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Sex, ethnicity and language differences in statin prescribing in community health center patients

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ABSTRACT

Background: Statins have been shown to reduce atherosclerotic cardiovascular disease (ASCVD). In the United States, statins are underutilized, and the literature suggests women and Latine individuals received even fewer prescriptions than men even when eligible. No study has shown how statins are prescribed when looking at language, ethnicity, and considering sex.

Methods: Data were analyzed from a multistate EHR network across the US from 2014 to 2020. We included patients aged 40+ that were non-Hispanic White, English speaking Latine, and Spanish speaking Latine and further disaggregated by sex with the aim to examine statin prescription prevalence and rates between groups. GEE logistic and negative binomial regression models were used determine the outcomes adjusted by appropriate covariates.

Results: We found compared to non-Hispanic White men, only Spanish speaking Latinos had higher odds of receiving a statin prescription, but once one statin was prescribed, non-Hispanic White women were the only group with higher rates. We found a higher percent of Spanish speaking Latine patients regardless of sex had a statin prescription. Prevalence of having a statin prescription was 59.3 % and 59.7 % for Spanish speaking Latinos and Latinas respectively compared to 55.5 % 57.0 % for non-Hispanic White men and women respectively.

Conclusions: Overall, we found ethnicity, language, and sex differences. Clinicians in CHCs play an important role in the process to eliminate the sex gap in preventive health. The attention to statin prescribing in Spanish speaking Latine patients indicates more conscious care is being implemented in these vulnerable populations.

1. Introduction

The effectiveness of HMG-CoA reductase inhibitors (statins) in improving lipid profiles and reducing atherosclerotic cardiovascular disease (ASCVD) is well documented [1]. Still, statin therapy remains underutilized in the US [2]. A substantial body of healthcare literature has shown that statins are less likely to be prescribed in women than men [3–5]. The literature also suggests that women experience more negative side effects when taking statins, potentially contributing to their lower prescription rates [2,6]. Further, according to the Consumer Assessment of Healthcare Providers and Systems, women who have already experienced an ASCVD event are more likely to experience poor patient–provider communication and poor perception of health status [7]. This could impact decision making when it comes to taking statins. Lower use of prescribed aspirin and statins, and greater odds of emergency department visits per year compared to men have also been reported among women with ASCVD [8]. While women overall are less likely to use statins than men, some racial/ethnic groups of women are even less likely than others [9].

There is a consensus in the literature that statin use for ASCVD prevention is lower among Latine individuals compared to their non-Hispanic White counterparts [9–12]. One recent study that considered language preference suggests this disparity may be driven by racial and ethnic differences, not necessarily different ASCVD risk [13]. Language barriers could lower the odds of medication adherence, as its been shown that non-English speaking patients have a higher non adherence

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to statins [14,15]. Differences by ethnicity in statin prescribing may exist once eligibility is established [16], however, the literature offers little if any understanding of how prescribing differs when ethnicity is further disaggregated into important subgroups. We are not aware of any studies focusing on statin prescribing that considers ethnicity disaggregated by sex and language preference.

To fill this gap, we aimed to use a multi-state electronic health record (EHR)–based data set from a network of community health centers (CHCs) to assess any differences in statin prescribing by sex, ethnicity, and language in underserved patients who met 2018 American College of Cardiology/American Heart Association (ACC/AHA) criteria for primary or secondary prevention of ASCVD.

2. Methods

2.1. Data source

We analyzed data from OCHIN, Inc., a linked multistate EHR network of CHCs across the United States. OCHIN (not an acronym) is a nonprofit health information technology organization which provides a single, patient-linked instance of the Epic® EHR (each patient has a single ID number and medical record shared across every clinic in the network). We extracted data from structured EHR fields for patients across 475 community-based primary care clinics live on the OCHIN network for years 2014–2020. These clinics were in 19 states (AK, CA, CO, CT, GA, IN, LA, MA, MN, MO, MT, NC, NJ, OH, OR, SC, TX, WA, WI). The data used in this study are collected during routine primary care and consent from patients to use data in research is obtained from clinics when care is initiated.

