Attachment B: Tables, Figures and Risk Adjustment Modeling Specifications for the Days at Home for Patients with Complex, Chronic Conditions Measure, CBE #4555, Full Measure Submission, Fall 2024

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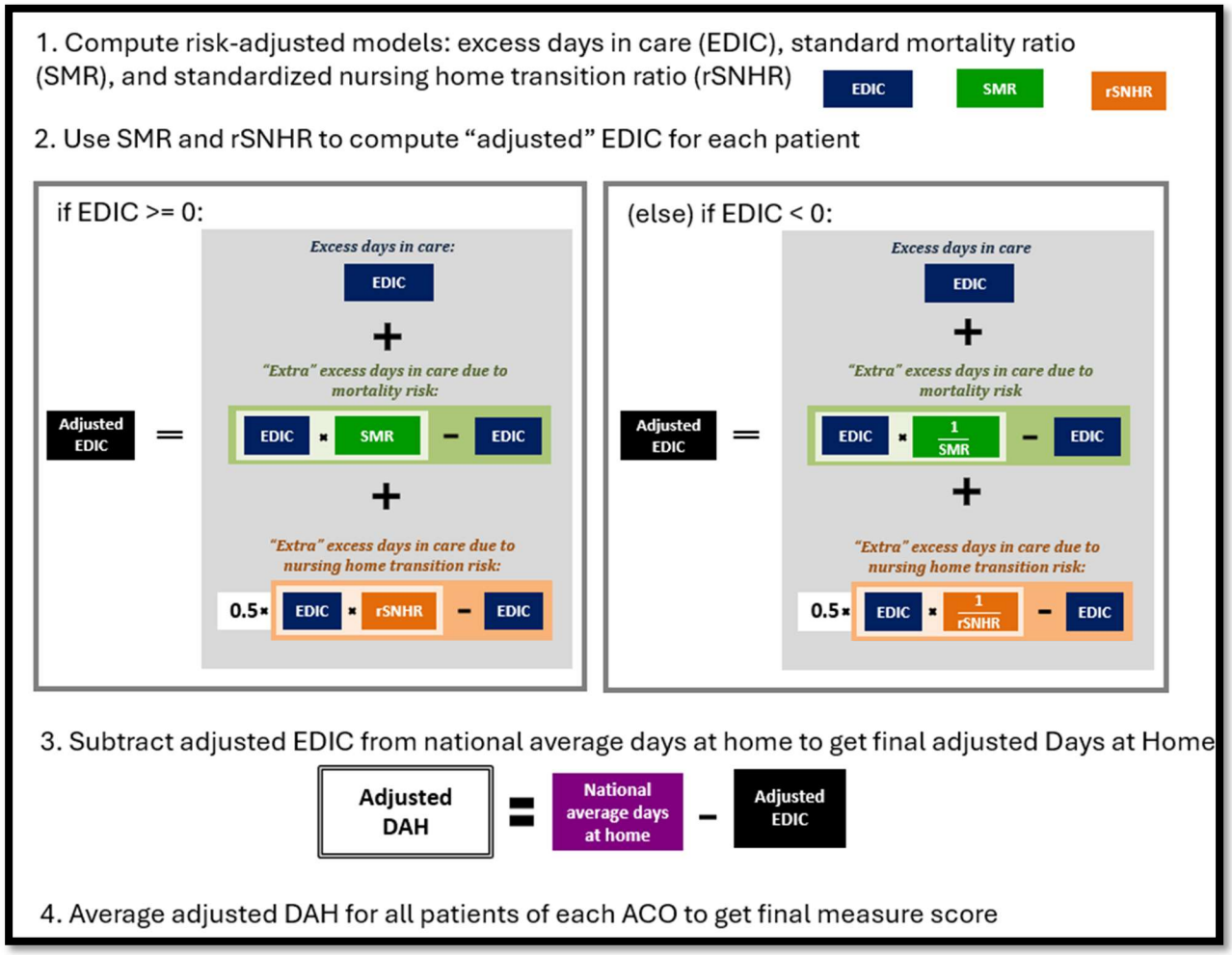
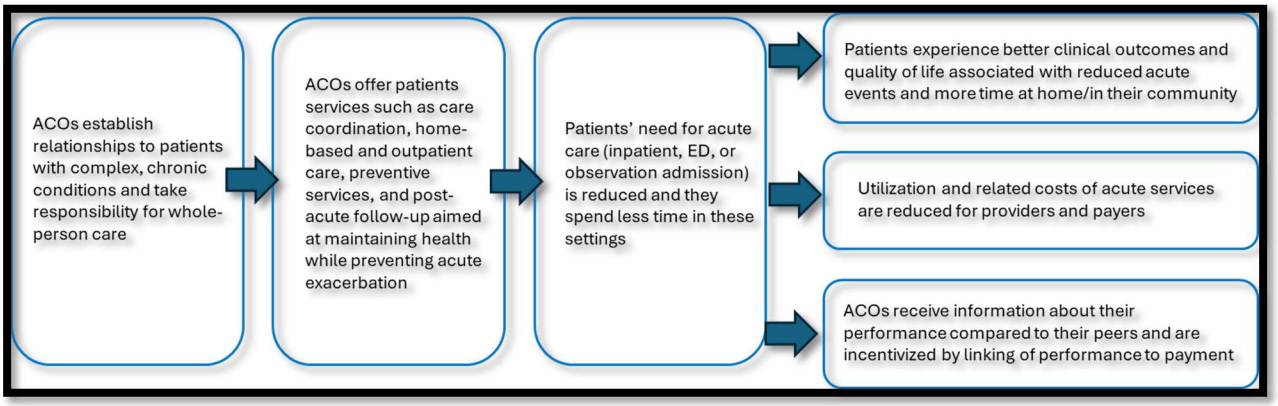
1.18a Measure Score Calculation Diagram

Figure 1. Measure Score Calculation Diagram



2.1 Logic Model

Figure 2. Days at Home Logic Model



2.4 Performance Gap

Table 1. Performance Scores by Decile

--	Overall	Min	Decile 1	Decile 2	Decile 3	Decile 4	Decile 5	Decile 6	Decile 7	Decile 8	Decile 9	Decile 10	Max
Mean Performance Score	323.04	300.31	315.19	320.24	321.66	322.46	323.06	323.76	324.41	325.21	325.79	327.84	334.01
N of Entities	99	1	9	10	10	10	10	10	10	10	10	10	1
N of Persons / Encounters / Episodes	169,324	1,220	21,647	22,900	13,128	21,641	11,620	12,713	15,143	17,766	13,377	19,389	361

*N=number

4.1.4 Characteristics of Units of the Eligible Population

Table 2. Characteristics of patients with complex, chronic conditions attributed to 2018 SSP ACOs

Characteristic	Total (n)	Percent (%)
Total Patients	1,154,779	100.00
Age Distribution	--	--
18 to <55	74,680	6.47
55 to <65	109,618	9.49
65 to <75	359,836	31.16
75 to <85	373,301	32.33
85 to <95	218,912	18.96
>=95	18,432	1.60
Female sex	621,937	53.86
Race Distribution	--	--
White	980,363	84.90
Black	112,383	9.73
Asian	16,162	1.40
Hispanic	21,255	1.84
Other	24,616	2.13
Patients with Average HCC Risk Score ≥3.0	468,173	40.54
Long-Term Institution (LTI) Status (nursing home residence for ≥90 days) in Calendar Year (CY) 2017	52,403	4.54
Any Dual-eligible status in CY 2017	263,114	22.78
Skilled Nursing Facility Care in CY 2017	149,737	12.97
Hospice Care in CY 2017	17,306	1.50

Table 3. Characteristics of patients with complex, chronic conditions attributed to 2022 REACH ACOs

