

Colonoscopy Measure Submission to PQM: Figures and Tables

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Figure 1A. Colonoscopy (HOPD): Cohort Flowchart

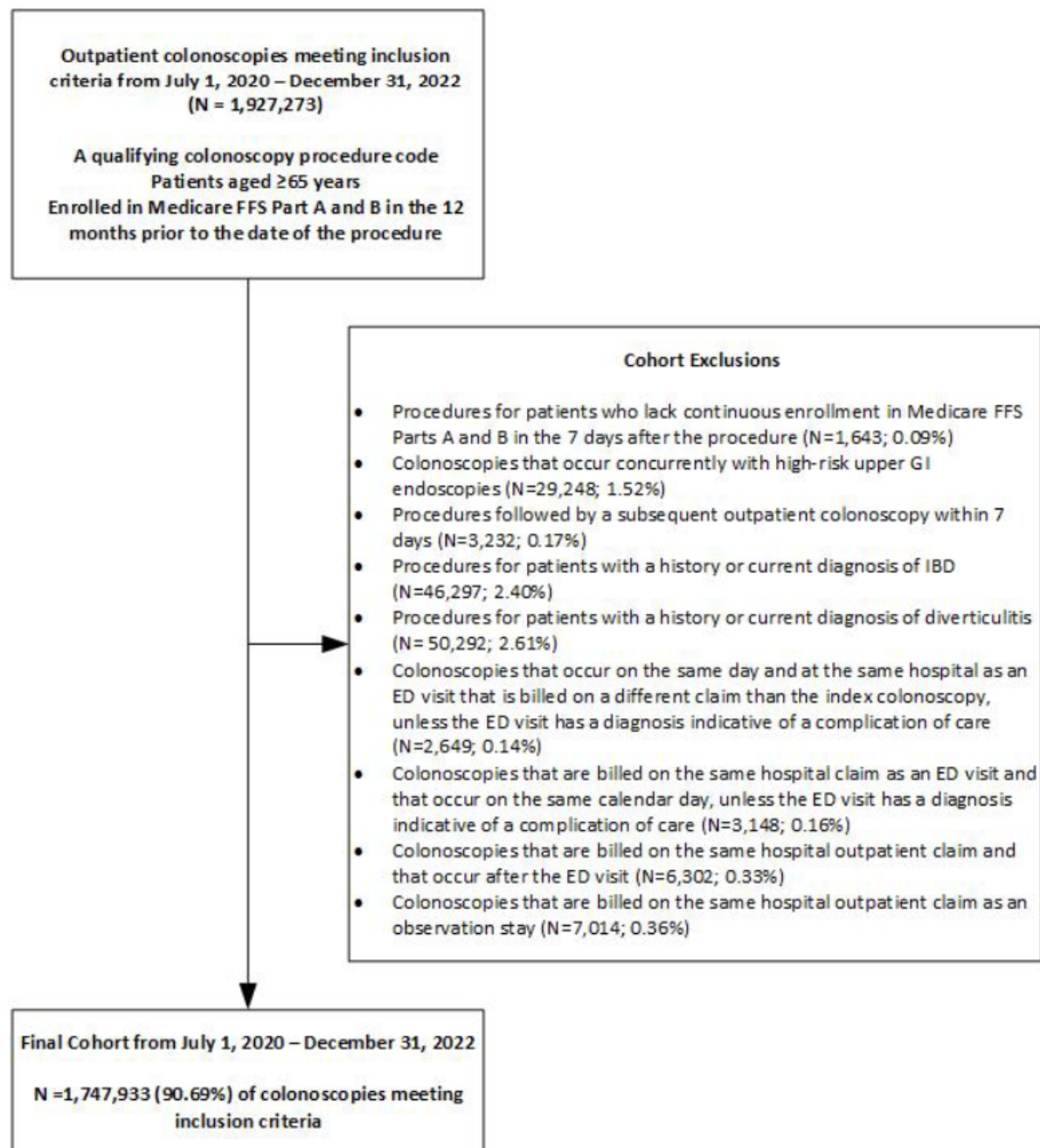


Figure 1B. Colonoscopy (ASC): Cohort Flowchart

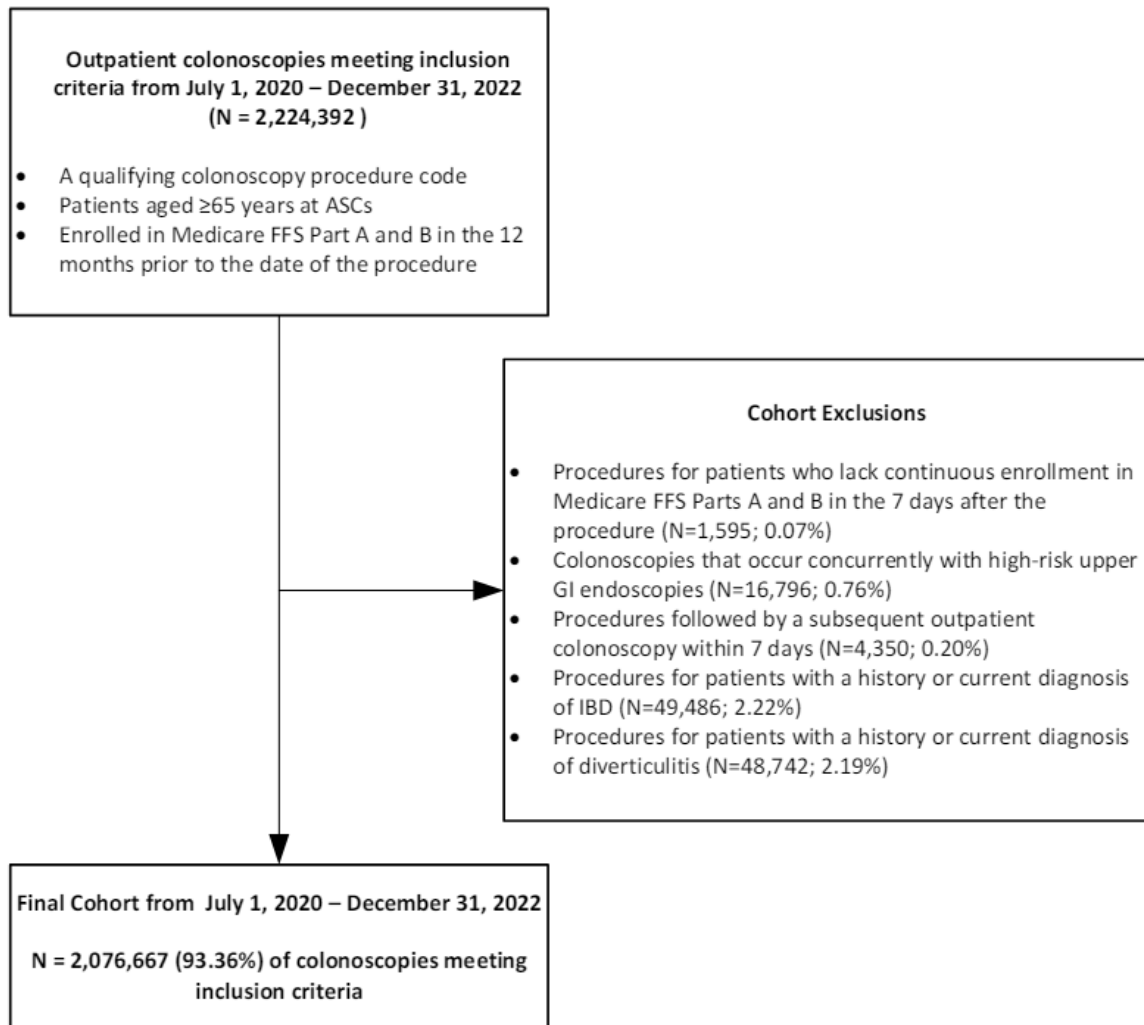


Figure 2. Within and Across Disparity Methodology

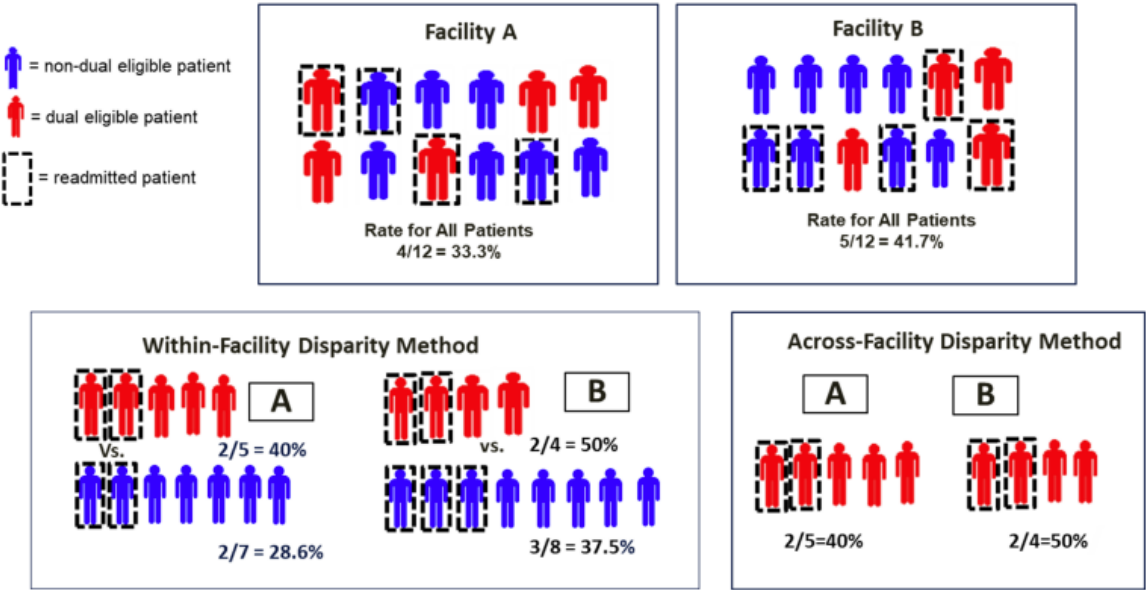


Figure 3. Colonoscopy: Logic Model

The conceptual model for colonoscopy quality, depicted below, illustrates the pathway through which facilities can influence the outcome of post-procedural hospital visits. For example, the model identifies that patient-level factors, such as comorbidities and other risk factors (such as age), increase the risk of unplanned hospital visits. Better management of the risks associated with these comorbidities may be a potential avenue for facilities to reduce unplanned hospital visits. Provider-level factors (technical quality of the procedure, post-procedure provider