2.2. Study population

Our study population included Latine and non-Hispanic White individuals aged 40+ with at least one primary care visit and who met one of four ACC/AHA criteria for statin eligibility during their time in the study between 2014 and 2020 [17]. Criteria were met with a) a significant coronary, cerebral, or peripheral arterial atherosclerosis event, such as a prior myocardial or cerebral infarction; the Common Procedural Terminology (CPT) codes can be found in Appendix I, b) LDL $\geq$ 190 mg/dL, c) diabetes on problem list, or d) ASCVD 10-year risk score $\geq$ 7.5 %. Eligibility was ascertained using discrete EHR fields (lab results, diagnosis codes, problem list). However, the 10-year risk score itself was not part of the patient record but calculated with EHR data using the pooled cohort equations (PCE) recommended in the ACC/AHA guidelines. This has been validated in prior published research [12,13]. Study time for each patient was calculated from the date they became eligible for statin use to either the end of the study period, the date the patient died, or three years past the last clinical encounter. Only primary care encounters were included after or at the statin eligibility date. Primary care encounters are defined as those occurring with a physician (Allopath, Osteopath, or Naturopath), physician assistant, or nurse practitioner utilizing Current Procedural Terminology codes 99,201–99,205, 99,212–99,215, 99,241–99,245, 99,386–99,387 and 99,396–99,397 [13]. We excluded patients from clinics that were open for less than one year or that closed before 2020 to ensure we had at least a years' worth of data from each clinic. Patients were excluded if they were pregnant during the study period (n = 1918), if they didn't have sex recorded as either male or female (n = 535), if they had no documentation of primary language spoken, or if language was something other than English or Spanish (n = 7824) as no other language was large enough for suitable model estimation.

2.3. Dependent variable

Our two dependent variables measured 1) if patients were ever prescribed a statin during their study period (i.e., a binary variable denoting Yes versus No) and 2) if prescribed, a yearly count of their prescriptions ordered. These variables denote prescriptions ordered not filled.

2.4. Independent variable

Our main independent variable was a combination of sex, ethnicity and primary language spoken. OCHIN CHCs follow the Office of Management and Budget standards for race and ethnicity by collecting these two variables separately. We classified individuals into six groups: (1) non-Hispanic White male, (2) non-Hispanic White female, (3) Spanish speaking Latina, (4) Spanish speaking Latino, (5) English speaking Latina, and (6) English speaking Latino. The terminology Latine is used when discussing both Latino and Latina patients to remain inclusive of both sexes. While we use the term Latine, the actual variable collected in the EHR is "Hispanic" and "non-Hispanic."

2.5. Covariates

We adjusted for the patient-level characteristics age at first primary care study visit after or at statin eligibility (40–49, 50–59, 60–69, 70+), family income as a percent of the federal poverty level (FPL) (always $\geq$138 %, above and below 138 %, always $<$138 %, never documented), insurance status throughout the study (Always Insured, Sometimes insured, Never Insured), number of encounters per year (0–1, 1–2, 2–4, 4+), first known smoking status (Smoking reported, Smoking not reported, not documented), renal disease (Yes/No), alcohol use disorder (Yes/No), number of lipid checks over the study period and a factor variable for which risk factor made the patient eligible (ASCVD, LDL $\geq$ 190 mg/dL, diabetes, risk score $>$ 7.5 %). The CPT codes for renal disease and alcohol use disorder can be found in Appendix I. The aggregated insurance status variable comes from the 'payor type' encounter level variable which includes, Medicaid, Medicare, other public, and private, this includes patients on a fee scale as insured [18]. These covariates were selected because they have been known to be influential factors in similar populations.

2.6. Statistical analysis

First, we described the overall sample and examined characteristics by sex, ethnicity, language group. Next, we used generalized estimating equations (GEE) logistic regression to estimate prevalence of ever being prescribed a statin by sex, ethnicity, language group. Then, among patients that were prescribed a statin, we used zero-truncated negative binomial regression GEE models to estimate yearly rates of prescription by sex, ethnicity, language group. The zero-truncated negative binomial model was utilized because the subsample for the rate outcome included only those with at least one prescription. Both the prevalence and yearly rates were estimated by the predictive margins (i.e. adjusted predictions at the means). We fit models including all covariates listed above and utilized an empirical sandwich variance estimator assuming an exchangeable working correlation to account for clustering of individuals within CHCs. We report unadjusted and adjusted prevalence and rates, adjusted odds ratios (ORs), and adjusted rate ratios (RRs) with their corresponding 95 % confidence intervals. Relative measures were estimated using the largest sample group (non-Hispanic White males) as the referent group. Two-sided statistical significance was set at $p < 0.05$ and analyses were conducted using RStudio version 4.2.1 and Stata version 15.1. This study was approved by the Oregon Health & Sciences University Institutional Review board.