Characteristic	Total (n)	Percent (%)
Total Patients	169,324	100.00
Age Distribution	-	-
18 to <55	6,259	3.70
55 to <65	10,527	6.22
65 to <75	53,986	31.88
75 to <85	61,001	36.03
85 to <95	33,884	20.01
>=95	3,667	2.17
Female sex	88,927	52.52
Race Distribution	-	-
White	141,945	83.83
Black	11,756	6.94
Asian	5,695	3.36
Hispanic	4,024	2.38
Other	3,031	1.79
Unknown	2,451	1.45
North American Native	422	0.25
Patients with Average HCC Risk Score ≥3.0	64,886	38.32

Characteristic	Total (n)	Percent (%)
Long-Term Institution (LTI) Status (nursing home residence for ≥90 days) in CY 2021	8,679	5.13
Any Dual-eligible status in CY 2021	37,673	22.25
SNF Care in CY 2021	20,424	12.06
Hospice Care in CY 2021	5,384	3.18
DME Care in CY 2021	93,714	55.35
Serious Illness in CY 2021	77,360	45.69
Fragmented Care in CY 2021	137,800	81.38
Residing in nursing home before Day 1 of performance year (January 1, 2022)	10,635	6.28

*Fragmented Care was defined as: 1) no single ACO provided at least half of patient's evaluation and management visits, or 2) a patient had at least two ED visits or observation stays in the year.

**Serious Illness was defined as a patient with 1) annual HCC score of >= 3.0; 2) annual HCC score of >=2.0 and with at least two unplanned admissions; or 3) signs of frailty determined by DME claims for hospital bed or transfer equipment.

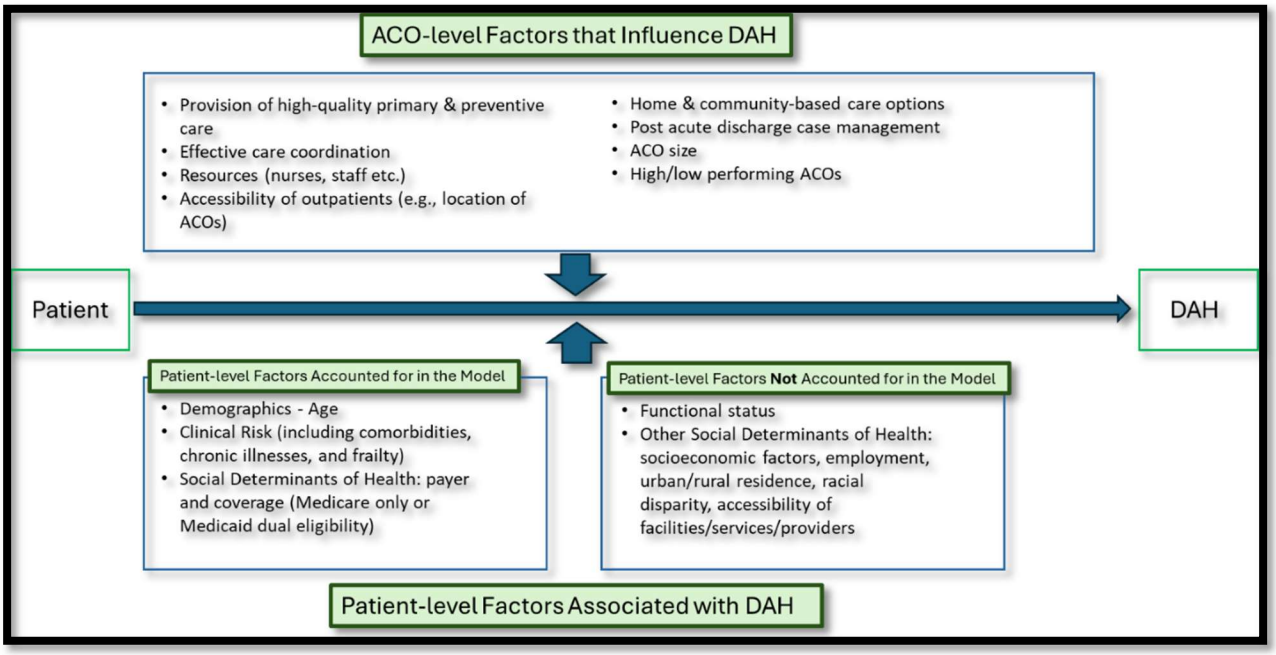
4.3.4 Validity Testing Results

Table 4. Construct Validity Comparison Results, 2022 ACO REACH Dataset

Measure Title	Expected	Pearson r (p-value)	Conclusion
All-cause unplanned admissions for patients with multiple chronic conditions	Strong inverse correlation	-0.51 (<0.0001)	Inverse correlation
Risk-standardized all condition readmission	Strong inverse correlation	-0.39 (<0.0001)	Inverse correlation
Timely Follow-up after Acute Exacerbations of Chronic Conditions	Weak positive correlation	0.15 (0.16)	No sig. correlation
Consumer Assessment of Healthcare Providers and Systems (CAHPS): Getting Timely Appointments, Care, and Information Summary Survey Measure (SSM)	Weak positive correlation	0.36 (0.0003)	Positive correlation
CAHPS: Care Coordination SSM	Weak positive correlation	0.28 (0.005)	Positive correlation
CAHPS: Shared Decision-Making SSM	No correlation	0.07 (0.50)	No sig. correlation
CAHPS: Patient Rating of Provider SSM	Weak positive correlation	0.20 (0.05)	No sig. correlation
CAHPS: Courteous and Helpful Office Staff SSM	Weak positive correlation	0.28 (0.007)	Positive correlation
CAHPS: Health Promotion and Education SSM	No correlation	-0.14 (0.17)	No sig. correlation

4.4.2a Attach Conceptual Model

Figure 3. Days at Home Conceptual Model



4.4.3 Risk Factor Characteristics Across Measured Entities

Table 5. Prevalence (N, %) of Clinical Risk Factors

Risk Factor	2022 ACO REACH (n=168,324)	2018 SSP ACOs (n=1,154,779)
Dialysis status	2,041 (1.21)	15,361 (1.3%)
Respiratory failure	36,793 (21.73)	235,365 (20.4%)
Advanced liver disease	9,806 (5.79)	60,544 (5.2%)
Pneumonia	28,628 (16.91)	228,942 (19.8%)
Septicemia/shock	16,831 (9.9)	110,320 (9.6%)
Marked disability/frailty	39,796 (23.5)	238,338 (20.6%)
Pleural effusion/pneumothorax	18,620 (11.0)	137,690 (11.9%)
Hematological diseases	42,579 (25.1)	204,466 (17.7%)
Advanced cancer	36,192 (21.4)	219,594 (19.0%)
Infectious and immunologic diseases	27,730 (16.4)	148,704 (12.9%)
Severe cognitive impairment	18,677 (11.0)	110,993 (9.6%)
Major organ transplant status	6,752 (4.0)	45,961 (4.0%)
Pulmonary heart disease	20,907 (12.3)	72,134 (6.2%)
Cardiomyopathy	N/A*	137,189 (11.9%)
Gastrointestinal disease	49,117 (29.0)	323,104 (28.0%)
Bone/joint/muscle infections/necrosis	6,850 (4.0)	46,386 (4.0%)
Iron deficiency anemia	89,452 (52.8)	593,522 (51.4%)
Diabetes	86,878 (51.3)	570,837 (49.4%)
Ischemic heart disease except AMI	92,077 (54.4)	640,912 (55.5%)
Other lung disorders	69,645 (41.1)	544,619 (47.2%)
Vascular or circulatory disease	104,650 (61.8)	678,978 (58.8%)
Other significant endocrine disorders	26,207 (15.5)	96,762 (8.4%)
Other disability and paralysis	16,479 (9.7)	102,794 (8.9%)
Substance abuse	16,263 (9.6)	207,690 (18.0%)
Pancreatic disease	1,563 (0.9)	10,346 (0.9%)
Other neurologic disorders	74,475 (44.0)	480,678 (41.6%)
Arrhythmia (except atrial fibrillation)	52,417 (31.0)	368,340 (31.9%)
Hypertension	144,117 (85.1)	998,262 (86.4%)
Hip or vertebral fracture	12,262 (7.2)	74,523 (6.5%)
Lower-risk cardiovascular disease	50,478 (29.8)	331,724 (28.7%)
Cerebrovascular disease	11,129 (6.6)	62,208 (5.4%)
Other malignancy	39,924 (23.6)	239,688 (20.8%)
Morbid obesity	31,897 (18.8)	190,568 (16.5%)
Urinary disorders	58,198 (34.4)	390,470 (33.8%)
Psychiatric disorders other than depression	74,367 (43.9)	360,851 (31.2%)
Age<55	6,259 (3.7)	74,680 (6.5%)
Age 55 to <65	10,527 (6.2)	109,618 (9.5%)
Age 65 to <75	53,986 (31.9)	359,836 (31.2%)
Age 75 to <85	61,001 (36.0)	373,301 (32.3%)
Age 85+ (ref.)	36,551 (21.7)	*237,344 (20.55%)*
AMI	3,980 (2.3)	20,715 (1.8%)
Alzheimer's disease and non-Alzheimer's dementia	33,394 (19.7)	263,438 (22.8%)

