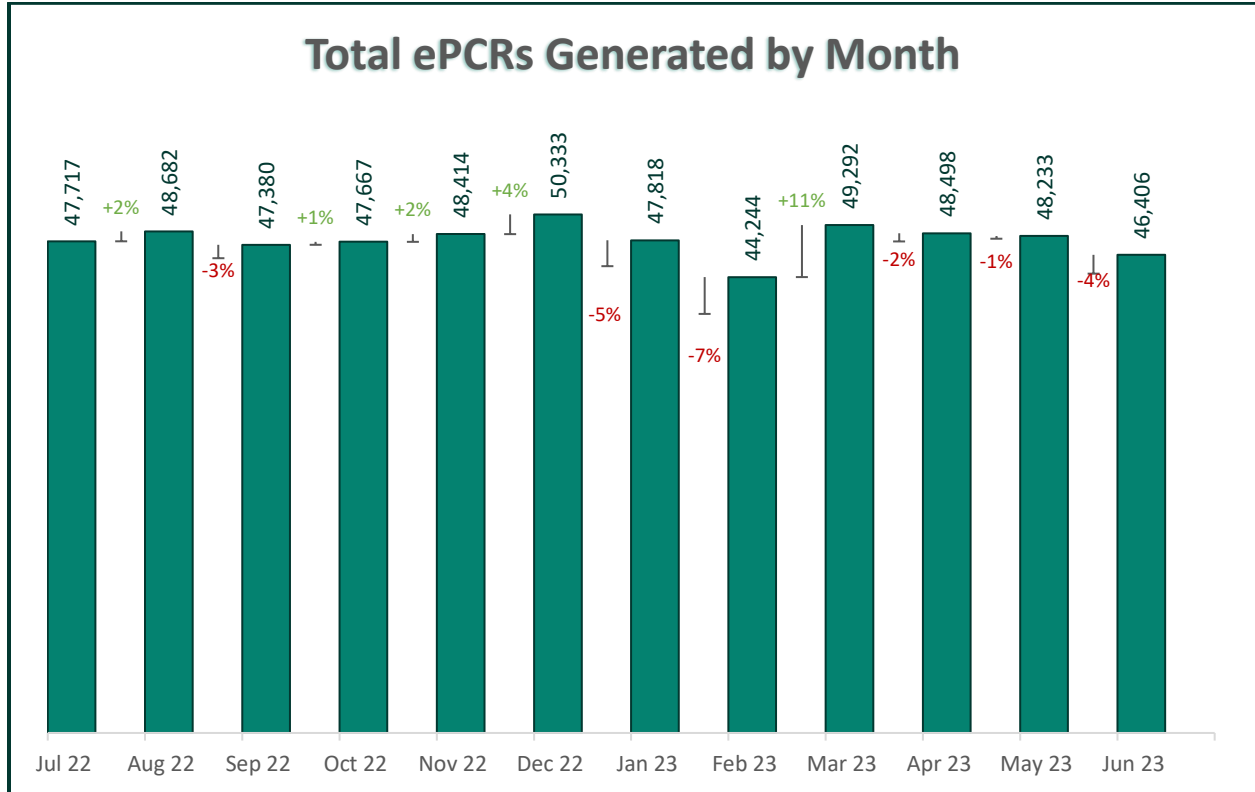| Month	Count	Variation
Jul 22	47,717	
Aug 22	48,682	+2%
Sep 22	47,380	-3%
Oct 22	47,667	+1%
Nov 22	48,414	+2%
Dec 22	50,333	+4%
Jan 23	47,818	-5%
Feb 23	44,244	-7%
Mar 23	49,292	+11%
Apr 23	48,498	-2%
May 23	48,233	-1%
Jun 23	46,406	-4%

Figure 2 above displays the counts of ePCRs that were generated each month and the variation from month to month. The greatest decrease in ePCR volume occurred from January 2023 to February 2023 (-7%). This decline in volume is consistent with the shorter number of days within the month of February (28) compared to January (31). The greatest increase occurred from the month of February to March in 2023 (+11%).

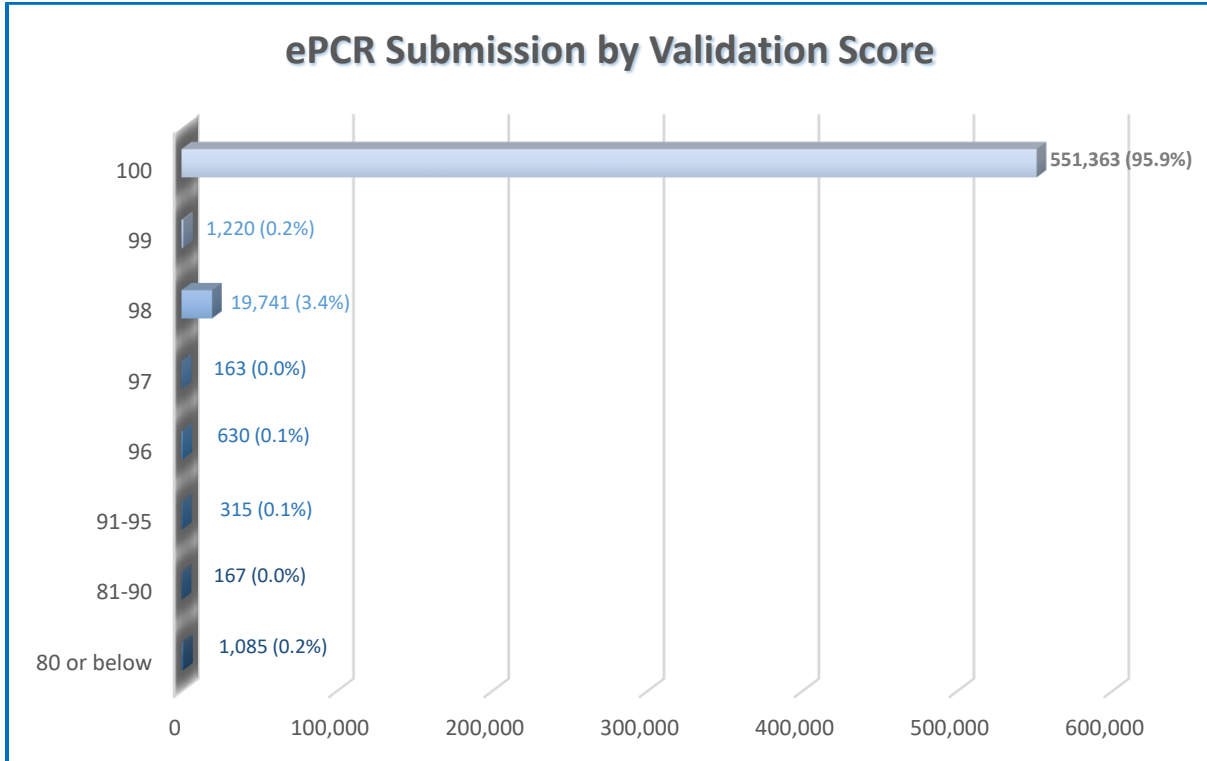## Figure 3: ePCR Completeness in 2022-2023 Fiscal Year by Validation Score