3. Results

Our study population consisted of 241,869 adults aged 40 and older (Table 1). One-quarter of patients reported smoking during the study period. Groups with the highest prevalence of smoking were non-

Table 1
Characteristics of study patients, overall and by ethnicity, sex, language groups.

		Total	non-Hispanic White Male	non-Hispanic White Female	Spanish Speaking Hispanic Female	Spanish Speaking Hispanic Male	English Speaking Hispanic Female	English Speaking Hispanic Male
N		241,869	77,449	57,318	44,542	41,107	9327	12,126
Age n (%)	40–49	48,986 (20.3)	11,484 (14.8)	8790 (15.3)	11,579 (26.0)	10,689 (26.0)	2865 (30.7)	3579 (29.5)
	50–59	80,434 (33.3)	28,666 (37.0)	16,034 (28.0)	13,627 (30.6)	14,380 (35.0)	2983 (32.0)	4744 (39.1)
	60–69	79,092 (32.7)	28,022 (36.2)	20,585 (35.9)	12,950 (29.1)	11,959 (29.1)	2442 (26.2)	3134 (25.8)
	70+	33,357 (13.8)	9277 (12.0)	11,909 (20.8)	1037 (11.1)	669 (5.5)	6386 (14.3)	4079 (9.9)
*FPL n (%)	Above & Below	31,518 (13.0)	10,577 (13.7)	8669 (15.1)	5172 (11.6)	5053 (12.3)	891 (9.6)	1156 (9.5)
	Always ≤ 138 %	142,576 (58.9)	37,926 (49.0)	27,979 (48.8)	33,454 (75.1)	28,945 (70.4)	6368 (68.3)	7904 (65.2)
	Always > 138 %	34,851 (14.4)	16,073 (20.8)	11,081 (19.3)	2213 (5.0)	3391 (8.2)	780 (8.4)	1313 (10.8)
	Never Documented	32,924 (13.6)	12,873 (16.6)	9589 (16.7)	3703 (8.3)	3718 (9.0)	1288 (13.8)	1753 (14.5)
Insurance Coverage n (%)	Always Insured	182,869 (75.6)	64,472 (83.2)	48,141 (84.0)	27,264 (61.2)	25,691 (62.5)	7666 (82.2)	9635 (79.5)
	Never Insured	26,035 (10.8)	4409 (5.7)	2684 (4.7)	7710 (17.3)	9450 (23.0)	629 (6.7)	1153 (9.5)
	Sometimes Insured	32,965 (13.6)	8568 (11.1)	6493 (11.3)	9568 (21.5)	5966 (14.5)	1032 (11.1)	1338 (11.0)
Number of Encounters Per Year n (%)	(0–1)	36,213 (15.0)	13,625 (17.6)	7753 (13.5)	5353 (12.0)	6457 (15.7)	1166 (12.5)	1859 (15.3)
	(1–2)	59,118 (24.4)	21,463 (27.7)	13,620 (23.8)	8580 (19.3)	10,570 (25.7)	1837 (19.7)	3048 (25.1)
	(2–4)	85,646 (35.4)	26,520 (34.2)	20,472 (35.7)	16,003 (35.9)	15,180 (36.9)	3192 (34.2)	4279 (35.3)
	4+	60,892 (25.2)	15,841 (20.5)	15,473 (27.0)	14,606 (32.8)	8900 (21.7)	3132 (33.6)	2940 (24.2)
**Smoke Status n (%)	Smoking Reported	57,635 (23.8)	27,108 (35.0)	17,922 (31.3)	1904 (4.3)	5620 (13.7)	1779 (19.1)	3302 (27.2)
	Smoking Not Reported	181,854 (75.2)	49,791 (64.3)	38,943 (67.9)	42,111 (94.5)	34,966 (85.1)	7398 (79.3)	8645 (71.3)
	Not Documented	2380 (1.0)	550 (0.7)	453 (0.8)	527 (1.2)	521 (1.3)	150 (1.6)	179 (1.5)
***Renal Disease n (%)	Yes	33,975 (14.0)	8462 (10.9)	7516 (13.1)	7743 (17.4)	6792 (16.5)	1578 (16.9)	1884 (15.5)
	No	207,894 (86.0)	68,987 (89.1)	49,802 (86.9)	36,799 (82.6)	34,315 (83.5)	7749 (83.1)	10,242 (84.5)
***Alcohol Use Disorder n (%)	Yes	8347 (3.5)	4593 (5.9)	1365 (2.4)	113 (0.3)	1433 (3.5)	167 (1.8)	676 (5.6)
	No	233,522 (96.5)	72,856 (94.1)	55,953 (97.6)	44,429 (99.7)	39,674 (96.5)	9160 (98.2)	11,450 (94.4)
***Number of Lipid Checks (mean (SD))		2.73 (2.60)	2.54 (2.37)	2.68 (2.49)	3.12 (2.98)	2.80 (2.68)	2.67 (2.75)	2.51 (2.55)
Number of Risk Factors		1.42 (0.57)	1.38 (0.55)	1.42 (0.58)	1.41 (0.56)	1.50 (0.57)	1.40 (0.57)	1.46 (0.57)
ASCVD		15,031 (6.2)	5823 (7.5)	4541 (7.9)	1549 (3.5)	1888 (4.6)	540 (5.8)	690 (5.7)
LDL ≥190		16,467 (6.8)	3681 (4.8)	6412 (11.2)	3126 (7.0)	2000 (4.9)	705 (7.6)	573 (4.7)
Diabetes		127,924 (52.9)	28,272 (36.5)	26,971 (47.1)	33,772 (75.8)	25,133 (61.1)	6755 (72.4)	7021 (57.9)
Risk Score > 7.5 %		82,417 (34.0)	39,673 (51.2)	19,394 (33.8)	6095 (13.7)	12,086 (29.4)	1327 (15.3)	3842 (31.7)