Risk Factor	2022 ACO REACH (n=168,324)	2018 SSP ACOs (n=1,154,779)
Atrial fibrillation	65,858 (38.9)	287,448 (24.9%)
CKD	84,363 (49.8)	694,137 (60.1%)
COPD and asthma	77,504 (45.8)	442,930 (38.4%)
Depression	71,434 (42.2)	387,165 (33.5%)
Heart failure	78,872 (46.6)	562,151 (48.7%)
Stroke and TIA	24,144 (14.3)	107,238 (9.3%)
Other organ transplant	22,716 (13.4)	116,641 (10.1%)
Precerebral arterial occlusion and transient cerebral ischemia	22,192 (13.1)	146,291 (12.7%)
Diabetic retinopathy	11,693 (6.9)	77,808 (6.7%)
Walking aids	5,941 (3.5)	55,466 (4.8%)
Wheelchairs	4,820 (2.8)	81,605 (7.1%)
Hospital bed	1,451 (0.9)	32,422 (2.8%)
Lifts	436 (0.3)	7,525 (0.7%)
Oxygen	10,899 (6.4)	158,476 (13.7%)
Dual eligible in 2022	39,341 (23.2)	271,506 (23.5%)

Table 6. Risk Factors with Adjusted Risk Ratio, 2018 SSP ACO Dataset

Variable	Adjusted Risk Ratio (95% CI)	Interpretation
Dual-eligible	1.248 (1.236, 1.261)	Dual-eligible beneficiaries have more days in care than Medicare-only
AHRQ SES index	0.988 (0.985, 0.991)	Fewer days in care among higher quintiles of SES index (that is, for patients with higher SES and lower social risk)
Urban	0.993 (0.980, 1.261)	Residence in an urban county not significantly associated with days in care
Specialist density	1.109 (1.076, 1.143)	Patients in counties with zero (0) specialists have more days in care than those in counties with one (1) or more
PCP density	1.022 (1.014, 1.030)	More days in care among higher quintiles of PCP density (that is, for patients in counties with more PCPs per 100,000)
Hospital beds	0.997 (0.994, 1.000)	Higher density of hospital beds not significantly associated with days in care
Certified nursing home beds	1.071 (1.067, 1.076)	More days in care among higher quintiles of nursing home beds (that is, for patients in counties with more beds per 100,000)
Never married	1.025 (1.021, 1.029)	More days in care among higher quintiles of unmarried density (that is, for patients in counties with higher percentage of individuals never married)
Living alone	0.997 (0.994, 1.000)	Percentage households within a county that are single occupant not significantly associated with days in care

Table 7. Prevalence of Social Determinants of Health Factors, 2022 ACO REACH Dataset

Variable	N (%)
Dual-eligible	39,341 (23.2%)
Non-White	27,379 (16.2%)
High ADI	18,807 (11.1%)

4.4.4 Risk Adjustment Modeling and/or Stratification Results

Table 8. Days in Care Rate Ratio, Mortality Odds Ratio, and Nursing Home Transition Odds Ratio with 95% Confidence Intervals, 2018 SSP ACO Dataset