accessibility), and facility-level factors (such as pre- and post-discharge patient communication, other post-procedural processes) may also contribute to the risk of unplanned hospital visits. Therefore, facilities may have opportunities to lower their unplanned hospital visit rates through quality improvement efforts focused on these factors. Examples of interventions that have been shown in the literature to reduce complications, and therefore decrease post-procedure acute care utilization, are discussed in Section 1.10, Section 2.2, and Section 6.2.1.

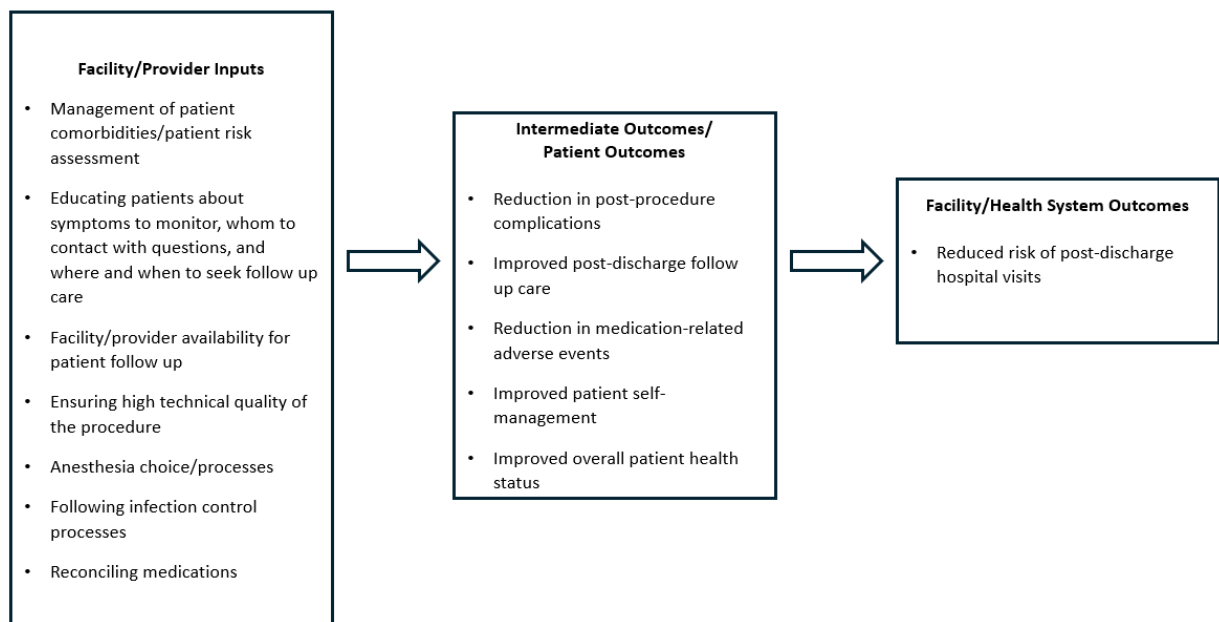


Table 1A. Colonoscopy (HOPD): Distribution of Measure Scores (2024 EM Dataset)

Characteristic	7/1/2020-12/31/2022
Number of facilities	3,775
Mean RSHV rate (SD)	13.18 (0.91)
Range (min – max)	9.13 – 18.14
25 th percentile	12.74
50 th percentile (median)	13.13
75 th percentile	13.61

SD=standard deviation

Table 1B. Colonoscopy (ASC): Distribution of Measure Scores (2024 EM Dataset)

