

INTRODUCTION

Annual screening with low-dose computed tomography (LDCT) can reduce mortality by detecting lung cancer early, when treatment is most effective.¹

Incomplete smoking history documentation in electronic health records (EHR) represents a health system barrier to identifying all individuals eligible for lung cancer screening (LCS).²

This barrier may limit the effectiveness of LCS in reducing racial and ethnic disparities in lung cancer mortality.

Objective: To identify temporal patterns and multilevel determinants of racial and ethnic variation in incomplete smoking history documentation.

METHODS

Design: Retrospective cohort study with repeated cross-sectional analyses at six-month intervals (n=701,311) and multilevel logistic regression modeling (n=429,594).

Setting: An integrated healthcare delivery system in Northern California (**Figure 1**).

Participants: Individuals aged 50-80 years with an EHR-documented history of smoking from July 1, 2014, to December 31, 2022.

Exposure: Race and ethnicity [American Indian or Alaska Native (AI/AN), Asian/Pacific Islander (PI), Black, Hispanic, multiracial, and non-Hispanic White (NHW)].

Main Outcome: Incomplete smoking history documentation to assess LCS eligibility, defined as missing cumulative pack-years, and for those who quit, years since last smoked.

Potential determinants: Demographic, clinical, neighborhood, provider, and facility characteristics ascertained using EHR data.

DISCUSSION AND CONCLUSION

- Incomplete EHR documentation of smoking history is common and varies across racial and ethnic groups, with demographic and clinical characteristics partially accounting for the observed variation.

- These findings highlight the need for tailored, system-level interventions to routinely elicit and fully document smoking history during clinical encounters.

RESULTS

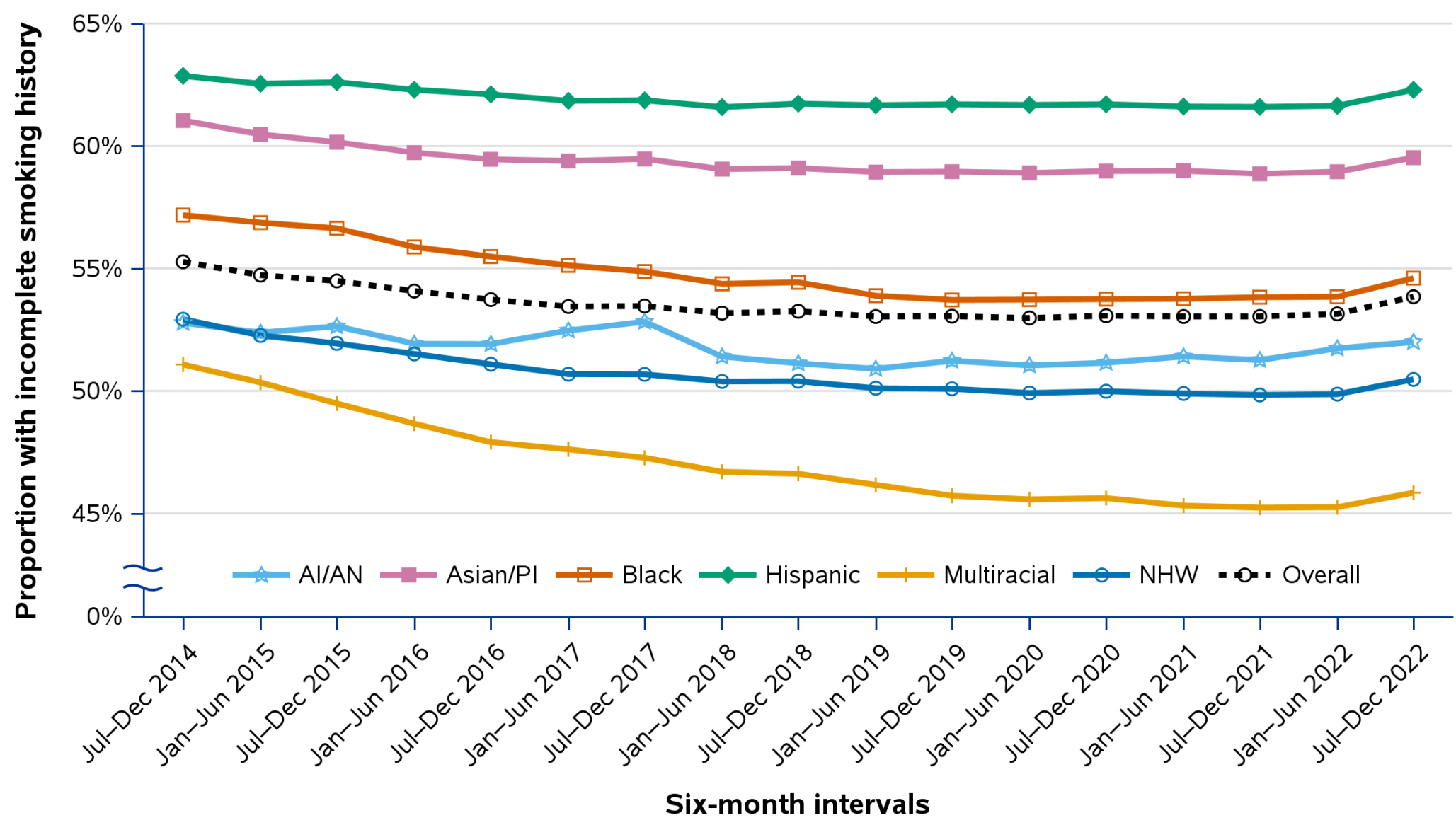
Table 1. Demographic and clinical characteristics by race and ethnicity among age-eligible adults who ever smoked, July–December 2022 (n=429,594)

