PurpleLab Inc.

2024 QE REPORT

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PURPLELAB STANDARD QE REPORTS ON MEASURES

Commercial and QE (closed) claims are compared across these metrics:

Hospital 30-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

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ABOUT THE QE PROGRAM

QUALIFIED ENTITY CERTIFICATION PROGRAM
FOR MEDICARE DATA

The Qualified Entity (QE) program was created as part of the Affordable Care Act to combine Medicare data with a commercial claims data set and use it to report health system quality measures publicly. In April 2022, PurpleLab became the 17th nationally certified QE while gaining access to data from Medicare parts A, B, and D, as well as all Medicare fee-for-service (FFS) claims for acute care, post-acute care, physician office, and pharmacy services for more than 59 million individuals each year. PurpleLab combined the Medicare data with its already rich set of commercial claims from 330+ million unique individuals, 50+ billion claims, and additional Social Determinant of Health (SDOH) attributes, making the data even more actionable.

For more information, visit www.qemedicaredata.org.

ABOUT PURPLELAB

PurpleLab™ is a health-tech company with a mission to make healthcare speak a single unified language to drive better outcomes. HealthNexus™, our no-code healthcare analytics platform, empowers life sciences, payers, providers and other stakeholders with real-world evidence to solve conventional and emerging challenges faster and more cost effectively.

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EXECUTIVE SUMMARY

OVERVIEW

This report highlights two standard measures used by PurpleLab as a QE to evaluate provider performance. The measures are claims-based and evaluate hospital readmissions after discharge, comparing commercial and Medicare populations.

PurpleLab's data comprise commercial and QE standard rates categorized by various social determinants of health. The data include information on patient counts with corresponding numerators and denominators. In addition, some patients are excluded from the analyses based on specific duplication criteria. For instance, the same patient might require several rounds of hospital readmission due to recurring illness. Therefore, a new denominator value is estimated by subtracting the excluded patient counts and calculating the new overall rates.

All data are analyzed using proportions tests on each metric across both types of claims. This results in derived p-values, confidence intervals, and proportion estimates, facilitating the evaluation of statistically significant disparities.

Further analysis involves cross-examining the social determinants of health data using Odds Ratios obtained using Fisher's Test to uncover potential associations between specific determinants.

When comparing the commercial and QE claims in the overall data, a statistically significant difference in the rates for the measures is observed at the 5% level. When SDOH variables such as race, ethnicity, and income are included in the analyses, statistically significant differences are observed for certain variables.

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EXECUTIVE SUMMARY

MEASURE SELECTION

PurpleLab chose these measures based on the data available in our HealthNexus™ platform. The standard measures are selected as they are all claims-based without needing other supplemental data, such as electronic medical records or laboratory results. The measures are applied to commercial and closed claims as well as the Social Determinant of Health (SDOH) variables of race, ethnicity, income, marital status, and employment. The data are examined using the commercial population only and then compared to the full QE data set.

In the aggregate view of the data, the measures show a statistically significant difference between the commercial and Medicare populations. Deidentified SDOH information was added to the cohort to perform further statistical analyses.

NQF2515: Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery is selected to see if there is any difference in admission after CABG, and if so, did the timing make a difference. In this and the subsequent measure, the older population is more likely to be readmitted than the younger population.

NQF3494: Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery. As described above, even after a longer period after surgery, the elderly population is more likely to be admitted than the younger one.

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METHODOLOGY

DATA SOURCING

The measures are evaluated using the QE data from January 2022 to December 2022. PurpleLab medical claims for the same period are also used. Claims from 2021 are examined but are not used in the reporting period.

PurpleLab derives commercial data from multiple sources but examines the QE data as given. Our analysis examines 33,255,026 unique patient identifiers for QE claims and 233,117,493 for commercial claims.

Various queries are used to pull the data for the necessary measures. Following these pulls, statistical analysis is performed in R (4.4.0) [1].