Characteristic	7/1/2020-12/31/2022
Number of facilities	2,152
Mean RSHV rate (SD)	9.92 (0.92)
Range (min – max)	6.29 – 14.16
25 th percentile	9.42
50 th percentile (median)	9.85
75 th percentile	10.37

SD=standard deviation

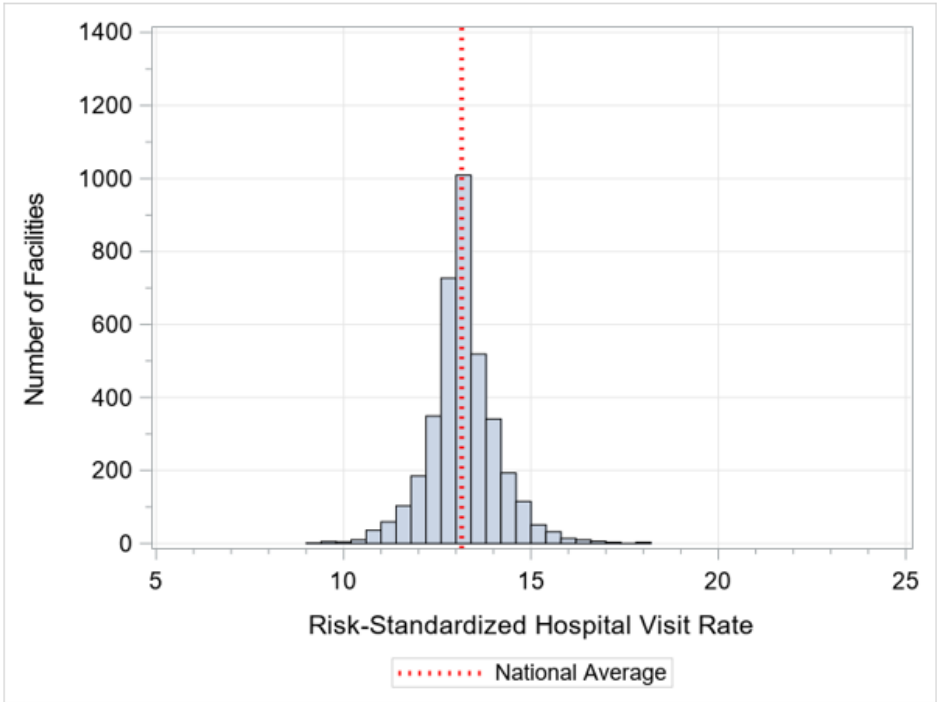
Table 2A. Colonoscopy (HOPD): Distribution of Measure Scores (2024 EM Dataset)

	Overall	Min	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	Max
Mean Score	13.18	9.13	11.56	12.40	12.74	12.94	13.07	13.18	13.38	13.63	14.02	14.93	18.14
Entities	3,775	1	377	378	377	378	377	378	378	377	378	377	1
Total Number of Procedures	1,747,993	3,606	506,806	210,522	151,798	101,998	63,409	83,284	131,654	123,112	153,100	222,250	1,303

Table 2B. Colonoscopy (ASC): Distribution of Measure Scores (2024 EM Dataset)

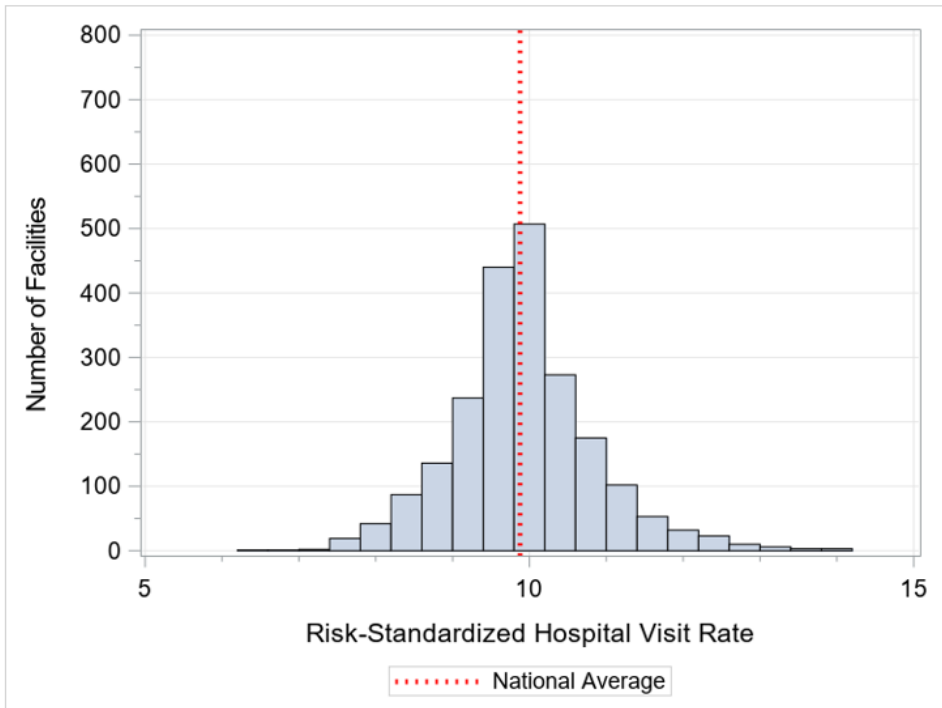
	Overall	Min	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	Max
Mean Score	9.92	6.29	8.33	9.06	9.42	9.65	9.80	9.91	10.13	10.38	10.78	11.74	14.16
Entities	2,152	1	215	215	215	215	215	215	216	215	215	215	1
Total Number of Procedures	2,076,667	5,284	421,952	292,312	196,499	133,460	103,808	110,350	147,143	163,761	235,472	271,910	2,118

Figure 4A. Colonoscopy (HOPD): Distribution of Measure Scores



Note: Results based on July 1, 2020 – December 31, 2022 performance period data.