Figure 3 above displays the distribution of validation scores for ePCRs for incidents that consist of patient contact. Each record generates a validation score based on quality of documentation. Nearly 92% of ePCRs generated a validation score of 100. There is an obvious difference in the volume of records submitted with validation scores of 98 compared to 97 or 99. Less than 1% (0.22%; 1,255 records) generated validation scores less than or equal to 80.

Figure 4: Variation of ePCR Submission by Increasing Time Intervals

Delay in ePCR Submission by Various Time Intervals

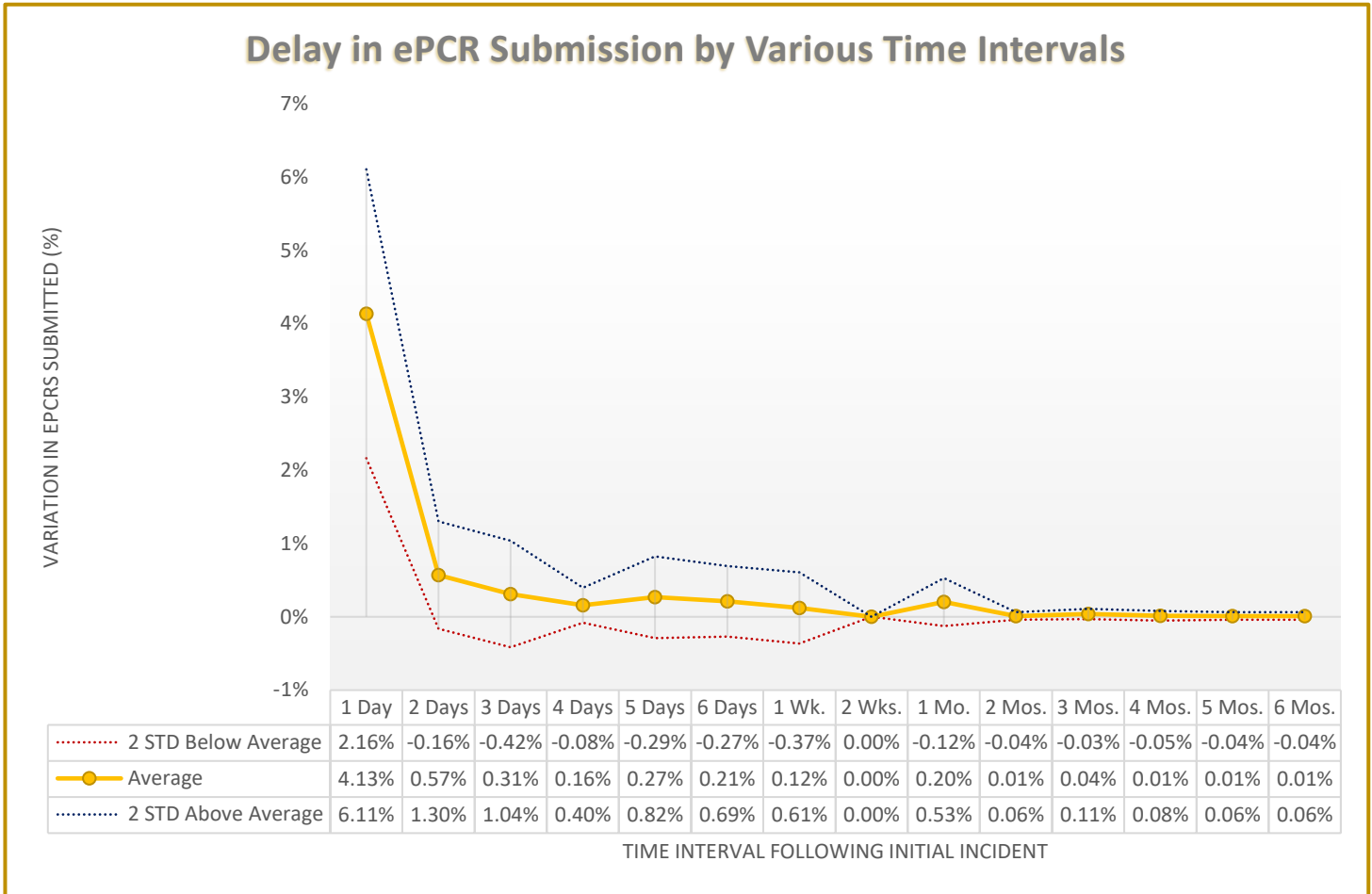|	1 Day	2 Days	3 Days	4 Days	5 Days	6 Days	1 Wk.	2 Wks.	1 Mo.	2 Mos.	3 Mos.	4 Mos.	5 Mos.	6 Mos.
⋯⋯ 2 STD Below Average	2.16%	-0.16%	-0.42%	-0.08%	-0.29%	-0.27%	-0.37%	0.00%	-0.12%	-0.04%	-0.03%	-0.05%	-0.04%	-0.04%
─○─ Average	4.13%	0.57%	0.31%	0.16%	0.27%	0.21%	0.12%	0.00%	0.20%	0.01%	0.04%	0.01%	0.01%	0.01%
⋯⋯ 2 STD Above Average	6.11%	1.30%	1.04%	0.40%	0.82%	0.69%	0.61%	0.00%	0.53%	0.06%	0.11%	0.08%	0.06%	0.06%