PurpleLab data follow the Privacy Rule, 45 CFR §164.514(b), of the Health Insurance Portability and Accountability Act of 1996 (HIPAA) for statistical de-identification of information [2]. PurpleLab's repository includes de-identified patient variables to facilitate longitudinal patient tracking while maintaining patient privacy and HIPAA compliance. Section 164.514(b) of the HIPAA law outlines two methods for determining the de-identification of health information: Expert Determination and Safe Harbor [3]. PurpleLab employs both methods to ensure compliance. During the Safe Harbor phase, data are inspected for any of 18 direct identifiers, which must be destroyed. Through expert determination, PurpleLab ensures minimal risk of direct or indirect patient re-identification [4-6].

Social Determinants of Health (SDOH) are sourced from several different sources. The data are linked using Datavant tokens. All identifiable information is removed, creating a HIPAA-certified data set with the attributes linked to the medical and pharmacy claims. The social determinants of health data are self-reported, sourced from four independent leading-industry sources, and linked to our HIPAA-compliant patient data warehouse. We present our SDOH data in a way that ensures the lowest risk of re-identification. SDOH attributes are mapped to additional data points, including age, gender, zip3, state, and mortality.

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METHODOLOGY

DATA SOURCING

Claims Data - Medical and Pharmacy claims data are provided to PurpleLab via relationships with a network of partners and aggregators. These data are tokenized by the source/partner and delivered to PurpleLab via Datavant software that creates a secure "transit token" while being transmitted to PurpleLab. Once received, PurpleLab uses the Datavant software to convert the Claims Data with transit tokens from suppliers to PurpleLab Tokens and ingests the data into the PurpleLab data environment.

QE Data - Claims data from CMS are made available to PurpleLab to pull from the CMS data warehouse. As this dataset is identifiable, PurpleLab first tokenizes the QE data using the Datavant de-identification software. Once tokenized, the data are ingested into PurpleLab's data environment.

SDOH Data - Reference data containing social determinants of health variables are provided to PurpleLab via relationships with a network of partners and suppliers. The data are tokenized by the source/partner and are delivered to PurpleLab via Datavant software which creates a secure "transit token" while being transmitted to PurpleLab. Once received, PurpleLab uses the Datavant software to convert the SDOH data with transit tokens from suppliers to PurpleLab Tokens and ingests the data into the PurpleLab data environment.

Any tokenized data (Medical/Pharmacy claims, QE Claims, or SDOH) can be matched by finding common tokens in each dataset that meet the project specifications.

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METHODOLOGY

STATISTICAL METHODOLOGY

Proportions Test

A proportions Z-test evaluates whether the frequencies of an outcome in two different groups (Open vs. QE) are significantly different from each other:

Denote:
p1 as the proportion of successes in group 1,
n1 as the total number of observations in group 1,
p2 as the proportion of successes in group 2,
n2 as the total number of observations in group 2.

The null hypothesis states that there is no difference in the group proportions, that is,

$$H_0 : p_1 - p_2 = 0$$
$$H_1 : p_1 - p_2 \neq 0$$

The corresponding test statistic is calculated as:

$$z = \frac{(p_1) - (p_2)}{\sqrt{P(1-P)(\frac{1}{n_1} + \frac{1}{n_2})}}$$

Where,
P represents the pooled proportion of positive outcomes and is obtained as:

$$\frac{x_1 + x_2}{n_1 + n_2}$$

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With x1 and x2 being the number of positive outcomes in groups 1 and 2, respectively.

The Z-test rests on the following assumptions:

- The samples are independent and randomly obtained from each population.
- The sampling distribution of the difference in proportions is approximately normally distributed. This assumption is generally satisfied when:

For all: $$n_1 p_1, n_1(1-p_1), n_2 p_2, n_2\,(1-p_2) > 5$$

The size of the Z-test statistic is compared to the standard normal distribution to determine the p-value. The decision to reject (or fail to reject) the null hypothesis is determined at a specified significance level of 5%.

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FINDINGS

OVERALL RESULTS

The measures selected show statistical significance between the commercial and Medicare populations. The younger population is less likely to be re-hospitalized after a general home health visit or after CABG than the older population. If the younger population goes to the ER, they are less likely to be admitted to the facility.