Figure 4B. Colonoscopy (ASC): Distribution of Measure Scores



Note: Results based on July 1, 2020 – December 31, 2022 performance period

Table 3. Descriptions of Datasets

Dataset	Description of Dataset	Use and Section in the Testing Attachment
<p>Dataset #1: Initial Development Dataset</p> <p>Dataset #1a: Development Dataset</p> <p>Dataset #1b: Validation Dataset</p>	<p>We used two claims datasets for measure development.</p> <p>To develop and test the patient-level model, CORE used 2009-2011 claims data from Medicare inpatient, outpatient, and carrier (Part B Physician) Standard Analytical Files (SAF). Specifically, we identified outpatient colonoscopies using 20% of Medicare FFS beneficiaries' claims from the carrier SAF consisting of physician claims from ASCs, HOPDs and physician office settings.</p> <p>For measure development and testing, we randomly split the 2010 data into Development and Validation Samples (each sample containing approximately 50% of colonoscopies contained in the 2010 data). For patients in these samples, we used data from 2009 to derive comorbidities for risk adjustment. We derived a cohort of colonoscopies in 2011 for temporal validation of the model (2011 Validation Sample), using 2010 data for risk adjustment.</p> <p>Dataset #1: Number of facilities (HOPDs and ASCs combined): 8,142 Number of procedures: 332,391 Percent female: 54.4% Mean age: 74.2 years.</p> <p>Dataset #1a (development split sample) Number of facilities (HOPDs and ASCs combined): 7,475 Number of procedures: 166,196</p> <p>Dataset #1b (validation split sample) Number of facilities (HOPDs and ASCs combined): 7,475 Number of procedures: 166,196</p>	<ul style="list-style-type: none"> • Validity testing (face validity) • Identification and selection of risk-adjustment variables • Risk model calibration statistics (overfitting)
<p>Stratification Dataset</p>	<p>For the stratification analyses, we used CMS claims data from July 1, 2019 through June 30, 2021.</p> <p>For the within-facility approach (HOPDs only):</p> <ul style="list-style-type: none"> • Number of procedures: 1,736,193 • Number (percent) of procedures for patients with Dual Eligibility: 86,620 (5%) (DE) • Number of facilities with DE/non-DE volume sufficient for public reporting: 976 of 3,379 facilities (29%) <p>For the across-facility approach (HOPDs only):</p> <ul style="list-style-type: none"> • Number of procedures in DE patients: 86,648 • Number of facilities with sufficient DE volume for reporting (at least 45 DE patients): 516 of 3,392 facilities (15.2%) 	<ul style="list-style-type: none"> • Stratification analyses

Dataset	Description of Dataset	Use and Section in the Testing Attachment
2024 Endorsement Maintenance Dataset (2024 EM Dataset)	<p>All analyses for this endorsement maintenance application were performed in CMS claims data from the July 1, 2020 – December 31, 2022 performance year period.</p> <p>For Colonoscopy (HOPD):</p> <ul style="list-style-type: none"> • Number of procedures: 1,747,933 • Number of facilities: 3,775 • Number of facilities >= 30 procedures during the performance period: 3,270 • Mean Age: 72.7 • % Female: 52.8 <p>For Colonoscopy (ASC):</p> <ul style="list-style-type: none"> • Number of procedures: 2,076,667 • Number of facilities: 2,152 • Number of facilities >= 30 procedures during the performance period: 1,948 • Mean Age: 72.4 • % Female: 53.9 	<ul style="list-style-type: none"> • Reliability testing • Measure score distribution • Model performance: predictive ability, • Model performance: calibration • Statistical model discrimination statistics

Table 4. Colonoscopy (HOPD) and Colonoscopy (ASC): Distribution of Signal-To-Noise Reliability (For Facilities With At least 30 Colonoscopy Procedures)

Facilities with at Least 30 Procedures	Mean (SD)	Min-Max	25 th Percentile	50 th Percentile	75 th Percentile
HOPDs (n=3,270)	0.700 (0.201)	0.239-0.992	0.555	0.748	0.872
ASCs (n=1,948)	0.822 (0.174)	0.265-0.994	0.752	0.894	0.948

Table 5. Colonoscopy (HOPD) and Colonoscopy (ASC): Distribution of Signal-To-Noise Reliability (For Facilities with at least Colonoscopy Procedures)

Facilities with at Least 1 Procedure	Mean (SD)	Min-Max	25 th Percentile	50 th Percentile	75 th Percentile
HOPDs (n=3,775)	0.682 (0.277)	0.010-0.992	0.427	0.695	0.857
ASCs (n=2,152)	0.755 (0.266)	0.012-0.994	0.656	0.876	0.943

**Table 6A. Colonoscopy (HOPD): Measure Scores within Deciles of Signal-to-Noise Reliability
(Facilities With At least 30 Cases)**

Variable	Overall	Min	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	Max
Reliability	0.700	0.239	0.314	0.446	0.552	0.636	0.714	0.778	0.829	0.872	0.909	0.953	0.992
Measure score	13.18	13.24	13.24	13.27	13.28	13.27	13.31	13.39	13.22	13.24	13.09	12.52	13.45
Number of facilities	3,270	16	329	320	329	330	327	327	328	325	328	327	1
Number of procedures	1,741,827	480	14,554	24,790	38,896	55,511	78,332	109,905	153,040	212,800	318,259	735,740	11,595

**Table 6B. Colonoscopy (ASC): Measure Scores within Deciles of Signal-to-Noise Reliability
(Facilities With At least 30 Cases)**

Variable	Overall	Min	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	Max
Reliability	0.822	0.265	0.412	0.627	0.751	0.829	0.877	0.908	0.931	0.947	0.962	0.976	0.994
Measure score	9.92	10.41	9.93	9.95	9.99	10.02	10.13	10.04	10.03	9.81	9.78	9.53	9.07
Number of facilities	1,948	3	195	195	195	196	193	195	194	196	195	194	1
Number of procedures	2,074,295	90	11,970	27,807	49,725	80,043	115,219	160,948	217,539	295,585	417,017	698,442	13,301

Table 7A. Colonoscopy (HOPD): Frequency of Diagnosis Codes (Top 25) Associated with the Outcome (Post-Procedural Unplanned Hospital Visits within 7 Days)

ICD-10 Diagnosis Code	ICD-10 Code Description	Number of Occurrences	Cumulative Percent
K91840	Postprocedural hemorrhage of a digestive system organ or structure following a digestive system procedure	1082	4.7
K625	Hemorrhage of anus and rectum	493	6.9
K922	Gastrointestinal hemorrhage, unspecified	470	8.9
N390	Urinary tract infection, site not specified	415	10.7
A419	Sepsis, unspecified organism	401	12.4
R079	Chest pain, unspecified	389	14.1
R0789	Other chest pain	370	15.7
R109	Unspecified abdominal pain	327	17.2
R55	Syncope and collapse	316	18.5
U071	COVID-19	309	19.9
K921	Melena	292	21.2
R42	Dizziness and giddiness	280	22.4
R339	Retention of urine, unspecified	252	23.5
K9171	Accidental puncture and laceration of a digestive system organ or structure	241	24.5

ICD-10 Diagnosis Code	ICD-10 Code Description	Number of Occurrences	Cumulative Percent
	during a digestive system procedure		
J189	Pneumonia, unspecified organism	230	25.5
I10	Essential (primary) hypertension	205	26.4
I4891	Unspecified atrial fibrillation	203	27.3
K529	Noninfective gastroenteritis and colitis, unspecified	200	28.2
I480	Paroxysmal atrial fibrillation	198	29.0
I130	Hypertensive heart and chronic kidney disease with heart failure and stage 1 through stage 4 chronic kidney disease, or unspecified chronic kidney disease	195	29.9
R1084	Generalized abdominal pain	190	30.7
N179	Acute kidney failure, unspecified	190	31.5
I214	Non-ST elevation (NSTEMI) myocardial infarction	188	32.3
E860	Dehydration	186	33.2
K5900	Constipation, unspecified	177	33.9

Table 7B. Colonoscopy (ASC): Frequency of Diagnosis Codes (Top 25) Associated with the Outcome (Post-Procedural Unplanned Hospital Visits within 7 Days)