TIME INTERVAL FOLLOWING INITIAL INCIDENT

Figure 4 represents the mean variation in ePCR submission within 1-7days, 2 weeks, and 1-6 months of the incident. Each day at 8 am records were collected for the previous day (12:00 AM-11:59 PM), then again, each day for 6 months. There were no changes noted following 8 days. However, there were a few records submitted beyond 2 weeks up to 6 months following the incident. This data collection was done at the same time each day to increase the validity of measure. A total of 7 different dates were collected for 6 months to calculate mean variations over time. Within 24 hours, there was an average of 95.9% of patient care records submitted. There was a slight increase in delayed record submissions on the 14th day (+0.1%), to the 1st month (+0.2%) after the incident. However, nearly all electronic patient care records were submitted within the first day of the incident (~96%), and there was a nominal increase observed for delayed submissions over the next few months. In all, nearly 100% were submitted by day 3.

Figure 5: Total ePCR Submission in 2022-2023 Fiscal Year by Hour of Day
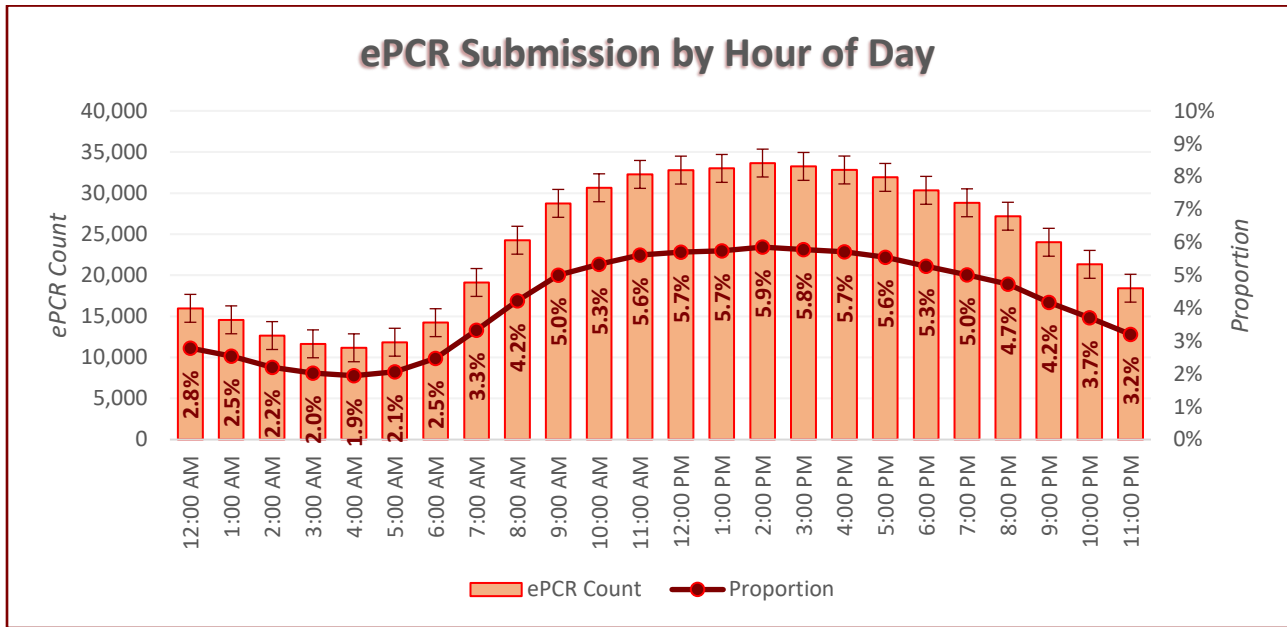
ePCR Submission by Hour of Day

Figure 5 above represents the distribution of EMS incidents by the hour of day reported in each ePCR generated. Most incidents reported were submitted between the hours of 9AM-7PM (60.6%). 2PM was the busiest with 33,654 records (5.9%) generated at that time. The error bars that do not overlap show significant difference among those hours. For instance, there is a significant difference in EMS incidents that occurred at 7AM and 8AM.

Figure 6: Total ePCR Submission in 2022-2023 Fiscal Year by Day of Week
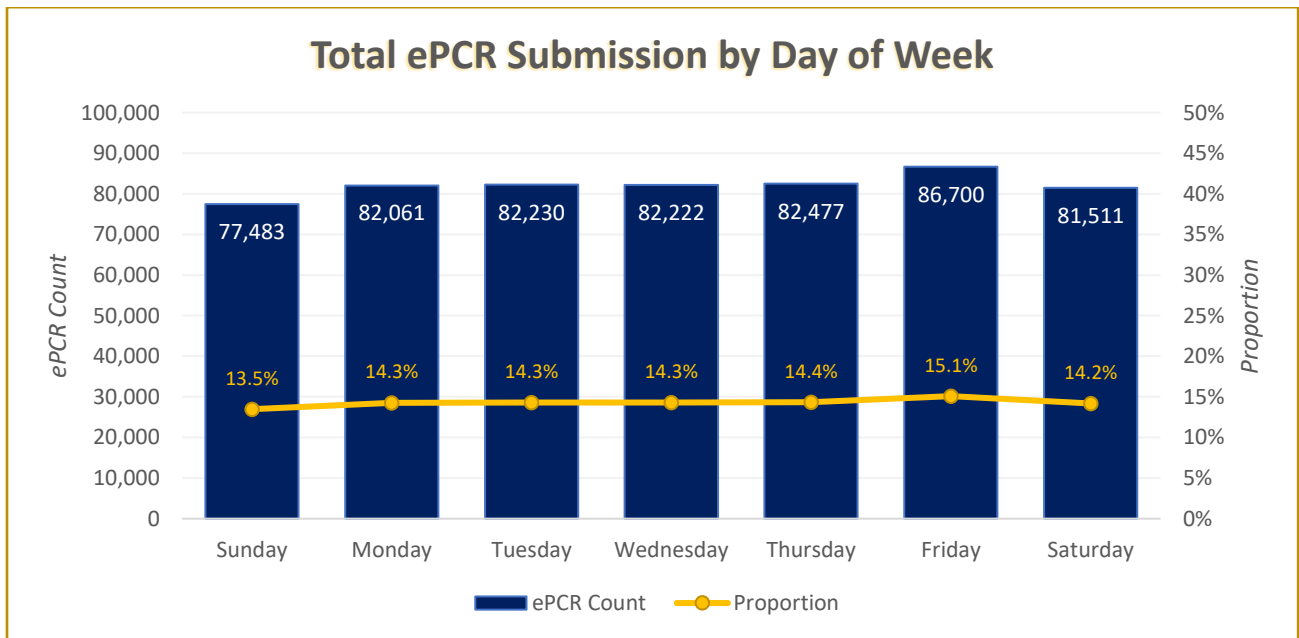
Total ePCR Submission by Day of Week