NQF2515: Hospital 30-day, all-cause, unplanned, risk-standardized readmission rate (RSRR) following coronary artery bypass graft (CABG) surgery
NQF3494: Hospital 90-Day, All-Cause, Risk-Standardized Mortality Rate (RSMR) Following Coronary Artery Bypass Graft (CABG) Surgery

For these measures, 76,898 commercial and 58,521 Medicare members are identified as eligible. Of those, 1,834 (2.38%) and 2,571 (4.39%) are readmitted within the first 30 days after discharge. When this is expanded to 90 days, the numbers increase to 2,542 (3.19%) and 3,256 (5.56%). For both the 30 and 90-day measures, the differences between the commercial and Medicare populations are statistically significant.

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FINDINGS

OVERALL RESULTS

Statistically Significant Rate Results
for both **Commercial** and **QE** claims

	Commercial	QE
NQF2515: Hosp 30-Day RSRR following CABG	✓	✓
NQF3494: Hosp 90-Day RSRR following CABG	✓	✓

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METHODOLOGY

SDOH STATISTICAL METHODOLOGY

Three different determinants are given in the SDOH dataset:

- Household Income
  - ≤$10,000 vs. >$10,000 & ≤$50,000
- Residing Area
  - Rural vs. Urban
- Race
  - White, African American, & Asian patients

First, the determinants are analyzed individually to determine whether the commercial and QE rates are statistically significant. Next, using Fisher's tests, Odds Ratios, p-values, and Confidence Intervals are obtained and compared to one another to estimate association.

Fisher's Test

Fisher's statistical significance test evaluates non-random associations between two categorical variables. It's especially useful when sample sizes are small where the underlying distribution assumptions may be violated. Data are usually arranged in a 2x2 contingency table as presented below:

	Outcome +	Outcome -
Group 1	**a**	**b**
Group 2	**c**	**d**

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The probability of obtaining the observed table above (or a more extreme arrangement) under the null hypothesis of no association between the variables, can be calculated using the hypergeometric distribution:

$$P = \frac{\left(\frac{a+b}{a}\right)\left(\frac{c+d}{c}\right)}{\left(\frac{n}{a+c}\right)}$$

Where,

- n = a + b + c + d
- P represents the hypergeometric probability of observing the current arrangement of the data under H0 relative to all possible arrangements (given the marginal totals).
- $\left(\frac{a+b}{a}\right)$ represents the number of ways to choose 'Outcome +' Group 1 individuals out of the Group 1 total (a+b).
- $\left(\frac{c+d}{c}\right)$ represents the number of ways to choose 'Outcome +' Group 2 individuals out of the Group 2 total (c+d).
- $\left(\frac{n}{a+c}\right)$ represents the total number of ways to choose a+c 'Outcome +' individuals out of the entire sample size n.

The decision to reject (or fail to reject) the null hypothesis is determined by comparing P to a specified significance level of 5%.

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METHODOLOGY

SDOH STATISTICAL METHODOLOGY

Odds Ratios

Odds Ratios, obtained when performing Fisher's test, are a valuable tool in the analysis of SDOH data because they provide a quantitative measure of the relationship between exposures and outcomes, facilitating evidence-based decision-making. Odds Ratio (OR) provides a measure of the strength and direction of the association between two binary variables. Using Table 1, the formula for the calculation of the OR and its corresponding confidence interval is given by:

$$\text{OR} = \frac{\text{Odds of positive outcome in Group 1}}{\text{Odds of positive outcome in Group 2}}$$

$$\text{OR} = \frac{a \div b}{c \div d} = \frac{ad}{bc}$$

$$\text{Upper 95\% CI} = e^{\ln(OR)+1.96\sqrt{\left(\frac{1}{a}\right)+\left(\frac{1}{b}\right)+\left(\frac{1}{c}\right)+\left(\frac{1}{d}\right)}}$$

$$\text{Lower 95\% CI} = e^{\ln(OR)-1.96\sqrt{\left(\frac{1}{a}\right)+\left(\frac{1}{b}\right)+\left(\frac{1}{c}\right)+\left(\frac{1}{d}\right)}}$$