ICD-10 Diagnosis Code	ICD-10 Code Description	Number of Occurrences	Cumulative Percent
K91840	Postprocedural hemorrhage of a digestive system organ or structure following a digestive system procedure	956	4.7
A419	Sepsis, unspecified organism	406	6.6
R55	Syncope and collapse	381	8.5
K625	Hemorrhage of anus and rectum	376	10.3
R0789	Other chest pain	369	12.1
I4891	Unspecified atrial fibrillation	364	13.9
K922	Gastrointestinal hemorrhage, unspecified	346	15.6
R109	Unspecified abdominal pain	327	17.2
R079	Chest pain, unspecified	311	18.7
N390	Urinary tract infection, site not specified	309	20.2
U071	COVID-19	288	21.6
J690	Pneumonitis due to inhalation of food and vomit	284	23.0
K9171	Accidental puncture and laceration of a digestive system organ or structure during a digestive system procedure	284	24.4
R42	Dizziness and giddiness	256	25.6
I480	Paroxysmal atrial fibrillation	256	26.9
I10	Essential (primary) hypertension	237	28.0

ICD-10 Diagnosis Code	ICD-10 Code Description	Number of Occurrences	Cumulative Percent
R1084	Generalized abdominal pain	232	29.2
R339	Retention of urine, unspecified	224	30.3
K921	Melena	222	31.3
S0990XA	Unspecified injury of head, initial encounter	208	32.4
K529	Noninfective gastroenteritis and colitis, unspecified	207	33.4
J189	Pneumonia, unspecified organism	203	34.4
R112	Nausea with vomiting, unspecified	199	35.3
E860	Dehydration	173	36.2
I214	Non-ST elevation (NSTEMI) myocardial infarction	156	36.9

Figure 5A. Colonoscopy (HOPD): Comparison of Colonoscopy Risk-Standardized Hospital Visit Rates

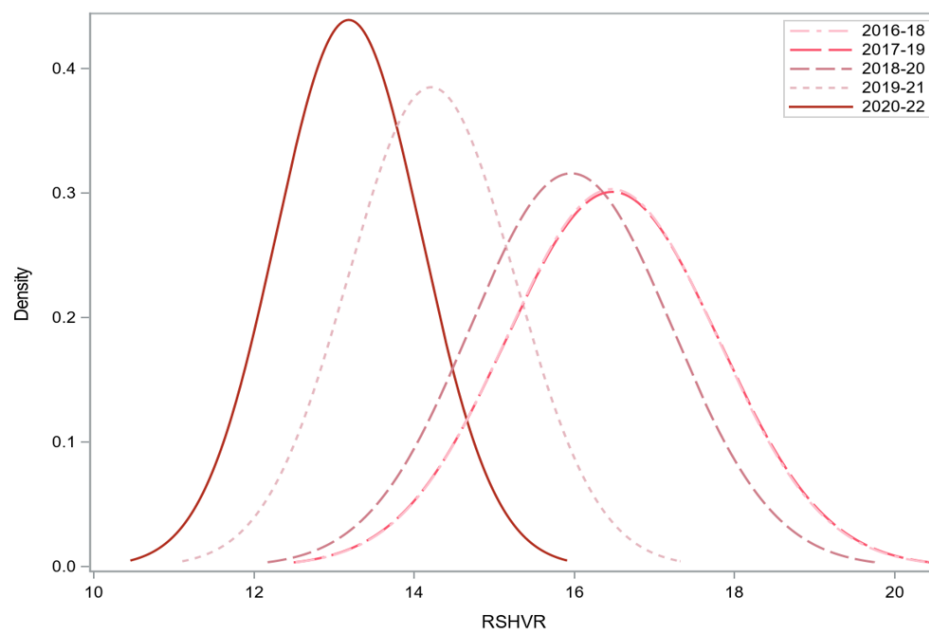


Figure 5B. Colonoscopy (ASC): Comparison of Colonoscopy Risk-Standardized Hospital Visit Rates

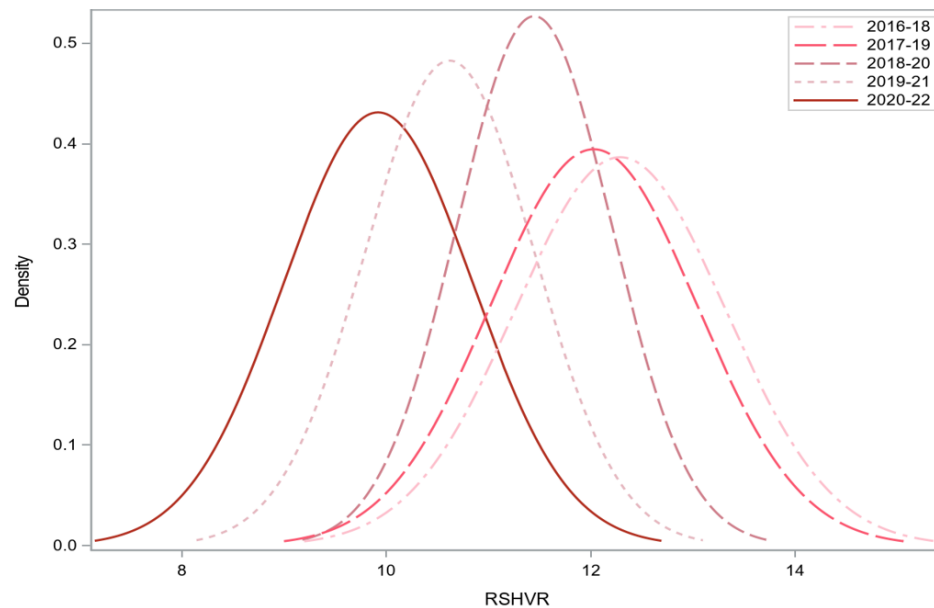


Table 8A. Colonoscopy (HOPD): Facility-level Distribution of Patients with Social Risk Factors

Social Risk Variable	25 th Percentile	50 th Percentile (Median)	75 th Percentile
DE (N)	3.0	9.0	26.0
DE (%)	1.8	3.9	7.9
High ADI (N)	3.0	26.0	56.0
High ADI (%)	1.4	9.1	26.2

Table 8B. Colonoscopy (ASC): Facility-level Distribution of Patients with Social Risk Factors

Social Risk Variable	25 th Percentile	50 th Percentile (Median)	75 th Percentile
DE (N)	3.0	10.0	28.0
DE (%)	0.6	1.6	4.0
High ADI (N)	2.0	12.0	59.0
High ADI (%)	0.5	2.6	9.8

Table 9A. Colonoscopy (HOPD): Frequency of Model Risk Factors

Risk Factor	7/1/2020-12/31/2022 (% unless otherwise indicated)
Total N	1,747,933
Age 65-69	31.35
Age 70-74	36.32
Age 75-79	21.48

Risk Factor	7/1/2020-12/31/2022 (% unless otherwise indicated)
Age 80-84	8.25
Age 85+	2.60
Endoscopy during Procedure	21.78
Polypectomy during Procedure	45.04
Congestive Heart Failure (CC 85)	9.55
Ischemic Heart Disease (CC 86-89)	20.16
Stroke/Transient Ischemic Attack (TIA) (CC 99-101)	7.40
Chronic Lung Disease (CC 111-113)	15.94
Metastatic Cancer (CC 8-11)	9.37
Liver Disease (CC 27-32)	8.52
Iron Deficiency Anemia (CC 49)	22.45
Disorders of Fluid, Electrolyte, Acid Base (CC 24)	9.29
Pneumonia (CC 114-116)	3.48
Psychiatric Disorders (CC 57-59, 61-63)	18.31
Substance Abuse (CC 54-56, 202-203)	6.77
Arrhythmia (CC 96-97)	20.15

Notes: Results based on July 1, 2020–December 31, 2022 performance period. CC-related risk factors are defined by v24 of CC map.