Figure 6 above represents the distribution of EMS incidents by the day of the week reported in each ePCR generated. Most reports were submitted on Friday with 15.1% of the ePCR distribution respectively. Sunday represents the day of the week with the fewest ePCRs submitted at 13.5%. However, there was no significant difference in EMS incidents that occurred on any day of the week.

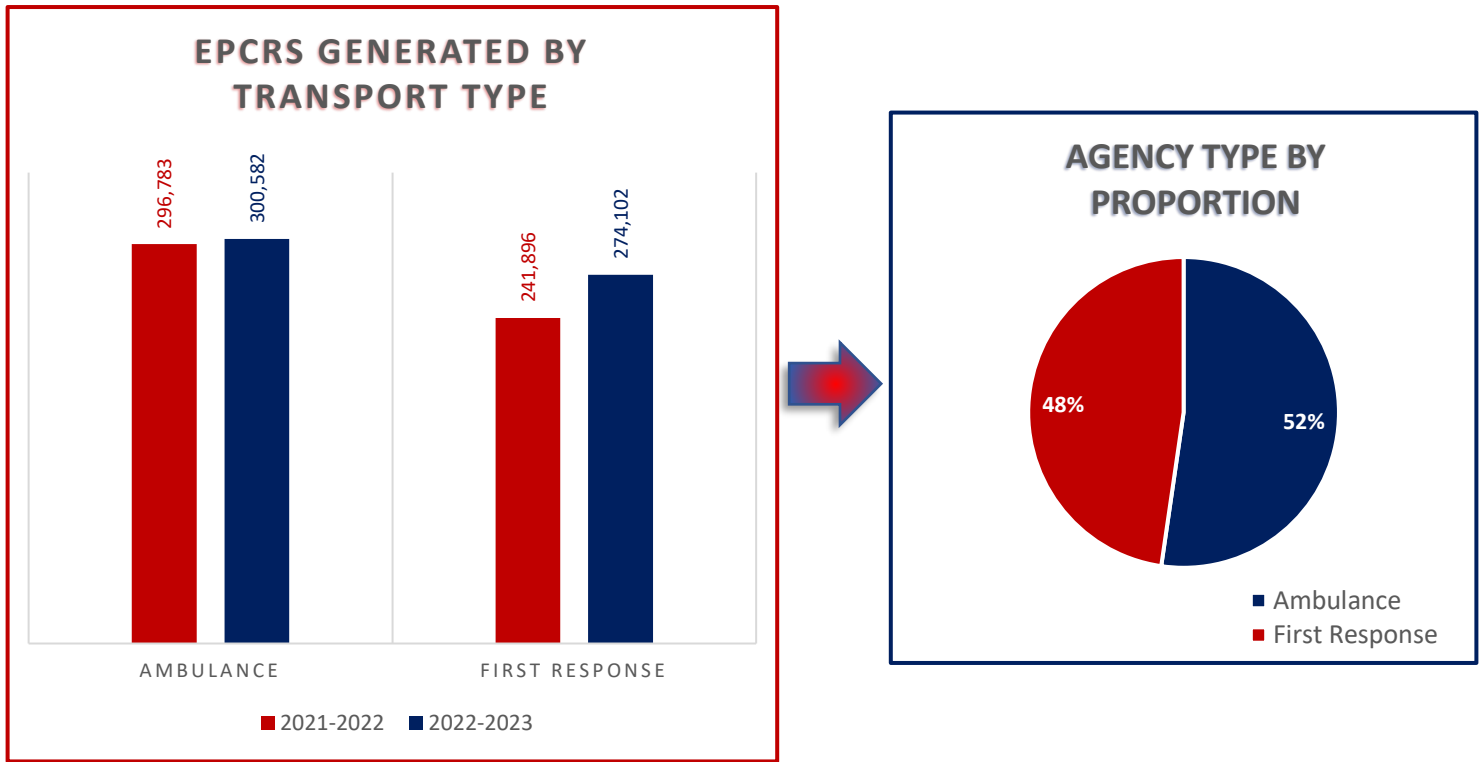# Figure 7: Total ePCRs Generated in 2022-2023 Fiscal Year by EMS Transport

Figure 7 above represents the total number of electronic patient care records generated by EMS transports. The volume was of ePCRs generated by both ambulance and first response transports in the 2022-2023 fiscal year were compared to the previous 2022 calendar year. For both ambulance and first response reports, the volume increased overall from 2022 to 2022-2023. However, the overall proportions did not change from year to year. Ambulance transports generated the largest volume of records with 300,582 submissions (52%).