In the context of analyzing SDOH data for commercial and QE sources, odds ratios are used for:

- Quantifying associations
- Comparing exposures
- Communicating findings

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FINDINGS

SDOH RESULTS

Statistically Significant Rate Results
for **Commercial** claims

	≤$10,000 / >$10,000 & ≤$50,000	Rural / Urban	African American / White Patients	Asian / White Patients	African American / Asian Patients
NQF2515	✓	✓	X	X	X
NQF3494	✓	✓	X	✓	✓

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FINDINGS

SDOH RESULTS

Statistically Significant Rate Results
for **QE** claims

	≤$10,000 / >$10,000 & ≤$50,000	Rural / Urban	African American / White Patients	Asian / White Patients	African American / Asian Patients
NQF2515	✓	X	X	X	X
NQF3494	X	X	X	X	X

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CONCLUSION

When commercial and Medicare data are examined, there are differences between the two groups of individuals. Younger people are less likely to be admitted to the hospital after discharge. If they go to the ED, they are more likely to be sent home rather than admitted when compared to the Medicare population. Because of the differences in race and income, sensitivity to these groups must also be considered when the patients are being evaluated for treatment. In addition, the more rural population is less likely to go to an ED due to the location of the nearest facility, but when they do, they are more likely to be admitted.

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APPENDIX

OVERALL RESULTS

Table 1: Statistical Significance Results for the Overall Data

Measure ID	Measure Name	p-value	Commercial Rate	QE Rate
NQF2558	Hospital 30-day, All-Cause, (RSMR) Following (CABG) Surgery	< 2.2e-16	0.02	0.04
NQF3494	Hospital 90-day, All-Cause, (RSMR) Following (CABG) Surgery	< 2.2e-16	0.03	0.06

When comparing both commercial and QE claims in the Overall Data, there is a significant statistical difference in the rates for the measures at the 5% level (p-values < 2.2e-16).

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APPENDIX

SDOH RESULTS

Household Income (<=$10,000 vs. >$10,000 & <=$50,000) :
Measure NQF2558

In both commercial and QE claims, the odds of a 30-day hospital episode occurring in a household making less than $10,000 are **28%** and **21%** higher respectively than the same odds in households making between $10,000 and $50,000.

COMMERCIAL	Hosp 30	Not Hosp 30	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
<=$10,000	131	3982	1.28	0.01	1.05	1.55
>$10,000 & <=$50,000	832	32386				

QE	Hosp 30	Not Hosp 30	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
<=$10,000	153	2669	1.21	0.03	1.01	1.44
>$10,000 & <=$50,000	1235	26113				

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APPENDIX

SDOH RESULTS

Household Income (<=$10,000 vs. >$10,000 & <=$50,000) :
Measure NQF3494

Only in commercial claims, the odds of a 90-day hospital episode occurring for a household making less than $10,000 are **26%** higher than the same odds in households making between $10,000 and $50,000. The same conclusion cannot be reached in QE claims (p-value < 5% BUT CI includes 1; therefore, the result is negative).

COMMERCIAL	Hosp 90	Not Hosp 90	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
<=$10,000	176	3937	1.26	7.10E-3	1.06	1.48
>$10,000 & <=$50,000	1140	32078				

QE	Hosp 90	Not Hosp 90	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
<=$10,000	190	2632	1.20	0.05	1.00	1.37
>$10,000 & <=$50,000	1235	26113				

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APPENDIX

SDOH RESULTS

Residing Area (Rural vs. Urban) :
Measure NQF2558

In commercial claims, the odds of a 30-day hospital episode occurring in rural households is **48%** higher than the same odds in urban households. The same conclusion cannot be reached in QE claims (p-value > 5% and CI includes 1).