Table 9B. Colonoscopy (HOPD): Model Risk Variable Odds Ratios (ORs) and 95% CIs

Variable (CC)	7/1/2020-12/31/2022 OR (95% CI)
Endoscopy during Procedure	1.28 (1.24-1.32)
Polypectomy during Procedure	1.19 (1.16-1.22)
Congestive Heart Failure (CC 85)	1.36 (1.31-1.41)
Ischemic Heart Disease (CC 86-89)	1.21 (1.17-1.25)
Stroke/Transient Ischemic Attack (TIA) (CC 99-101)	1.20 (1.15-1.25)
Chronic Lung Disease (CC 111-113)	1.26 (1.22-1.30)
Metastatic Cancer (CC 8-11)	1.20 (1.16-1.25)
Liver Disease (CC 27-32)	1.23 (1.18-1.28)
Iron Deficiency Anemia (CC 49)	1.35 (1.30-1.39)
Disorders of Fluid, Electrolyte, Acid Base (CC 24)	1.44 (1.39-1.50)
Pneumonia (CC 114-116)	1.25 (1.19-1.32)
Psychiatric Disorders (CC 57-59, 61-63)	1.32 (1.28-1.36)
Substance Abuse (CC 54-56, 202-203)	1.22 (1.16-1.27)
Arrhythmia (CC 96-97)	1.38 (1.30-1.47)
With Arrhythmia: Age 70-74 v. Age 65-69	1.08 (1.01-1.16)
With Arrhythmia: Age 75-79 v. Age 65-69	1.20 (1.13-1.29)
With Arrhythmia: Age 80-84 v. Age 65-69	1.46 (1.36-1.57)
With Arrhythmia: Age 85+ v. Age 65-69	1.79 (1.63-1.96)
Without Arrhythmia: Age 70-74 v. Age 65-69	1.03 (0.99-1.07)
Without Arrhythmia: Age 75-79 v. Age 65-69	1.18 (1.13-1.24)
Without Arrhythmia: Age 80-84 v. Age 65-69	1.58 (1.49-1.68)
Without Arrhythmia: Age 85+ v. Age 65-69	2.21 (2.04-2.41)

Notes: Results based on July 1, 2020 – December 31, 2022 performance period data. CC-related risk factors are defined by v24 of CC map.

OR=Odds ratio; CI=Confidence interval

Table 10A. Colonoscopy (ASC): Frequency of Model Risk Factors

Risk Factor	7/1/2020-12/31/2022 (% unless otherwise indicated)
Total N	2,076,667
Age 65-69	32.21
Age 70-74	38.03
Age 75-79	21.62
Age 80-84	6.75
Age 85+	1.39
Endoscopy during Procedure	19.08
Polypectomy during Procedure	44.47
Metastatic Cancer (CC 8-11)	6.93
Disorders of Fluid, Electrolyte, Acid Base (CC 24)	6.25
Liver Disease (CC 27-32)	6.82
Iron Deficiency Anemia (CC 49)	18.17
Substance Abuse (CC 54-56, 202-203)	4.39
Psychiatric Disorders (CC 57-59, 61-63)	14.09
Congestive Heart Failure (CC 85)	4.79
Ischemic Heart Disease (CC 86-89)	16.16
Arrhythmia (CC 96-97)	14.23
Stroke/Transient Ischemic Attack (TIA) (CC 99-101)	6.42
Chronic Lung Disease (CC 111-113)	11.02
Pneumonia (CC 114-116)	2.17

Notes: CC-related risk factors are defined by v24 of CC map.

Table 10B. Colonoscopy (ASC): Model Risk Variable Odds Ratios (ORs) and 95% CIs

Variable (CC)	7/1/2020-12/31/2022 OR (95% CI)
Endoscopy during Procedure	1.32 (1.28-1.36)
Polypectomy during Procedure	1.18 (1.15-1.21)
Metastatic Cancer (CC 8-11)	1.12 (1.07-1.18)
Disorders of Fluid, Electrolyte, Acid Base (CC 24)	1.44 (1.38-1.51)
Liver Disease (CC 27-32)	1.24 (1.19-1.30)
Iron Deficiency Anemia (CC 49)	1.24 (1.20-1.28)
Substance Abuse (CC 54-56, 202-203)	1.27 (1.20-1.34)
Psychiatric Disorders (CC 57-59, 61-63)	1.37 (1.32-1.42)
Congestive Heart Failure (CC 85)	1.28 (1.21-1.34)
Ischemic Heart Disease (CC 86-89)	1.22 (1.17-1.26)
Stroke/Transient Ischemic Attack (TIA) (CC 99-101)	1.13 (1.08-1.19)

Variable (CC)	7/1/2020-12/31/2022 OR (95% CI)
Chronic Lung Disease (CC 111-113)	1.29 (1.24-1.34)
Pneumonia (CC 114-116)	1.26 (1.18-1.35)
Arrhythmia (CC 96-97)	1.39 (1.29-1.50)
With Arrhythmia: Age 70-74 v. Age 65-69	1.03 (0.95-1.12)
With Arrhythmia: Age 75-79 v. Age 65-69	1.16 (1.06-1.26)
With Arrhythmia: Age 80-84 v. Age 65-69	1.55 (1.40-1.70)
With Arrhythmia: Age 85+ v. Age 65-69	1.97 (1.72-2.26)
Without Arrhythmia: Age 70-74 v. Age 65-69	1.09 (1.05-1.13)
Without Arrhythmia: Age 75-79 v. Age 65-69	1.25 (1.19-1.30)
Without Arrhythmia: Age 80-84 v. Age 65-69	1.72 (1.62-1.83)
Without Arrhythmia: Age 85+ v. Age 65-69	2.06 (1.85-2.30)

Notes: CC-related risk factors are defined by v24 of CC map.