Variable	Days in Care Rate Ratio (95% CI)	Mortality Odds Ratio (95% CI)	Nursing Home Transition Odds Ratio (95% CI)
Dialysis status	1.15 (1.11, 1.19)	1.27 (1.21, 1.33)	1.05 (0.96, 1.14)
Respiratory failure	1.19 (1.18, 1.20)	1.28 (1.26, 1.31)	1.10 (1.07, 1.13)
Advanced liver disease	1.20 (1.18, 1.22)	1.43 (1.39, 1.47)	1.07 (1.02, 1.12)
Pneumonia	1.18 (1.16, 1.19)	1.21 (1.20, 1.23)	1.01 (0.98, 1.03)
Septicemia/shock	1.16 (1.14, 1.18)	1.03 (1.01, 1.05)	1.10 (1.07, 1.13)
Marked disability/frailty	1.42 (1.40, 1.43)	1.57 (1.55, 1.59)	1.31 (1.28, 1.34)
Pleural effusion/pneumothorax	1.18 (1.17, 1.20)	1.44 (1.41, 1.46)	1.04 (1.01, 1.07)
Hematological diseases	1.08 (1.07, 1.09)	1.10 (1.08, 1.12)	1.01 (0.99, 1.04)
Advanced cancer	1.09 (1.08, 1.11)	2.04 (2.01, 2.07)	0.95 (0.92, 0.98)
Infectious and immunologic diseases	1.05 (1.04, 1.07)	1.17 (1.15, 1.19)	0.96 (0.94, 1.00)
Severe cognitive impairment	1.24 (1.22, 1.26)	1.29 (1.27, 1.32)	1.29 (1.26, 1.33)
Major organ transplant status	0.90 (0.88, 0.92)	0.73 (0.70, 0.76)	0.65 (0.60, 0.71)
Pulmonary heart disease	1.17 (1.15, 1.19)	1.27 (1.24, 1.30)	1.09 (1.05, 1.13)
Cardiomyopathy	1.00 (0.99, 1.01)	1.13 (1.11, 1.15)	0.97 (0.94, 1.00)
Gastrointestinal disease	1.05 (1.05, 1.06)	1.01 (1.00, 1.03)	0.95 (0.93, 0.97)
Bone/joint/muscle infections/necrosis	1.19 (1.16, 1.21)	0.93 (0.91, 0.96)	1.12 (1.07, 1.17)
Iron deficiency anemia	1.20 (1.19, 1.21)	1.20 (1.18, 1.21)	1.05 (1.02, 1.07)
Ischemic heart disease except AMI	1.04 (1.03, 1.05)	1.02 (1.00, 1.03)	0.96 (0.94, 0.98)
Other lung disorders	0.97 (0.96, 0.98)	0.88 (0.87, 0.90)	0.92 (0.90, 0.94)
Vascular or circulatory disease	1.15 (1.14, 1.16)	1.11 (1.09, 1.12)	1.16 (1.13, 1.18)
Other significant endocrine disorders	1.03 (1.01, 1.04)	0.99 (0.97, 1.01)	0.97 (0.94, 1.00)
Other disability and paralysis	1.16 (1.14, 1.17)	1.10 (1.07, 1.12)	1.19 (1.15, 1.22)
Substance abuse	1.15 (1.14, 1.16)	1.09 (1.07, 1.11)	1.08 (1.05, 1.11)
Other neurologic disorders	1.10 (1.09, 1.11)	0.94 (0.93, 0.95)	1.14 (1.12, 1.17)
Arrhythmia (except atrial fibrillation)	1.05 (1.04, 1.06)	0.97 (0.96, 0.99)	1.04 (1.01, 1.06)
Hypertension	1.02 (1.01, 1.03)	0.84 (0.82, 0.85)	0.97 (0.94, 1.00)
Hip or vertebral fracture	1.26 (1.24, 1.28)	1.06 (1.04, 1.08)	1.28 (1.25, 1.32)
Lower-risk cardiovascular disease	1.03 (1.02, 1.04)	0.99 (0.98, 1.01)	1.02 (1.00, 1.04)
Cerebrovascular disease	1.07 (1.05, 1.09)	1.00 (0.97, 1.02)	1.09 (1.05, 1.13)
Other malignancy	0.98 (0.97, 0.99)	1.23 (1.21, 1.25)	0.99 (0.96, 1.01)
Morbid obesity	1.05 (1.04, 1.06)	0.75 (0.74, 0.77)	1.14 (1.11, 1.17)
Urinary disorders	1.08 (1.07, 1.09)	1.02 (1.01, 1.03)	1.03 (1.01, 1.05)
Psychiatric disorders other than depression	1.10 (1.09, 1.11)	1.01 (1.00, 1.02)	1.08 (1.06, 1.10)
AMI	1.12 (1.09, 1.15)	1.26 (1.21, 1.30)	1.06 (1.00, 1.13)
Alzheimer's disease and related disorders or senile dementia	1.33 (1.32, 1.35)	1.63 (1.61, 1.66)	1.73 (1.69, 1.76)
Atrial fibrillation	1.10 (1.09, 1.11)	1.06 (1.05, 1.08)	1.05 (1.03, 1.07)
CKD	1.20 (1.19, 1.21)	1.19 (1.17, 1.20)	1.06 (1.03, 1.08)
COPD and asthma	1.10 (1.09, 1.11)	1.05 (1.04, 1.07)	0.97 (0.95, 0.99)
Depression	1.16 (1.15, 1.17)	1.02 (1.00, 1.03)	1.24 (1.22, 1.27)
Diabetes	1.07 (1.06, 1.07)	1.01 (0.99, 1.02)	0.93 (0.91, 0.94)
Heart failure	1.23 (1.22, 1.24)	1.32 (1.30, 1.34)	1.11 (1.09, 1.14)
Stroke and TIA	1.07 (1.05, 1.08)	1.01 (0.99, 1.03)	1.07 (1.04, 1.10)
Other organ transplant	1.08 (1.07, 1.09)	1.04 (1.02, 1.06)	1.06 (1.03, 1.09)

Variable	Days in Care Rate Ratio (95% CI)	Mortality Odds Ratio (95% CI)	Nursing Home Transition Odds Ratio (95% CI)
Precerebral arterial occlusion and transient cerebral ischemia	0.95 (0.93, 0.96)	0.89 (0.87, 0.91)	0.94 (0.92, 0.97)
Diabetic retinopathy	1.01 (1.00, 1.03)	0.93 (0.91, 0.96)	0.95 (0.92, 0.98)
Walking aids	1.07 (1.05, 1.09)	0.92 (0.89, 0.94)	1.12 (1.08, 1.16)
Wheelchairs	1.14 (1.12, 1.16)	1.14 (1.12, 1.17)	1.25 (1.21, 1.28)
Hospital bed	1.06 (1.03, 1.08)	1.24 (1.20, 1.28)	1.10 (1.05, 1.15)
Lifts	0.87 (0.83, 0.91)	1.11 (1.05, 1.19)	0.91 (0.84, 0.99)
Oxygen	1.14 (1.12, 1.15)	1.45 (1.42, 1.48)	0.99 (0.96, 1.02)
Age 85 and older (Referent)	1 (Ref.)	1 (Ref.)	1 (Ref.)
Age 18-54	0.56 (0.55, 0.57)	0.23 (0.22, 0.24)	0.17 (0.16, 0.17)
Age 55-64	0.57 (0.56, 0.58)	0.32 (0.32, 0.33)	0.26 (0.24, 0.27)
Age 65-74	0.62 (0.61, 0.63)	0.41 (0.40, 0.41)	0.34 (0.33, 0.35)
Age 75-84	0.77 (0.76, 0.78)	0.56 (0.55, 0.57)	0.55 (0.54, 0.57)
Dual-eligible	1.49 (1.47, 1.50)	n/a	2.62 (2.57, 2.68)

Table 9. Risk Factors and Days in Care Rate Ratio, Mortality Odds Ratio, and Nursing Home Transition Odds Ratio with 95% Confidence Interval, 2022 ACO REACH Dataset

Risk Factor	Days in Care: RR (95% CI)	Mortality: OR (95% CI)	Nursing home transition: OR (95% CI)
Dialysis status	1.24 (1.12, 1.37)	1.43 (1.27, 1.61)	1.10 (0.89, 1.36)
Respiratory failure	1.24 (1.20, 1.28)	1.47 (1.41, 1.52)	1.18 (1.10, 1.25)
Advanced liver disease	1.17 (1.12, 1.23)	1.39 (1.30, 1.47)	0.96 (0.86, 1.07)
Pneumonia	1.22 (1.18, 1.26)	1.21 (1.16, 1.26)	1.03 (0.96, 1.10)
Septicemia/shock	1.22 (1.17, 1.27)	1.08 (1.03, 1.13)	1.10 (1.03, 1.19)
Marked disability/frailty	1.51 (1.47, 1.55)	1.69 (1.64, 1.75)	1.31 (1.25, 1.39)
Pleural effusion/pneumothorax	1.28 (1.24, 1.33)	1.53 (1.47, 1.60)	0.99 (0.92, 1.07)
Hematological diseases	0.96 (0.94, 0.99)	0.97 (0.94, 1.01)	0.99 (0.94, 1.05)
Advanced cancer	1.07 (1.03, 1.10)	1.76 (1.70, 1.83)	0.86 (0.80, 0.92)
Infectious and immunologic diseases	1.04 (1.01, 1.08)	1.08 (1.04, 1.13)	0.92 (0.85, 0.99)
Severe cognitive impairment	1.37 (1.32, 1.42)	1.39 (1.33, 1.45)	1.25 (1.17, 1.34)
Major organ transplant status	1.03 (0.97, 1.09)	0.83 (0.76, 0.91)	0.61 (0.50, 0.75)
Pulmonary heart disease	1.03 (0.99, 1.06)	1.08 (1.04, 1.13)	1.06 (0.98, 1.14)
Gastrointestinal disease	1.05 (1.03, 1.08)	1.01 (0.97, 1.04)	0.99 (0.94, 1.05)
Bone/joint/muscle infections/necrosis	1.20 (1.13, 1.26)	0.97 (0.90, 1.04)	1.19 (1.07, 1.32)
Iron deficiency anemia	1.25 (1.22, 1.28)	1.15 (1.11, 1.19)	1.12 (1.06, 1.18)
Diabetes	1.10 (1.07, 1.12)	1.00 (0.97, 1.03)	0.93 (0.89, 0.98)
Ischemic heart disease except AMI	1.03 (1.00, 1.05)	0.98 (0.95, 1.01)	0.88 (0.84, 0.93)
Other lung disorders	0.96 (0.93, 0.98)	0.89 (0.86, 0.92)	0.93 (0.88, 0.98)
Other vascular or circulatory disease	1.13 (1.10, 1.15)	1.06 (1.03, 1.09)	1.20 (1.14, 1.27)
Other significant endocrine disorders	1.02 (0.99, 1.05)	1.01 (0.97, 1.05)	0.97 (0.90, 1.04)
Other disability and paralysis	1.19 (1.14, 1.23)	1.10 (1.04, 1.15)	1.17 (1.09, 1.25)
Substance abuse	0.99 (0.96, 1.03)	0.89 (0.85, 0.94)	1.04 (0.96, 1.13)
Other neurologic disorders	1.10 (1.08, 1.13)	0.97 (0.94, 1.00)	1.09 (1.04, 1.15)