Figure 8: ePCRs Generated in 2022-2023 Fiscal Year by Response Type
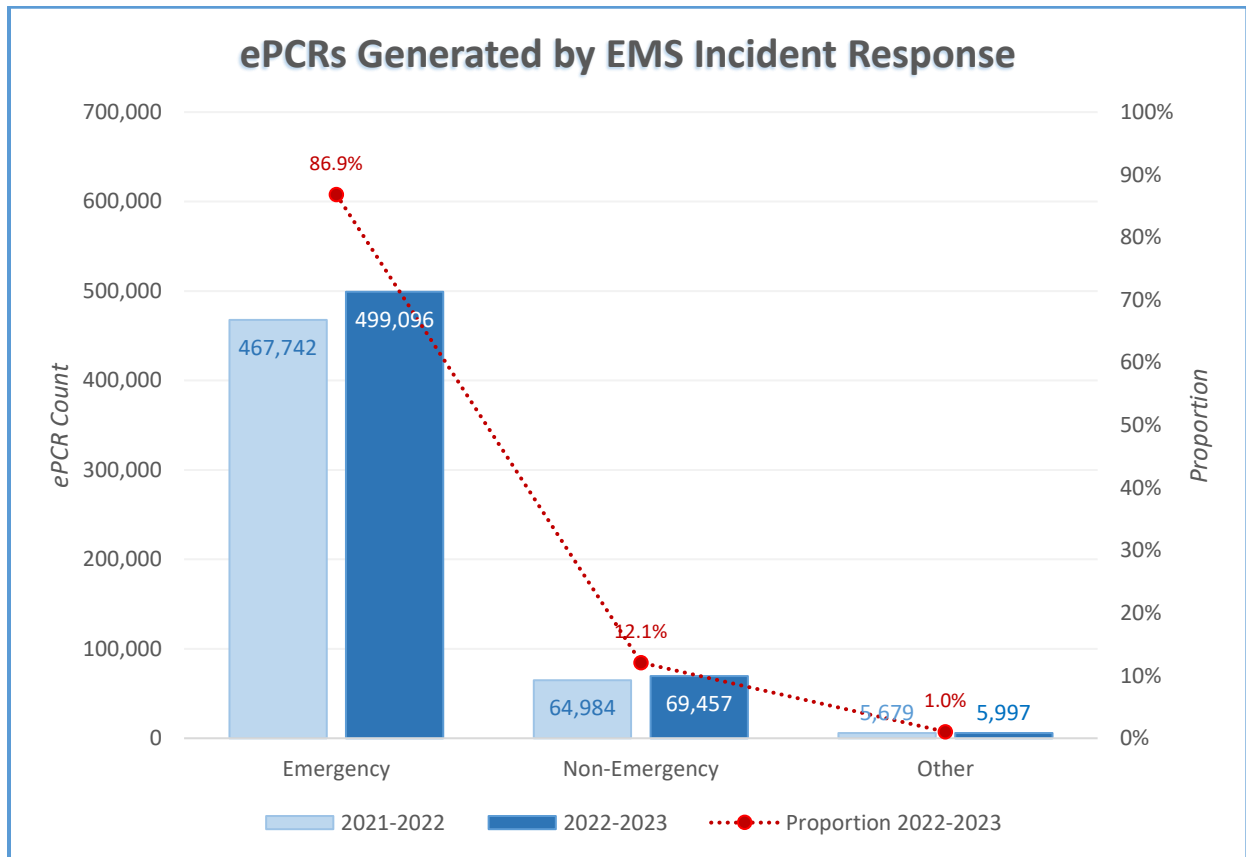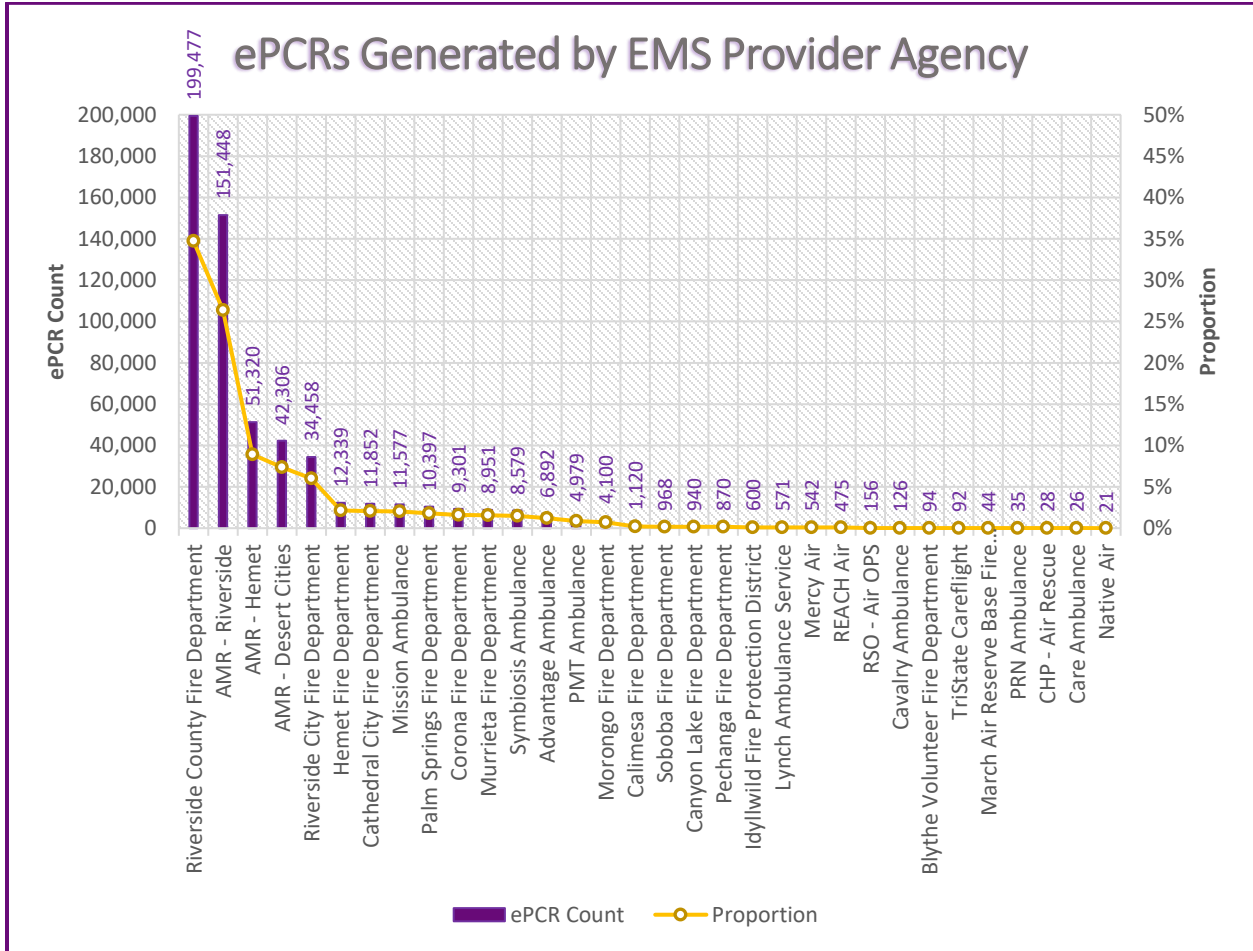