OR=Odds ratio; CI=Confidence interval

Table 11A. Colonoscopy (HOPD): Generalized Linear Model (Logistic Regression) Performance

Characteristic	Result
C-statistic	0.679
Predictive ability, % (lowest decile – highest decile)	0.60 – 3.75

Table 11B. Colonoscopy (ASC): Generalized Linear Model (Logistic Regression) Performance

Characteristic	Result
C-statistic	0.638
Predictive Ability, % (lowest decile – highest decile)	0.47 – 2.34

Figure 6A. Colonoscopy (HOPD): Risk-Decile Plot (All Patients)

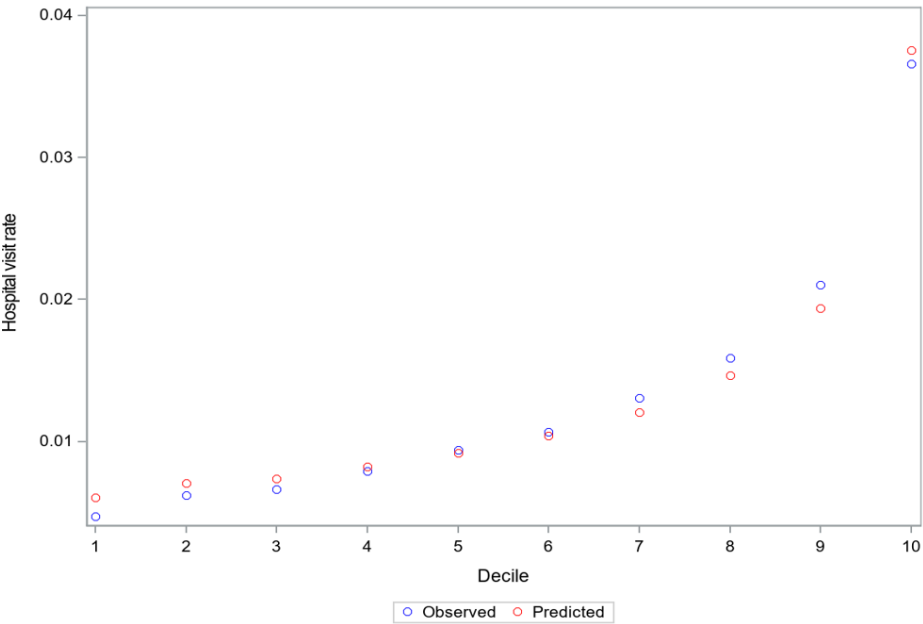


Figure 6B. Colonoscopy (ASC): Risk-Decile Plot (All Patients)

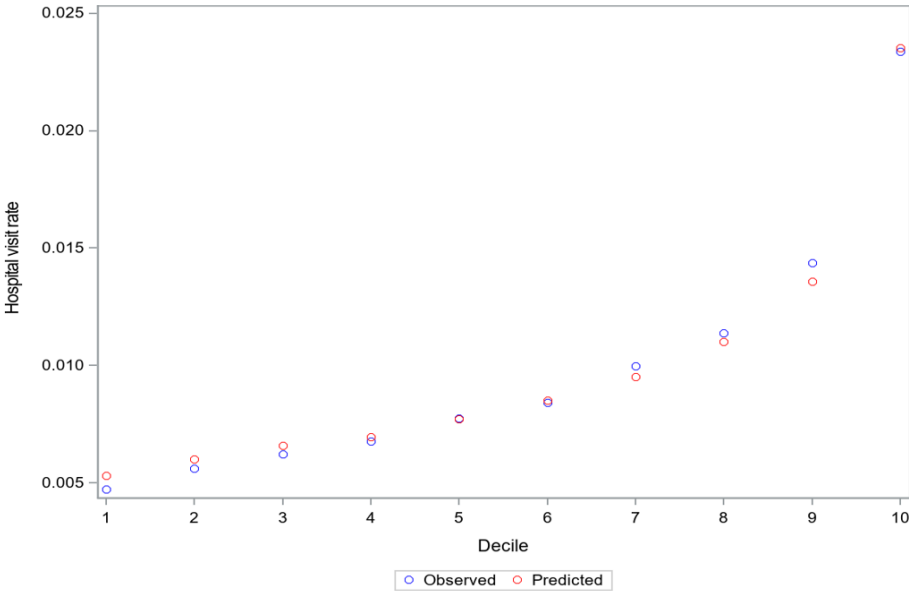


Table 12. Patient-Level Observed Outcomes for Patients With and Without Social Risk Factors (2024 EM Dataset)

Facility type (facilities with at least 1 qualifying procedure)	Dual Eligible (DE) HVR per 1,000 colonoscopies	Non-DE HVR per 1,000 colonoscopies	High ADI HVR per 1,000 colonoscopies	Non-High ADI HVR per 1,000 colonoscopies
HOPDs (n=3,775)	23.8	12.6	17.0	12.7
ASCs (n=2,152)	17.2	9.6	13.2	9.6

Figure 7A. Colonoscopy (HOPD): Correlation Between Measure Scores Calculated With and Without the DE Variable in the Risk Model

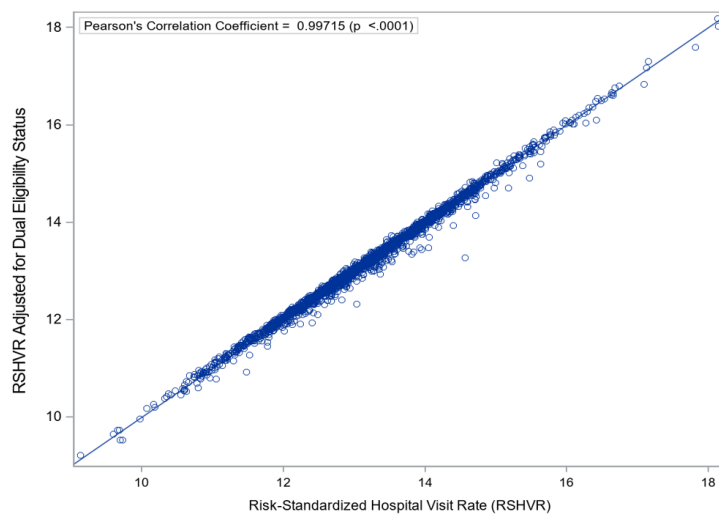


Figure 7B. Colonoscopy (HOPD): Correlation Between Measure Scores Calculated With and Without the High ADI Variable in the Risk Model

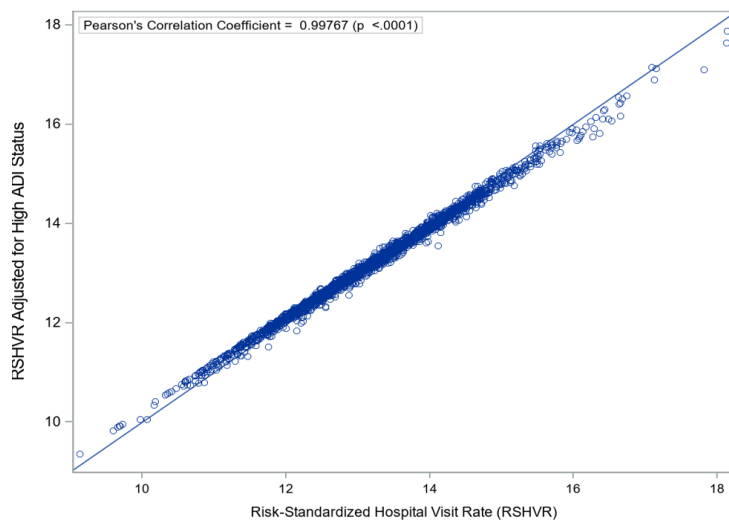


Figure 8A. Colonoscopy (ASC): Correlation Between Measure Scores Calculated With and Without the DE Variable in the Risk Model