Risk Factor	Days in Care: RR (95% CI)	Mortality: OR (95% CI)	Nursing home transition: OR (95% CI)
Arrhythmia (except atrial fibrillation)	1.02 (0.99, 1.04)	0.97 (0.94, 1.00)	1.06 (1.00, 1.11)
Hypertension	1.06 (1.03, 1.10)	0.78 (0.75, 0.82)	1.07 (0.99, 1.15)
Hip or vertebral fracture	1.29 (1.24, 1.35)	1.10 (1.04, 1.15)	1.33 (1.23, 1.43)
Lower-risk cardiovascular disease	0.97 (0.95, 1.00)	0.94 (0.91, 0.97)	0.96 (0.90, 1.01)
Cerebrovascular disease except stroke/TIA	1.04 (1.00, 1.09)	1.02 (0.97, 1.08)	1.02 (0.94, 1.11)
Other malignancy	0.92 (0.90, 0.95)	1.07 (1.03, 1.11)	0.90 (0.84, 0.96)
Morbid obesity	1.07 (1.04, 1.10)	0.78 (0.75, 0.82)	1.08 (1.01, 1.15)
Urinary disorders	1.10 (1.07, 1.12)	1.01 (0.98, 1.04)	1.01 (0.96, 1.07)
Psychiatric disorders other than depression	1.06 (1.03, 1.09)	0.98 (0.95, 1.02)	1.10 (1.03, 1.16)
Age<55	0.55 (0.51, 0.59)	0.22 (0.20, 0.25)	0.26 (0.22, 0.30)
Age 55 to <65	0.63 (0.60, 0.66)	0.35 (0.32, 0.38)	0.37 (0.33, 0.42)
Age 65 to <75	0.64 (0.62, 0.66)	0.39 (0.37, 0.40)	0.43 (0.40, 0.46)
Age 75 to <85	0.79 (0.77, 0.81)	0.54 (0.52, 0.56)	0.61 (0.58, 0.65)
Age >= 85	Ref.	Ref.	Ref.
AMI	1.01 (0.94, 1.08)	1.21 (1.12, 1.31)	1.07 (0.94, 1.22)
Alzheimer's disease & non-Alzheimer's dementia	1.30 (1.26, 1.34)	1.81 (1.75, 1.87)	1.64 (1.55, 1.73)
Atrial fibrillation & flutter	1.14 (1.12, 1.17)	1.18 (1.15, 1.22)	1.10 (1.04, 1.16)
CKD	1.14 (1.12, 1.17)	1.16 (1.12, 1.19)	1.07 (1.02, 1.12)
COPD and asthma	1.11 (1.08, 1.13)	1.07 (1.04, 1.11)	1.02 (0.97, 1.07)
Depression, bipolar, or other depressive mood disorders	1.16 (1.13, 1.20)	1.04 (1.01, 1.08)	1.36 (1.28, 1.44)
Heart failure and non-ischemic heart disease	1.23 (1.20, 1.26)	1.30 (1.26, 1.35)	1.16 (1.10, 1.22)
Stroke and TIA	1.11 (1.07, 1.14)	0.97 (0.92, 1.01)	1.18 (1.11, 1.26)
Other organ transplant	1.11 (1.08, 1.15)	1.13 (1.09, 1.18)	1.10 (1.02, 1.17)
Precerebral arterial occlusion and transient cerebral ischemia	0.94 (0.91, 0.97)	0.90 (0.86, 0.94)	0.90 (0.84, 0.97)
Diabetic retinopathy	0.99 (0.95, 1.03)	0.89 (0.85, 0.95)	0.82 (0.74, 0.90)
Walking aids	1.24 (1.17, 1.31)	1.02 (0.95, 1.10)	1.17 (1.05, 1.30)
Wheelchairs	1.08 (1.01, 1.15)	1.16 (1.07, 1.26)	1.13 (1.01, 1.27)
Hospital bed	1.04 (0.93, 1.17)	1.20 (1.05, 1.38)	1.15 (0.95, 1.40)
Lifts	1.08 (0.88, 1.33)	1.33 (1.04, 1.70)	1.18 (0.85, 1.65)
Oxygen	1.13 (1.08, 1.18)	1.45 (1.37, 1.53)	0.99 (0.90, 1.09)
Dual-eligible in 2022	1.72 (1.67, 1.77)	n/a	2.30 (2.18, 2.42)

Table 10. Prevalence of individuals with SDOH Factors Among Patients Aligned to ACOs by Quartile of ACO Overall Performance Score, 2022

Description	Overall	Q1 (24 ACOs)	Q2 (25 ACOs)	Q3 (25 ACOs)	Q4 (25 ACOs)
N (patients)	169,324	55,700	35,236	34,588	43,800
Dual-eligible proportion	23%	27.6%	15.8%	19.1%	27.0%
Non-White proportion	16%	14.8%	14.6%	14.0%	20.9%
High ADI proportion	7%	13.1%	5.5%	4.6%	2.7%

4.4.4a Attach Risk Adjustment Modeling and/or Stratification Specifications

Final Model Specifications

Days in Care Model

We model days in care rather than days at home because days in care is distributed as a typical count variable. To model days in care, we use a hierarchical negative binomial regression model. The model includes adjustment of the risk factors to account for patient case-mix and provider entity-specific random effects to account for the patient mix within provider entities. It also includes an offset for the number of days the patients survived in the performance year for adjustment.

Specifically, we let Y_{ij} denote the number of days in care in the year experienced by *i*-th patient enrolled at the *j*-th provider entity with risk factors $X_{ij,1}, \dots, X_{ij,p}$ and the exposure-time s_{ij} (that is, the number of days alive from 1 up to 365 if the patient died, or set to 365 if patient did not die during the performance year), where *p* is the number of risk factors in the model. The days in care Y_{ij} is modeled as negative binomial distributed with mean μ_{ij} and variance $\mu_{ij} + k\mu_{ij}^2$ where *k* is the scale parameter. The hierarchical negative binomial regression model equation is

$$\log(\mu_{ij}) = \beta_0 + \beta_1 X_{ij,1} + \cdots + \beta_p X_{ij,p} + \log(s_{ij}) + z_j$$

where z_j is the provider entity-specific random effect that is normally distributed with mean 0 and variance σ_z^2.

For each patient, the predicted days in care is calculated as:

$$P_{ij} = \exp(\beta_0 + \beta_1 X_{ij,1} + \cdots + \beta_p X_{ij,p} + log(s_{ij}) + z_j)$$

the expected number of days in care is calculated as:

$$E_{ij} = \exp(\beta_0 + \beta_1 X_{ij,1} + \cdots + \beta_p X_{ij,p} + log(s_{ij}))$$

and the excess days in care (EDIC) is the difference of "predicted" minus "expected" days in care, calculated as:

$$EDIC_{ij} = P_{ij} - E_{ij}$$

$EDIC_{ij} > 0$ indicates that the patient spent more days in care due to their provider entity's performance than expected at a provider entity of average quality, while $EDIC_{ij} < 0$ indicates the patient spent fewer days in care due to their provider entity's performance than expected.