Figure 8 above represents the distribution of ePCRs generated by each type of EMS response. The graph also displays the record counts by year for each incident response type. Emergency responses made up the majority of ePCRs generated throughout the 2022-2023 fiscal year (499,096 records; 86.9%). Nearly 12% of records were from non-emergency response calls in both 2022 and the 2022-2023 fiscal year. 134 records did not include a response type of service requested and were excluded from analysis.

Figure 9: Total ePCRs Generated in 2022-2023 Fiscal Year by Incident Patient Disposition

| Patient Incident Disposition	ePCR Count	Proportion (%)
Patient Treated and Transported by this EMS Unit	241,653	42.0%
Patient Treated and Care Transferred to Another EMS Unit	98,510	17.1%
Canceled at Scene by Another Unit, No Patient Contact	53,758	9.4%
Assist another/same Agency	40,365	7.0%
Canceled Enroute	38,664	6.7%
Patient Treated, Refused Transport	34,023	5.9%
No Patient Found	19,730	3.4%
Patient Refused Evaluation/Care, No Transport	12,593	2.2%
Patient Treated and Transported with this Crew in Another EMS Unit	9,881	1.7%
Public Assist	9,649	1.7%
Canceled Prior to En Route	4,010	0.7%
Resuscitation Attempted, Dead at Scene, No Transport	2,726	0.5%
Dead at Scene, No Resuscitation, No Transport	2,605	0.5%
No Assessment, Care Transferred to Another EMS Unit	2,179	0.4%
Patient Treated, Transported by Law Enforcement	808	0.1%
REMSA - Assess and Refer	748	0.1%
Patient Treated, Transported by Private Vehicle	605	0.1%
Standby: No Services or Support Provided	528	0.1%
Non-Patient Transport (Crew, Equipment, Team, etc.)	495	0.1%
Patient Treated and Transported to Landing Zone by this EMS Unit	479	0.1%
Standby: Public Safety, Fire, or EMS Operational Support Provided	452	0.1%
Blank	73	0.0%
Patient Condition Precludes Interfacility Transport	61	0.0%
Patient Transported but Refused Evaluation/Care	55	0.0%
MCI Patients Triaged and Care Transferred to Other EMS Units	28	0.0%
False Call / False Alarm	5	0.0%
Patient Evaluated, No Treatment/Transport Required	1	0.0%
Grand Total	**574,684**	**100.0%**

The table above represents the total number and proportion of ePCRs in 2022 by Incident Patient Disposition. Patient incident disposition is taken from ImageTrend NEMSIS value eDisposition.12. According to the data, many patients encountered were treated and transported by the same EMS unit (241,653 records; 42%). Approximately, 16.8% of the reports submitted were due to calls that were canceled at the scene or prior to EMS arrival. Records that did not include an incident patient disposition were labeled as "Blank" (73 records; 0.0%).

Figure 10: Total Number of ePCRs Generated in 2022-2023 Fiscal Year by Agency


The figure above shows the distribution of EMS patient care reports submitted by each provider agency from Jul 2022-Jun 2023. Riverside County Fire Department represents the agency that makes up the largest proportion of ePCRs received during this time with 199,477 reports (34.7%). AMR Riverside was the second agency with the most ePCRs generated during that time with 151,448 reports (26.4%).

Figure 11: Total ePCR Count by Scene Incident Location Type
(see Appendix for Breakdown)
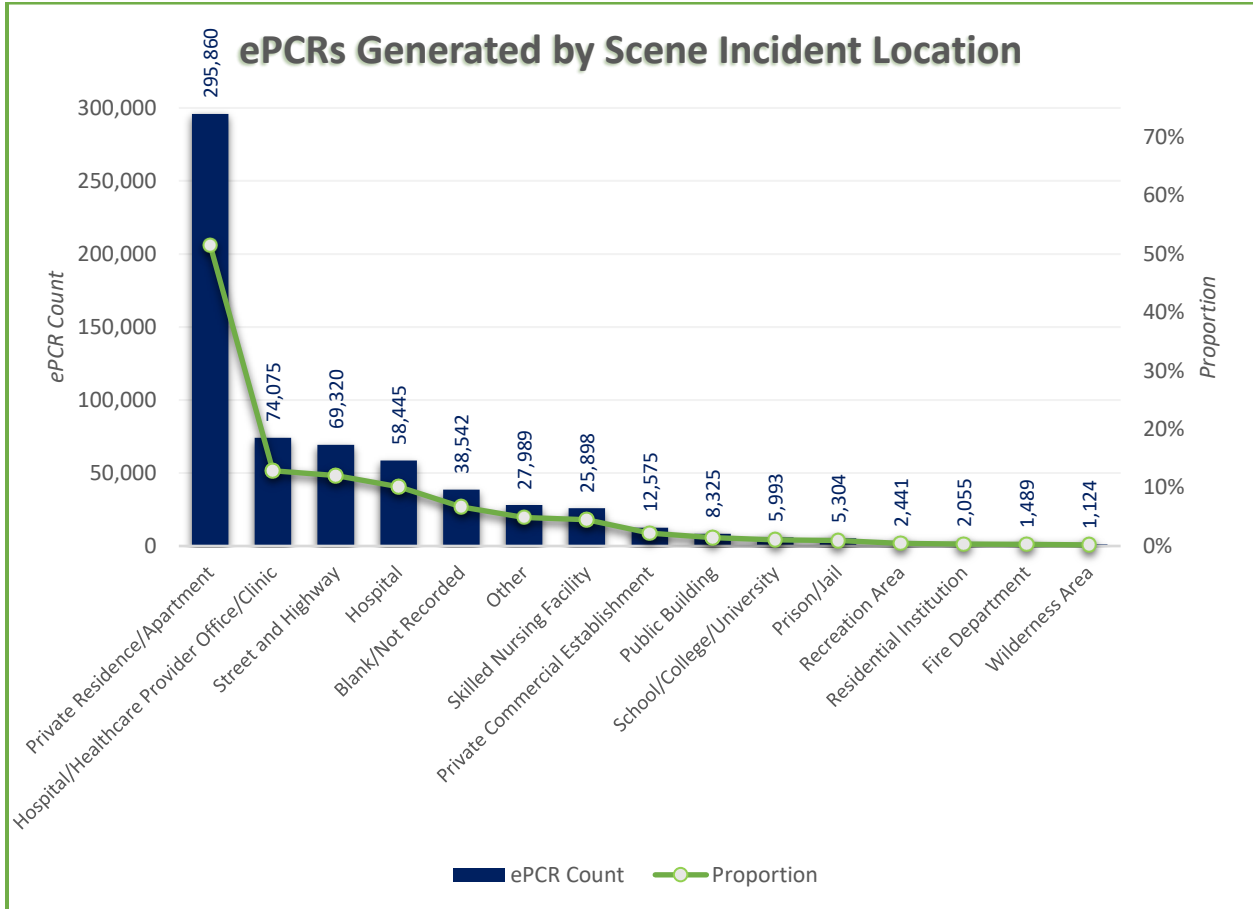
The figure above displays the total number and proportion of ePCRs by Scene Incident Location Type in 2022-2023 fiscal year. The 15 scene incident location types with greatest frequency of records are shown in this figure. There were a total of 24 different location types then collapsed into 22 categories (shown in Appendix A). The scene incident location types from non-emergency responses are also shown (Appendix B) and it was found that 78.7% (52,121 incidents) come from hospital settings. Overall, most of the records indicated that the incident occurred in a private residence or apartment location (295,860 records, 51.5%). 6.7% (38,542 records) of the total ePCRs submitted did not include a scene incident location type, shown as "Blank Not Recorded".