	Race and Ethnicity ^a					
	AI/AN	Asian/PI	Black	Hispanic	Multiracial	NHW
Total, n	2,414	63,483	35,903	65,296	11,521	250,977
Characteristic, %						
Smoking status						
Former	77.5	77.3	73.6	81.8	84.4	82.9
Current	22.5	22.7	26.4	18.2	15.6	17.1
Age at Index						
50-54	17.3	21.0	15.7	21.9	11.4	14.0
55-59	18.6	19.5	17.5	21.1	13.0	14.8
60-64	21.3	20.0	21.1	20.1	18.3	18.7
65-69	17.8	17.3	19.4	16.3	20.0	18.6
70-74	14.8	13.6	16.1	11.9	19.8	18.0
75-80	10.1	8.6	10.4	8.7	17.5	15.9
Sex						
Female	51.8	24.2	52.6	38.8	52.5	50.2
Male	48.2	75.8	47.4	61.2	47.5	49.8
Unknown/Other	0.0	0.0	0.0	0.0	0.0	0.0
Marital Status						
Single/Never married	20.8	12.8	31.8	15.6	17.4	18.2
Married/Partnered	50.5	64.5	40.7	59.9	57.4	54.5
Divorced/Separated	11.6	5.5	12.9	9.8	12.3	11.1
Widowed	6.9	2.3	5.9	3.8	6.4	5.4
Other	0.0	0.0	0.1	0.1	0.1	0.1
Unknown	10.2	14.8	8.5	10.8	6.4	10.8
Insurance						
Medicaid	7.0	5.8	10.1	6.3	6.2	4.0
Medicare	38.4	29.9	37.8	30.9	51.2	47.7
Commercial	52.0	62.5	49.3	60.5	40.9	46.8
Other	0.5	0.3	0.5	0.4	0.5	0.4
Unknown	2.1	1.5	2.3	1.9	1.2	1.2
Language Concordance						
No	0.9	12.3	0.2	17.2	2.1	0.5
Yes	99.0	87.6	99.7	82.7	97.9	99.4
Unknown	0.1	0.1	0.1	0.1	0.0	0.1
Interpreter Use						
English preferred	98.6	79.3	99.7	70.3	97.0	99.3
Non-English/No interpreter	0.8	11.8	0.2	13.9	2.0	0.5
Interpreter needed	0.6	8.9	0.1	15.8	1.0	0.2
Unknown	0.0	0.0	0.0	0.1	0.0	0.0
Prior Cancer						
No	90.8	94.3	89.7	93.3	88.6	89.7
Yes	9.2	5.7	10.3	6.7	11.4	10.3
Outpatient Visits in Prior Year						
0	13.1	14.9	11.5	13.4	8.9	12.2
1-3	34.6	38.1	29.9	33.9	28.0	32.4
4-6	8.0	9.2	8.3	8.6	8.2	8.6
7+	44.2	37.8	50.3	44.1	55.0	46.8

^a Race and ethnicity distribution in the cohort was: AI/AN 0.6%, Asian/PI 14.8%, Black 8.4%, Hispanic 15.2%, Multiracial 2.7%, and NHW 58.4%.