Mortality Model

For mortality model, we used a hierarchical logistic regression model.

We let M_{ij} denote whether the *i*-th patient enrolled at the *j*-th provider entity died during the performance year with risk factors $X_{ij,1}, \dots, X_{ij,p}$, and p is the number of risk factors in the model. The model includes adjustment of the risk factors and provider entity-specific random effects to account the within-provider entity variation for mortality. The hierarchical logistic regression model equation is:

$$\log\left(\frac{p_{ij}}{1-p_{ij}}\right) = \alpha_0 + \alpha_1 X_{ij,1} + \cdots + \alpha_p X_{ij,p} + w_j$$

where p_{ij} is the Bernoulli distributed event probability of the mortality outcome and w_j is the provider entity-specific random effect that is normally distributed with mean 0 and variance σ_w^2.

For each patient, the predicted mortality is calculated as:

$$Q_{ij} = \frac{1}{1 + \exp\left(-\left(\alpha_0 + \alpha_1 X_{ij,1} + \cdots + \alpha_p X_{ij,p} + w_j\right)\right)}$$

And the expected mortality is calculated as:

$$F_{ij} = \frac{1}{1 + \exp\left(-\left(\alpha_0 + \alpha_1 X_{ij,1} + \cdots + \alpha_p X_{ij,p}\right)\right)}$$

The standardized mortality ratio for the patient is calculated as the ratio of the predicted and expected 1-year mortality $\mathrm{SMR}_{ij} = Q_{ij}/F_{ij}$. SMR_{ij} is interpreted as the patient's risk of death due to their provider entity's performance relative to their risk at a provider entity of average quality; if $SMR_{ij} > 1$ the patient is at higher risk of death due to their provider entity's performance while if $SMR_{ij} < 1$ the patient is at lower risk of death.

Nursing Home Transition Model

To model the transitioning to a nursing home, we use a hierarchical logistic regression model with specifications similar to those used for mortality (above). Similarly, the SNHR is given by $\mathrm{SNHR}_{ij} = Q_{ij}/F_{ij}$, where Q_{ij} is the predicted risk of transition to a nursing home and F_{ij} is the expected risk of nursing home transition. $SNHR_{ij}$ is interpreted as the patient's risk of transitioning to a nursing home due to their provider entity's performance relative to their risk at a provider entity of average quality; if $SNHR_{ij} > 1$ the patient is at higher risk of transitioning due to their provider entity's performance while if $SNHR_{ij} < 1$ the patient is at lower risk of transitioning.

We finally rescale $SNHR_{ij}$ to have the same mean and standard deviation (SD) over all patients as the SMR, using the equation below; this rescaling ensures that the two values have similar impact when used to adjust the days in care.

$$rSNHR_{ij} = \exp\left(\frac{\left(\log\left(SNHR_{ij}\right) - \overline{\log\left(SNHR_{ij}\right)}\right)}{\mathrm{SD}\left(\log\left(\mathrm{NHR_{ij}}\right)\right)}\mathrm{SD}\left(\log\left(\mathrm{SMR_{ij}}\right)\right) + \overline{\log\left(\mathrm{SMR_{ij}}\right)}\right)$$

Adjusted Days in Care

We then use each patient's SMR and SNHR to construct a corresponding adjustment factor.

For the mortality adjustment factor, each patient's EDIC is multiplied by SMR if EDIC ≥ 0 or divided by SMR if EDIC < 0; the patient's EDIC is then subtracted from the result to produce the number of "extra" excess days in care for that patient due to their provider entity's performance on mortality.

Similarly, a nursing home transition adjustment factor is constructed by multiplying each patient's EDIC by rSNHR if EDIC ≥ 0 or divided by rSNHR if EDIC < 0; the patient's EDIC is then subtracted from the result to produce the number of "extra" excess days in care for that patient due to their provider entity's performance on nursing home transitions. The nursing home transition adjustment factor is multiplied by half (0.5). The adjustment factor, in combination with the rescaling of SNHR to have the same mean and standard deviation as SMR, is intended to address feedback from stakeholders, experts, and patients that death is a more serious outcome than nursing home use by making the overall impact of the SMR adjustment greater. (We found that without these rescaling factors, in the test dataset the distribution of SNHR was broader than that of SMR across patients and so had a much greater impact on a provider entity's Days at Home score.)

For each patient, the two adjustment factor representing "extra" excess days are added to each patient's original EDIC to get an "adjusted EDIC" for each patient:

$$\text{Adjusted } EDIC_{ij} == \begin{cases} EDIC_{ij} + [(SMR_{ij}EDIC_{ij} - EDIC_{ij}) + \frac{1}{2}(rSNHR_{ij}EDIC_{ij} - EDIC_{ij})] & if\ EDIC_{ij} \geq 0 \\ EDIC_{ij} + \left[\left(\frac{EDIC_{ij}}{SMR_{ij}} - EDIC_{ij}\right) + \frac{1}{2}\left(\frac{EDIC_{ij}}{rSNHR_{ij}} - EDIC_{ij}\right)\right] & if\ EDIC_{ij} < 0 \end{cases}$$

$$= \begin{cases} \left(SMR_{ij} + \frac{1}{2}rSNHR_{ij} - \frac{1}{2}\right) * EDIC_{ij} & if\ EDIC_{ij} \geq 0 \\ \left(SMR_{ij}^{-1} + \frac{1}{2}rSNHR_{ij}^{-1} - \frac{1}{2}\right) * EDIC_{ij}\ if\ EDIC_{ij} < 0 \end{cases}$$

This risk-, mortality- and nursing home transition adjusted days in care is used to construct provider entity-level days at home by subtracting from the cohort mean survival days and averaging over each provider entity. That is, the risk-, mortality-, and nursing home transition-adjusted days at home ("Adjusted Days at Home") for provider entity *j* is the average adjusted days at home of all patients in the provider entity, calculated as

$$\text{Adjusted } DAH_j = \sum_{i=1}^{n_j} \frac{M - adjusted\ EDIC_{ij}}{n_j}$$

where *M* is the mean number of days at home of all patients and the sum is over all patients, and n_j is the number of patients in provider entity *j*.

4.4.5a Attach Calibration and Discrimination Testing Results

Table 11. Testing and calibration results, Mortality model, 2022 ACO REACH Dataset

Characteristic	Value
Days in Care model: deviance R-square	0.0183
Mortality model: C-statistic	0.736
Nursing home transition model: C-statistic	0.753

Table 12. Testing and calibration results, Days in Care model, 2018 SSP ACO Development Dataset

Characteristic	Development Sample	Validation Sample
Number of patients	84,662	84,662
Number of eligible ACOs	99	99
Unadjusted mean Days in Care	12.3	12.4
Predictive ability (lowest decile of predicted Days in Care per day alive, highest decile)	4.18, 51.9	4.02, 52.0
Model fit (deviance R-squared)	0.0184	0.0184

Table 13. Testing and calibration results, Mortality model, 2022 ACO REACH Dataset

Characteristic	Development Sample	Validation Sample
Number of patients	84,662	84,662
Number of eligible ACOs	99	99
Unadjusted mortality risk	15.0%	15.0%
Calibration (γ0, γ1)	0, 1	-0.044, 0.974
Discrimination - predictive ability (lowest decile %, highest decile %)	3.24%, 40.2%	3.06%, 39.9%
Discrimination – C-statistic	0.738	0.734
Model fit: Chi-Square	7013.7	6843.8

Table 14. Testing and calibration results, Nursing Home Transition model, 2022 ACO REACH Dataset