Figure 12: Total ePCRs Generated in FY 2022-2023 by EMS Zone
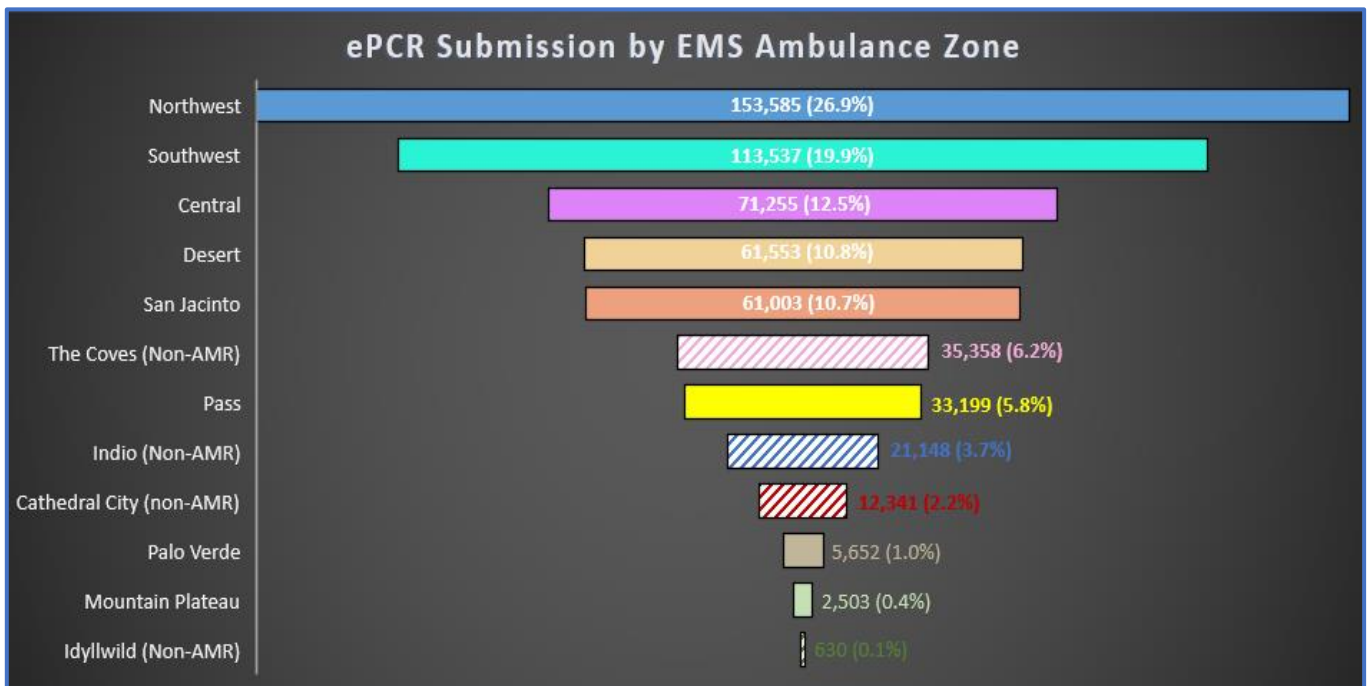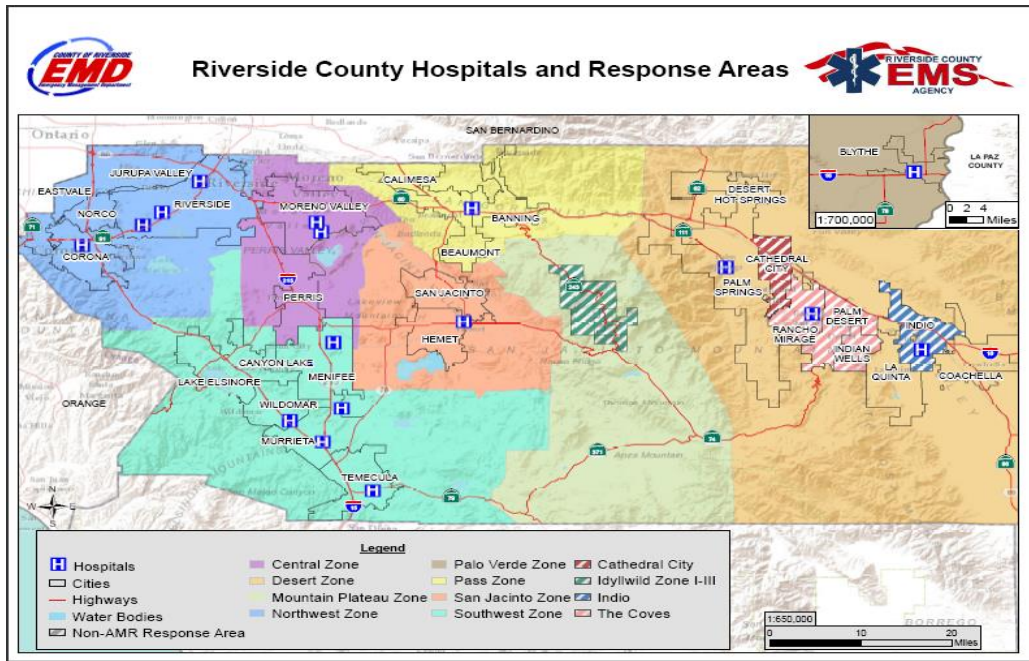
The figure above represents the number and proportions of ePCRs generated within each EMS Zone from July 1st,2022-June 30th, 2023. Most records originated within the Northwest EMS Zone with 153,585 records (27%). The EMS zone with the lowest frequency of generated records was the Idyllwild Zone with 630 records (0.1%). This analysis was done using data extracted from ImageTrend Elite using the scene incident city name (escene.17) and matched to corresponding zones. Approximately 0.5% (2,920) of the records were removed from this analysis due to incident city documented as missing/blank.