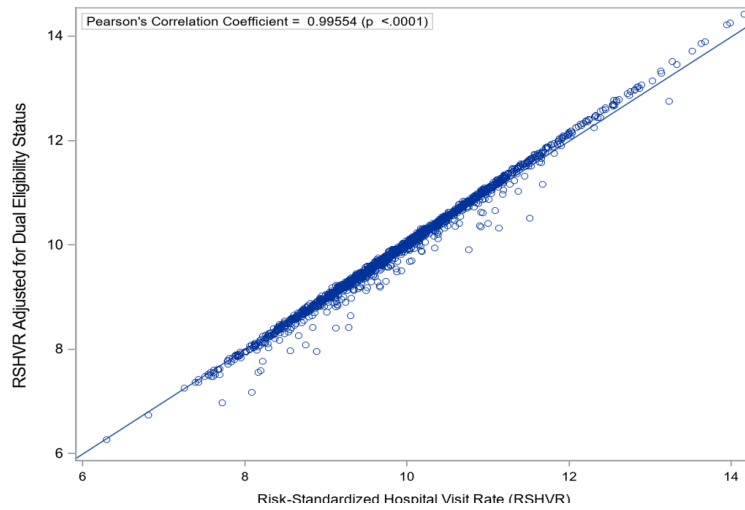


Figure 8B. Colonoscopy (ASC): Correlation Between Measure Scores Calculated With and Without the High ADI Variable in the Risk Model

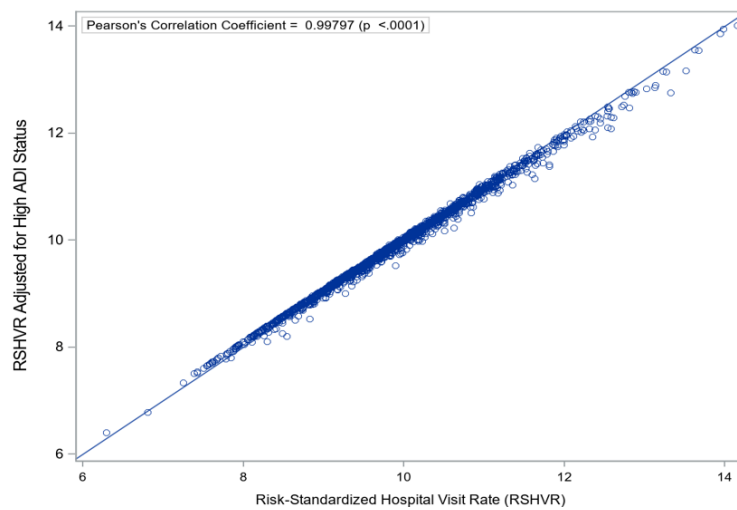


Figure 9A. Colonoscopy (HOPD): Correlation Between Measure Scores And The Top Quartile Of The Facility-Proportion Of Patients With DE

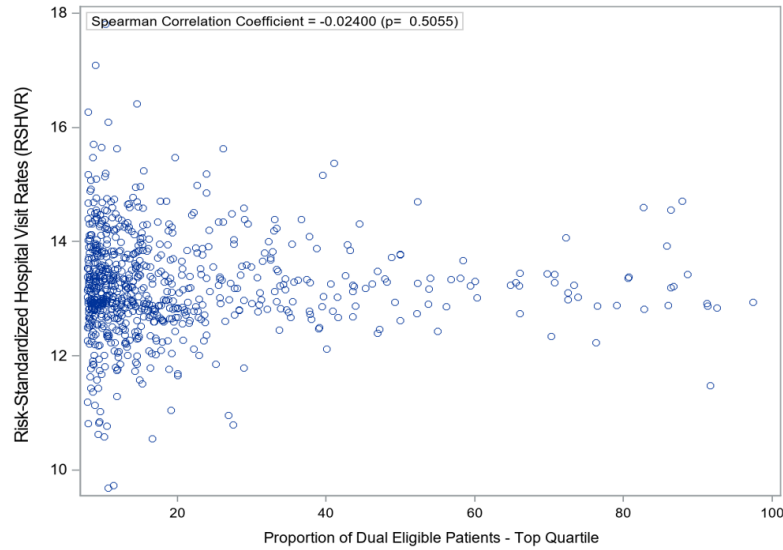


Figure 9B. Colonoscopy (HOPD): Correlation Between Measure Scores And The Top Quartile Of The Facility-Proportion Of Patients With High ADI

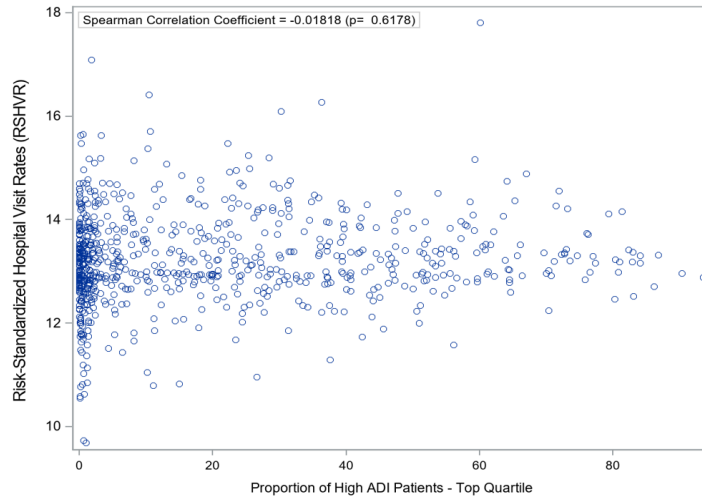


Figure 10A. Colonoscopy (ASC): Correlation Between Measure Scores And The Top Quartile Of The Facility-Proportion Of Patients With DE

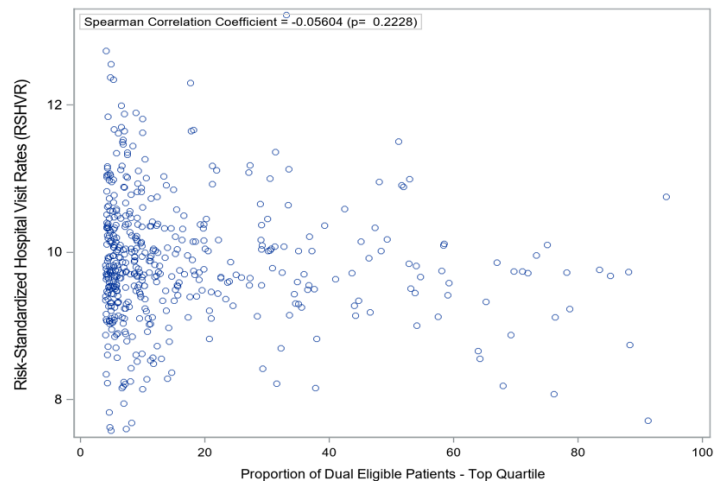


Figure 10B. Colonoscopy (ASC): Correlation Between Measure Scores And The Top Quartile Of The Facility-Proportion Of Patients With High ADI