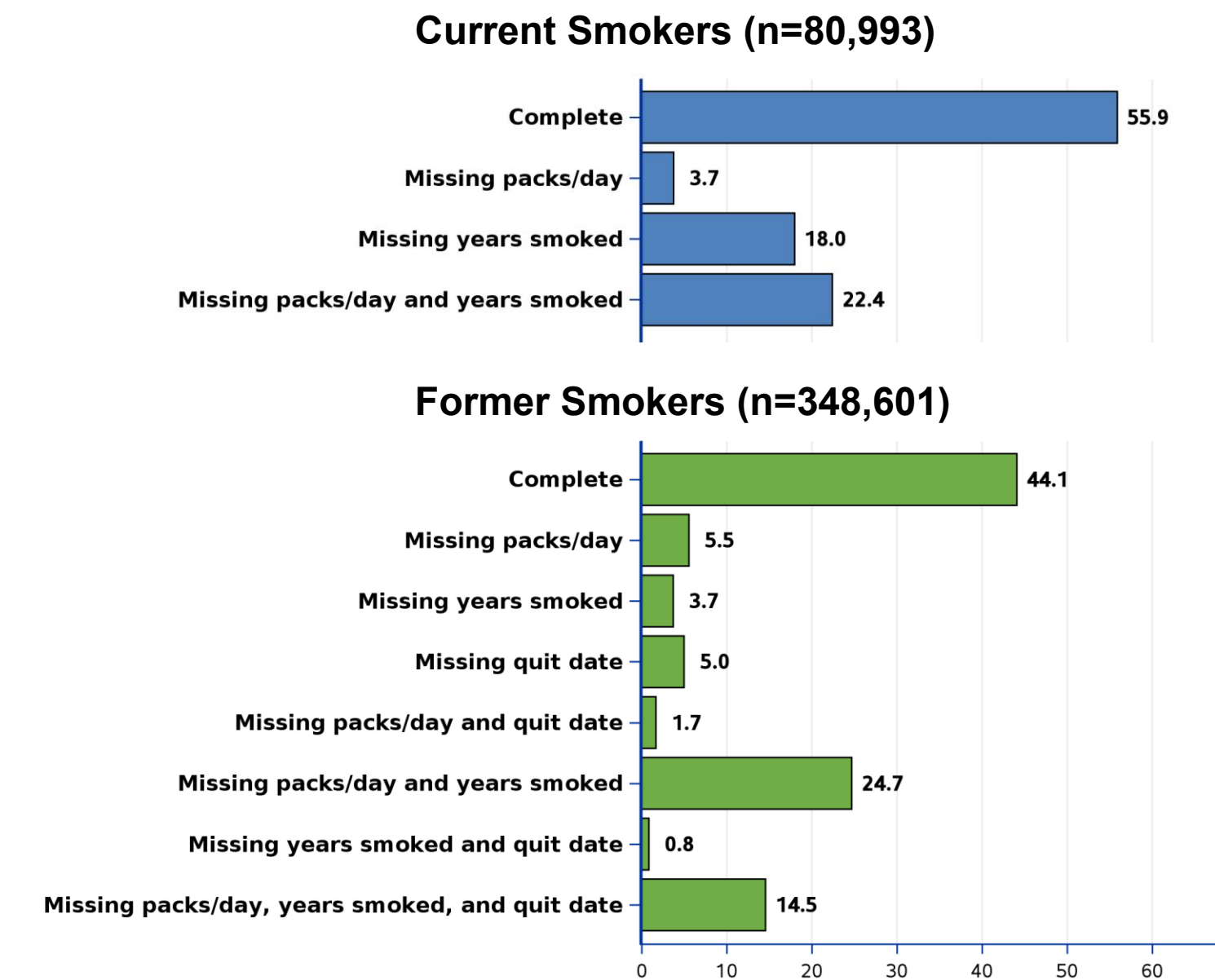
Demographic and clinical characteristics varied across racial and ethnic groups. Asian/PI and Hispanic individuals were more likely to be younger, male, commercially insured, prefer a language not spoken by their provider, need interpreter services, and be less likely to have a prior cancer.

Figure 2. Temporal trends for incomplete smoking history documentation in adults aged 50–80 years who ever smoked, by race and ethnicity, July 2014–December 2022 (n=701,311)



Incomplete smoking history documentation exceeded 50% in most groups. Hispanic and Asian/PI adults consistently had the highest prevalence, while multiracial adults had the lowest.

Figure 3. Missing components of smoking history documentation, July–December 2022 (n=429,594)



Incomplete smoking history documentation was driven primarily by missing smoking duration alone or in combination with smoking quantity and/or quit date.