Characteristic	Development Sample	Validation Sample
Number of patients	84,662	84,662
Number of eligible ACOs	99	99
Unadjusted nursing home transition risk	4.58%	4.69%
Calibration (γ0, γ1)	0, 1	-0.036, 0.978
Discrimination - predictive ability (lowest decile %, highest decile %)	0.45%, 13.7%	0.39%, 13.7%
Discrimination – C-statistic	0.754	0.752

Figure 4. Days in Care calibration plot: Development sample, 2022 ACO REACH dataset

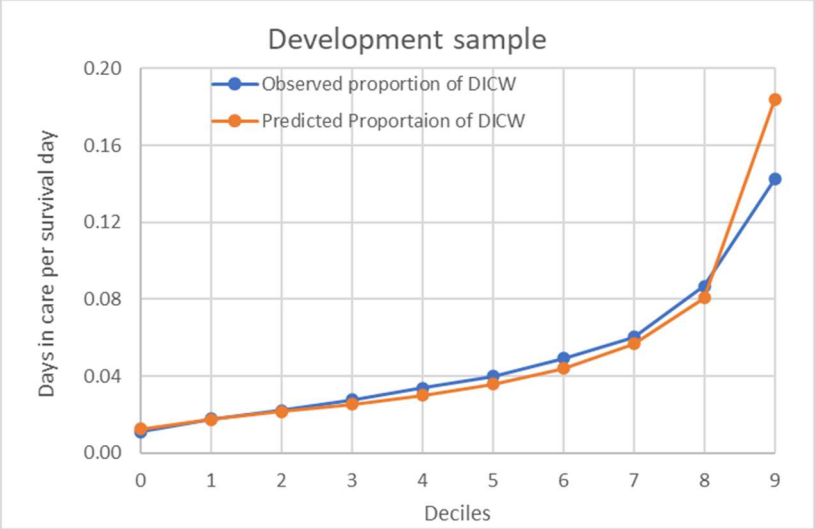


Figure 5. Days in Care calibration plot: Validation sample, 2022 ACO REACH dataset

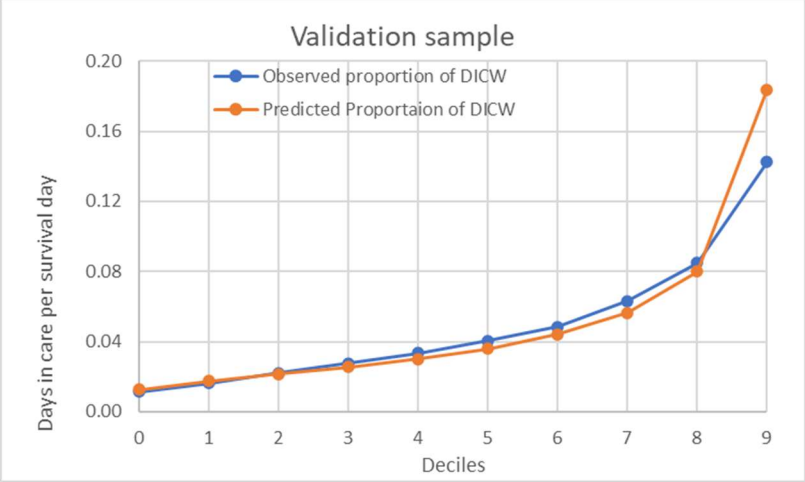


Figure 6. Days in Care calibration plots: Dual-eligible vs. non-dual-eligible patients, 2022 ACO REACH dataset

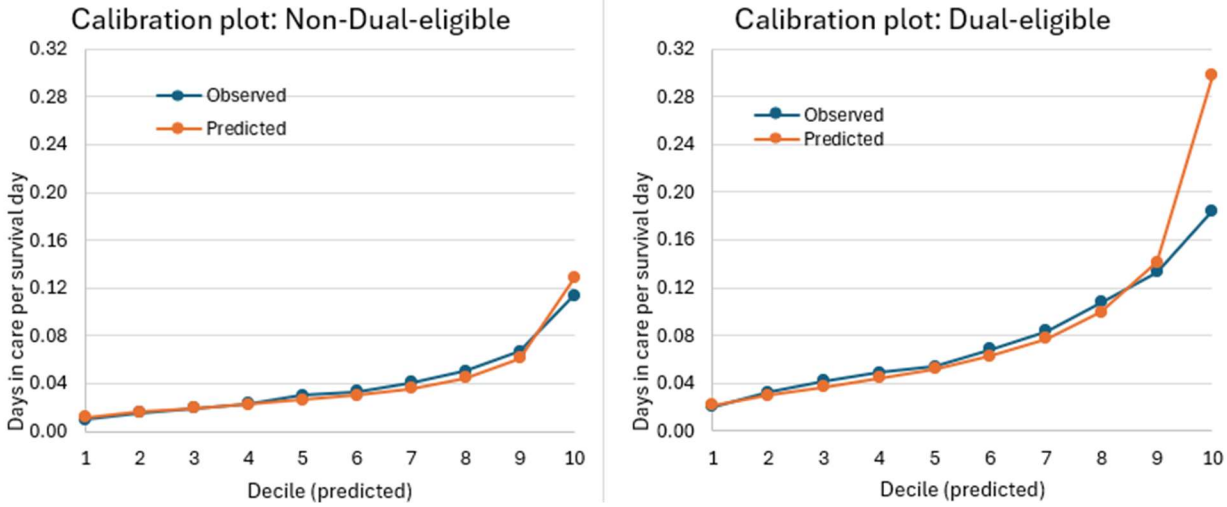


Figure 7. Days in Care calibration plots: White vs. non-white patients, 2022 ACO REACH dataset