COMMERCIAL	Hosp 30	Not Hosp 30	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Rural	103	2897	1.48	3.00E-4	1.20	1.82
Urban	1731	72167				

QE	Hosp 30	Not Hosp 30	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Rural	162	3372	1.05	0.55	0.89	1.23
Urban	2409	52578				

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APPENDIX

SDOH RESULTS

Residing Area (Rural vs. Urban) :
Measure NQF3494

In commercial claims, the odds of a 90-day hospital episode occurring in rural households is **29%** higher than the same odds in urban households. The same conclusion cannot be reached in QE claims (p-value > 5% and CI includes 1).

COMMERCIAL	Hosp 90	Not Hosp 90	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Rural	121	2879	1.29	0.01	1.06	1.56
Urban	2331	71567				

QE	Hosp 90	Not Hosp 90	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Rural	211	3323	1.08	0.27	0.93	1.25
Urban	3045	51942				

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APPENDIX

SDOH RESULTS

Race (African American Patients vs. White Patients) :
Measure NQF2558

In both commercial and QE claims, the odds of a 30-day hospital episode occurring for African American patients are not significantly different than the same odds for White patients.

COMMERCIAL	Hosp 30	Not Hosp 30	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Black/African American	135	5211	1.03	0.71	0.85	1.24
White	1169	46557				

QE	Hosp 30	Not Hosp 30	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Black/African American	150	3349	1.01	0.90	0.85	1.20
White	1732	39029				

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APPENDIX

SDOH RESULTS

Race (African American Patients vs. White Patients) :
Measure NQF3494

In both commercial and QE claims, the odds of a 90-day hospital episode occurring for African American patients are not significantly different than the same odds for White patients.

COMMERCIAL	Hosp 90	Not Hosp 90	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Black/African American	193	5153	1.08	0.30	0.93	1.26
White	1595	46131				

QE	Hosp 90	Not Hosp 90	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Black/African American	206	3293	1.11	0.17	0.95	1.28
White	2180	38581				

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APPENDIX

SDOH RESULTS

Race (Asian Patients vs. White Patients) :
Measure NQF2558

In both commercial and QE claims, the odds of a 30-day hospital episode occurring for Asian patients are not significantly different than the same odds for White patients.

COMMERCIAL	Hosp 30	Not Hosp 30	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Asian	42	2136	0.78	0.13	0.56	1.07
White	1169	46557				

QE	Hosp 30	Not Hosp 30	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Asian	47	1060	1.00	1.00	0.73	1.34
White	1732	39029				

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APPENDIX

SDOH RESULTS

Race (Asian Patients vs. White Patients) :
Measure NQF3494

Only in commercial claims, the odds of a 90-day hospital episode occurring for Asian patients are **28%** lower than the same odds for White patients. The same conclusion cannot be reached in QE claims (p-value > 5% and CI includes 1).

COMMERCIAL	Hosp 90	Not Hosp 90	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Asian	53	2125	0.72	0.02	0.54	0.95
White	1595	46131				

QE	Hosp 90	Not Hosp 90	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Asian	62	1045	1.05	0.68	0.80	1.36
White	2180	38581				

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Race (African American Patients vs. Asian Patients) :
Measure NQF2558

In both commercial and QE claims, the odds of a 30-day hospital episode occurring for African American patients are not significantly different than the same odds for Asian patients.

COMMERCIAL	Hosp 30	Not Hosp 30	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Black/African American	135	5211	1.32	0.13	0.92	1.92
Asian	42	2136				

QE	Hosp 30	Not Hosp 30	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Black/African American	150	3349	1.01	1.00	0.72	1.44
Asian	47	1060				

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APPENDIX

SDOH RESULTS

Race (African American Patients vs. Asian Patients) :
Measure NQF3494

Only in commercial claims, the odds of a 90-day hospital episode occurring for African American patients are 50% higher than the same odds for Asian patients. The same conclusion cannot be reached in QE claims (p-value > 5% and CI includes 1).

COMMERCIAL	Hosp 90	Not Hosp 90	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Black/African American	193	5153	1.50	0.01	1.10	2.08
Asian	53	2125				

QE	Hosp 90	Not Hosp 90	OR	p-value	Confidence Interval Lower	Confidence Interval Upper
Black/African American	206	3293	1.05	0.77	0.78	1.44
Asian	62	1045				

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