Table 2. Odds ratios and 95% confidence intervals for incomplete smoking history documentation by race and ethnicity in domain-adjusted mixed-effects models, July–December 2022 (n=429,594)

Race and Ethnicity	Incomplete n (%)	Model						
		Unadjusted OR (95% CI)	Demographics OR (95% CI)	Clinical OR (95% CI)	Neighborhood OR (95% CI)	Provider OR (95% CI)	Facility OR (95% CI)	Fully Adjusted OR (95% CI)
NHW	126,273 (50.3)	ref	ref	ref	ref	ref	ref	ref
AI/AN	1,260 (52.2)	1.07 (0.98, 1.16)	1.04 (0.96, 1.13)	1.09 (1.00, 1.18)	1.08 (1.00, 1.18)	1.07 (0.98, 1.16)	1.07 (0.98, 1.16)	1.09 (1.01, 1.19)
Asian/PI	37,735 (59.4)	1.33 (1.31, 1.36)	1.17 (1.15, 1.20)	1.29 (1.27, 1.32)	1.34 (1.31, 1.36)	1.33 (1.31, 1.36)	1.33 (1.31, 1.36)	1.19 (1.16, 1.21)
Black	19,536 (54.4)	1.08 (1.05, 1.10)	1.07 (1.04, 1.09)	1.14 (1.11, 1.16)	1.10 (1.08, 1.13)	1.08 (1.05, 1.10)	1.08 (1.05, 1.10)	1.15 (1.13, 1.18)
Hispanic	40,565 (62.1)	1.52 (1.49, 1.55)	1.37 (1.34, 1.39)	1.50 (1.47, 1.53)	1.55 (1.52, 1.58)	1.51 (1.49, 1.54)	1.51 (1.49, 1.54)	1.43 (1.40, 1.46)
Multiracial	5,264 (45.7)	0.80 (0.77, 0.84)	0.84 (0.81, 0.88)	0.87 (0.83, 0.90)	0.81 (0.78, 0.84)	0.81 (0.78, 0.84)	0.80 (0.77, 0.84)	0.89 (0.85, 0.92)

Model Components: Demographics (age, sex, marital status, insurance, language concordance, interpreter use, patient portal use); Clinical (prior cancer history, outpatient visits); Neighborhood (healthcare accessibility, neighborhood socioeconomic status); Provider (age, sex, race/ethnicity, years of service, panel size); Facility (provider volume, patient volume, service area).

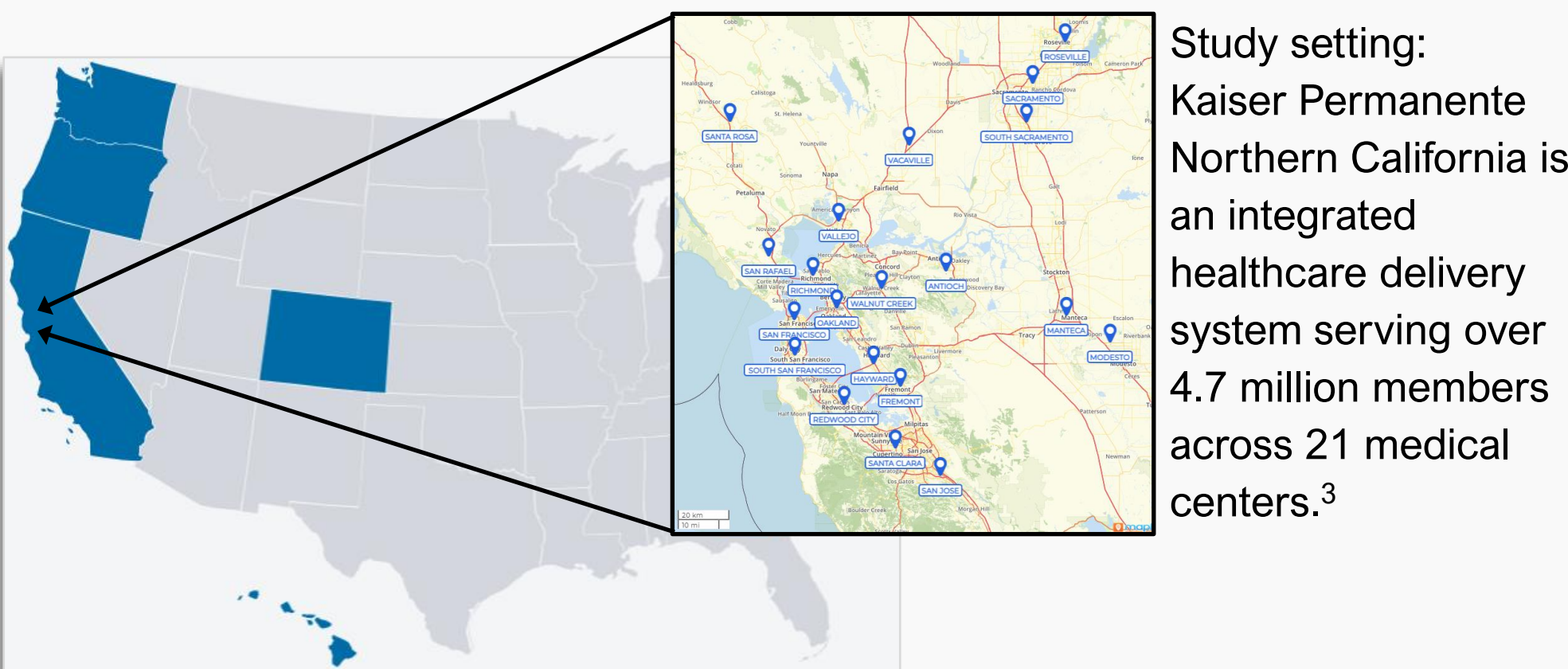
Hispanic, Asian/PI, Black and AI/AN adults had higher odds of incomplete smoking history documentation than NHW adults. Demographic and clinical characteristics partially accounted for racial and ethnic differences.