Appendix A- *Scene Location Breakdown for All Incidents*

Original Scene Location Type	ePCR Count	Scene Location Type	ePCR Count	Proportion
Private Residence/Apartment	295,860	Private Residence/Apartment	295,860	51.5%
Street and Highway	69,320	Street and Highway	69,320	12.1%
Hospital	58,445	Hospital/Healthcare Provider/Clinic	74,075	12.9%
Healthcare provider office/clinic	13,855			
Urgent Care	1,775			
(blank)	38,259	Blank/Not Recorded	38,542	6.7%
Not Recorded	283			
Other	27,989	Other	27,989	4.9%
Skilled Nursing Facility	25,898	Skilled Nursing Facility	25,898	4.5%
Private Commercial Establishment	12,575	Private Commercial Establishment	12,575	2.2%
Public Building	8,325	Public Building	8,325	1.4%
School/College/University	5,993	School/College/University	5,993	1.0%
Prison/Jail	5,304	Prison/Jail	5,304	0.9%
Recreation area	2,441	Recreation Area	2,441	0.4%
Residential institution	2,055	Residential institution	2,055	0.4%
Fire Department	1,489	Fire Department	1,489	0.3%
Wilderness area	1,124	Wilderness Area	1,124	0.2%
Airport/Transport Center	1,112	Airport/Transport Center	1,112	0.2%
Industrial or construction area	868	Industrial/Construction Area	868	0.2%
Health Club/Gym	728	Health Club/Gym	728	0.1%
Swimming Pool	243	Swimming Pool	243	0.0%
Farm/Ranch	237	Farm/Ranch	237	0.0%
Beach/Ocean/Lake/River	185	Beach/Ocean/Lake/River	185	0.0%
Railroad Track	129	Railroad Track	129	0.0%
Military base	98	Military Base	98	0.0%
Not Applicable	94	Not Applicable	94	0.0%
Grand Total	**574,684**	**Grand Total**	**574,684**	**100%**

Appendix B- *Scene Location Breakdown for Non-Emergency Responses*

Original Scene Location Type	ePCR Count	Scene Location Type	ePCR Count	Proportion
Hospital	55,276	*Hospital/Healthcare Provider/Clinic*	57,229	82.4%
Healthcare provider office/clinic	1,818			
Urgent Care	135			
Skilled Nursing Facility	5,149	*Skilled Nursing Facility*	5,149	7.4%
Private Residence/Apartment	2,348	*Private Residence/Apartment*	2,348	3.4%
Other	1,567	*Other*	1,567	2.3%
Prison/Jail	1,309	*Prison/Jail*	1,309	1.9%
(blank)	703	*Blank/Not Recorded*	704	1.0%
Not Recorded	1			
Airport/Transport Center	515	*Airport/Transport Center*	515	0.7%
Street and Highway	198	*Street and Highway*	198	0.3%
School/College/University	129	*School/College/University*	129	0.2%
Not Applicable	94	*Not Applicable*	94	0.1%
Public Building	74	*Public Building*	74	0.1%
Residential institution	70	*Residential Institution*	70	0.1%
Private Commercial Establishment	28	*Private Commercial Establishment*	28	0.0%
Recreation area	17	*Recreation Area*	17	0.0%
Fire Department	10	*Fire Department*	10	0.0%
Industrial or construction area	5	*Industrial/Construction Area*	5	0.0%
Military base	4	*Military Base*	4	0.0%
Swimming Pool	2	*Swimming Pool*	2	0.0%
Health Club/Gym	2	*Health Club/Gym*	2	0.0%
Farm/Ranch	2	*Farm/Ranch*	2	0.0%
Railroad Track	1	*Railroad Track*	1	0.0%
Grand Total	**69,457**	**Grand Total**	**69,457**	**100%**

References

- Riverside County Emergency Medical Services Agency (REMSA) Policy 7701 https://www.remsa.us/policy/7701.pdf
- State of California. California Code of Regulations, Title 22. Social Security, Division 9. Prehospital Emergency Medical Services. State of California Emergency Medical Services Authority / Health and Human Services Agency. 2021. https://emsa.ca.gov/wp-content/uploads/sites/71/2021/01/EMSA-REGS-2020-12-15.pdf