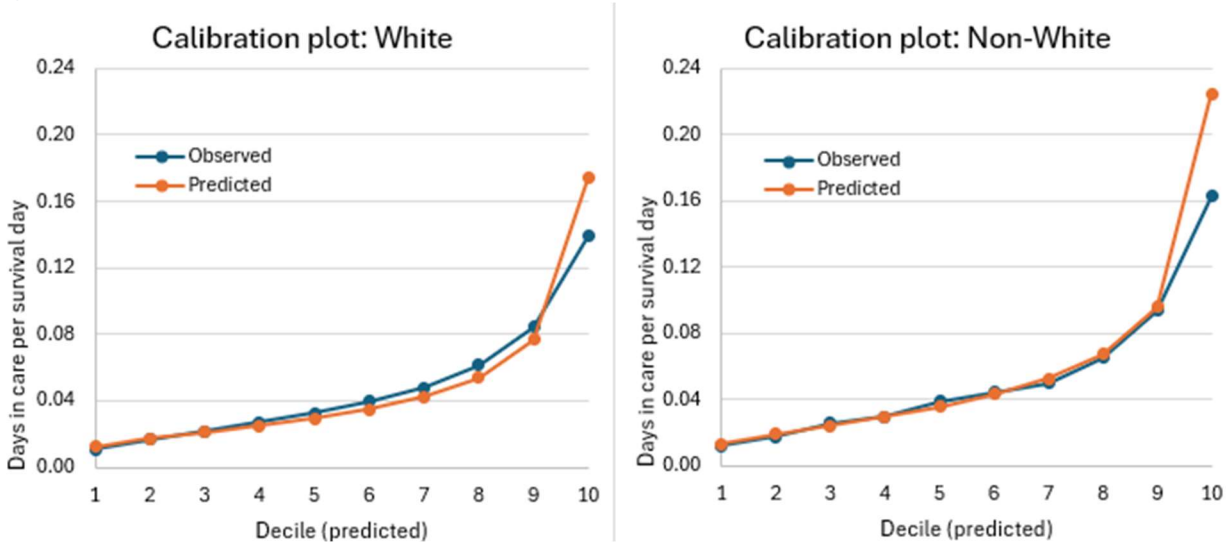
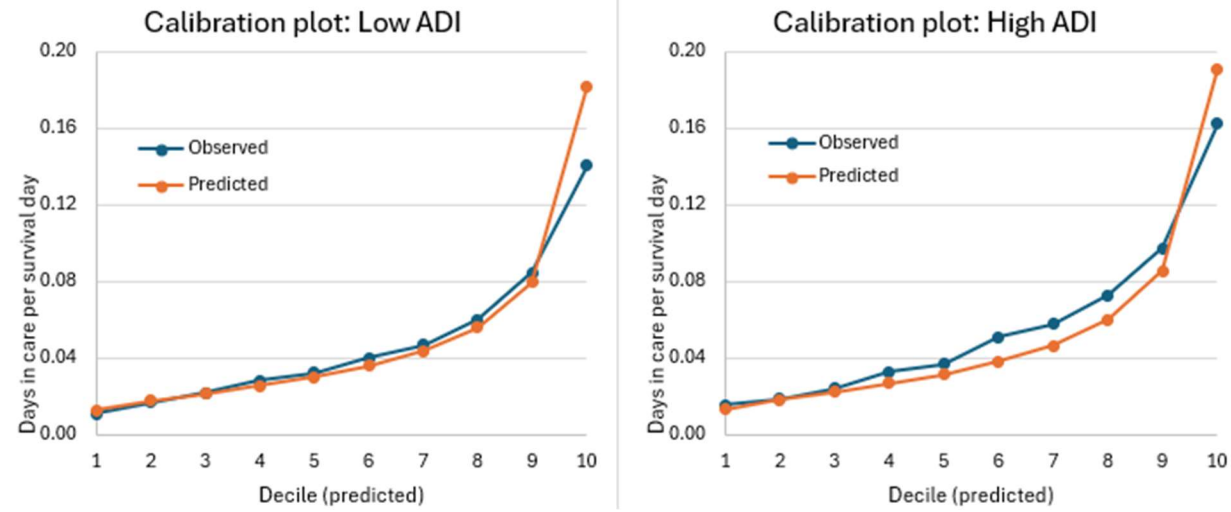


Figure 8. Days in Care calibration plots: High ADI vs. low ADI patients, 2022 ACO REACH dataset



5.1 Contributions towards advancing health equity

Table 15. DAH Performance Scores with DIC only, DIC with SMR/NHR Adjustment, and Differences With vs. Without Adjustment, 2022 ACO REACH Dataset

Variable	N	Min	1st Pctl	10th Pctl	Q1	Median	Q3	90th Pctl	99th Pctl	Max
DAH (DIC only)	99	305.34	305.34	319.72	321.85	323.61	325.06	326.04	331.79	331.79
DAH (DIC + SMR/NHR adjustment)	99	300.31	300.31	319.47	321.72	323.57	325.25	326.60	334.01	334.01
Difference with vs. without adjustment	99	-5.02	-5.02	-0.37	-0.07	0.01	0.19	0.54	2.22	2.22

Table 16. Patient number and mean unadjusted Days in Care by stratum, 2022 ACO REACH Dataset

Description	N (%)	Mean # Days in Care per person (SD)	Mean Days in Care rate per person-year (SD)
All patients	169,324	12.3 (26.4)	17.9 (43.3)
Dual-eligible	39,341 (23.2%)	20.9 (37.4)	28.3 (54.9)
Non-dual eligible	129,983 (76.8%)	9.7 (21.3)	14.7 (38.6)
Non-white	27,379 (16.2%)	13.6 (29.4)	19.7 (47.1)
White	141,945 (83.8%)	12.1 (25.8)	17.6 (42.6)
High ADI	18,807 (11.1%)	14.3 (29.0)	20.7 (47.6)
Low ADI	150,517 (88.9%)	12.1 (26.0)	17.5 (42.8)

Table 17. ACO level descriptive statistics (patient volume by stratum and SDOH proportion), 2022 ACO REACH Dataset

Description	Mean	SD	Min	10th Pctl	Q1	Median	Q3	90th Pctl	Max
All patients - N	1710.3	2330.9	60	257	478	971	2099	3900	16390
Dual eligible - N	397.4	634.5	13	44	69	186	418	925	4657
Non-white - N	276.6	430.9	8	34	67	116	287	625	2660
High ADI - N	190.0	533.1	0	1	5	30	173	443	4464
Dual eligible %	27.8%	23.5	2.7%	5.9%	10.1%	21.6%	38.1%	68.2%	96.3%
Non-white %	20.4%	19.5	2.0%	4.9%	7.4%	14.1%	26.0%	51.6%	94.0%
High ADI %	9.9%	12.6	0.0%	0.1%	0.6%	5.1%	15.0%	29.4%	55.8%

Table 18. Mean days in care (relative rate per person-year) and adjusted rate difference, ACO-level distribution, 2022 ACO REACH Dataset

Description	N	Mean	SD	Min	10th Pctl	Q1	Median	Q3	90th Pctl	Max
ReR: Dual-eligible	98	16.70	2.61	10.69	13.31	14.79	16.43	18.72	19.80	23.52

Description	N	Mean	SD	Min	10th Pctl	Q1	Median	Q3	90th Pctl	Max
ReR: Non-dual-eligible (ref.)	98	9.78	1.36	6.36	8.18	8.76	9.62	10.76	11.72	13.91
RD: Dual-eligible status	**98**	**+6.92**	**2.00**	**+2.38**	**+4.58**	**+5.53**	**+6.85**	**+8.14**	**+9.50**	**+13.47**
ReR: Nonwhite race	98	9.12	1.50	5.80	7.18	8.05	9.14	10.24	10.80	13.54
ReR: White race (ref.)	98	9.88	1.44	5.93	8.11	8.95	9.72	10.78	11.96	13.26
RD: Race	**98**	**-0.75**	**1.02**	**-4.77**	**-2.00**	**-1.30**	**-0.78**	**-0.05**	**+0.68**	**+1.21**
ReR: High ADI	64	10.49	1.30	7.74	8.98	9.44	10.35	11.34	12.04	14.50
ReR: Low ADI (ref.)	64	9.66	1.23	7.29	8.21	8.60	9.59	10.53	11.32	12.32
RD: ADI	**64**	**+0.83**	**0.50**	**-0.55**	**+0.36**	**+0.60**	**+0.76**	**+1.03**	**+1.46**	**+2.24**

Glossary of Terms

Acronym	Definition
ACO	Accountable Care Organizations
ADI	Area Deprivation Index
AMI	Acute Myocardial Infarction
ARHQ	Agency for Healthcare Research and Quality
CAHPS	Consumer Assessment of Healthcare Providers and Systems
CI	Confidence Interval
CKD	Chronic Kidney Disease
COPD	Chronic Obstructive Pulmonary Disease
CY	Calendar Year
DAH	Days at Home
DIC	Days in Care
DME	Durable Medical Equipment
ED	Emergency Department
EDIC	Excess Days in Care
HCC	Hierarchical Condition Category
LTI	Long-Term Institution
NHR	Nursing Home Ratio
OR	Odds Ratio
PCP	Primary Care Physician
RD	Rate Difference
REACH	Realizing Equity, Access, and Community Health
ReR	Relative Ratio
RR	Rate Ratio
SD	Standard deviation
SDOH	Social determinants of health
SES	Socioeconomic Status
SMR	Standard(ized) Mortality Ratio
SNF	Skilled Nursing facility
SSM	Summary Survey Measure
SSP	Shared Savings Program
TIA	Transient Ischemic Attack