Table 3. Odds ratios and 95% confidence intervals for incomplete smoking history documentation by race and ethnicity in minimally adjusted mixed-effects models, July–December 2022 (n=429,594)

Model	Race and Ethnicity					
	NHW OR (95% CI)	AI/AN OR (95% CI)	Asian/PI OR (95% CI)	Black OR (95% CI)	Hispanic OR (95% CI)	Multiracial OR (95% CI)
Unadjusted	ref	1.07 (0.98, 1.16)	1.33 (1.31, 1.36)	1.08 (1.05, 1.10)	1.52 (1.49, 1.55)	0.81 (0.77, 0.84)
Demographic & Clinical Factors						
+ Age	ref	1.03 (0.95, 1.12)	1.27 (1.24, 1.29)	1.05 (1.03, 1.08)	1.43 (1.41, 1.46)	0.82 (0.79, 0.85)
+ Sex	ref	1.07 (0.99, 1.16)	1.30 (1.27, 1.33)	1.08 (1.06, 1.11)	1.50 (1.47, 1.53)	0.81 (0.78, 0.84)
+ Marital Status	ref	1.07 (0.98, 1.16)	1.28 (1.26, 1.31)	1.08 (1.05, 1.11)	1.51 (1.48, 1.54)	0.83 (0.80, 0.86)
+ Insurance	ref	1.04 (0.96, 1.13)	1.27 (1.25, 1.30)	1.06 (1.04, 1.09)	1.45 (1.43, 1.48)	0.82 (0.79, 0.85)
+ Language Concordance	ref	1.07 (0.98, 1.16)	1.30 (1.28, 1.33)	1.08 (1.05, 1.10)	1.47 (1.44, 1.49)	0.80 (0.77, 0.83)
+ Interpreter Use	ref	1.07 (0.98, 1.16)	1.29 (1.26, 1.31)	1.08 (1.06, 1.11)	1.43 (1.41, 1.46)	0.80 (0.77, 0.83)
+ Cancer History	ref	1.06 (0.98, 1.15)	1.30 (1.28, 1.33)	1.08 (1.05, 1.10)	1.49 (1.46, 1.52)	0.81 (0.78, 0.84)
+ Number Outpatient Visits	ref	1.06 (0.97, 1.15)	1.30 (1.27, 1.32)	1.09 (1.06, 1.12)	1.51 (1.48, 1.54)	0.83 (0.80, 0.86)

Demographic and clinical characteristics that partially explained racial and ethnic differences in incomplete smoking history documentation included age, sex, marital status, insurance type, provider language concordance, interpreter use, prior cancer history, and outpatient utilization.

Figure 1. Map of Kaiser Permanente Northern California medical centers



Study setting: Kaiser Permanente Northern California is an integrated healthcare delivery system serving over 4.7 million members across 21 medical centers.³

REFERENCES & ACKNOWLEDGEMENTS

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