* FPL=Federal Poverty Level throughout the study period.
** Smoke status by first encounter in the study period.
*** Ever in the study period.

Hispanic White males (35 %) and non-Hispanic White females (31 %). Spanish speaking Latinos and Latinas had the lowest percentages of smoking of all groups, 13.7 % and 4.3 % respectively. Most patients were always insured (76 %) and 25 % of patients had four or more encounters per year in the study period. There were 5910 (2.4 %) patients who died during the study period, 3170 (54 %) had ever been prescribed a statin.

The unadjusted overall prevalence of having at least one statin prescription for the study sample was 58 %. Spanish speaking Latinas and Latinos had the highest unadjusted percentages of patients with a prescription at 65 % and 61 % respectively, while non-Hispanic White males had the lowest at 52 %. Findings from GEE models are reported in Fig. 1and illustrates a similar pattern of adjusted prevalence by sex,

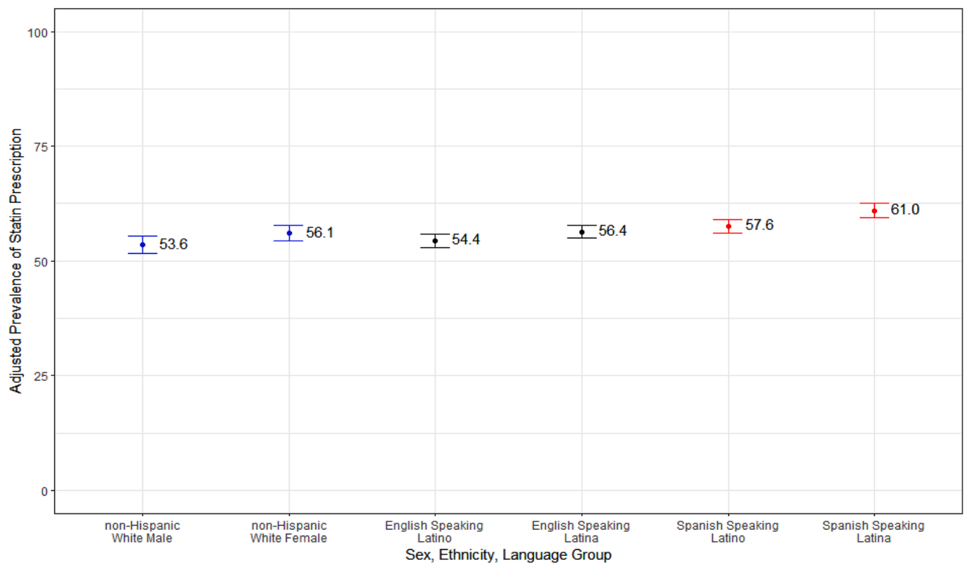

Fig. 1. GEE Adjusted Prevalence of Statin Prescription of eligible adults by Sex, Ethnicity, Language Groups.
Note: Statin prescription prevalence at the means was calculated from the Logistic GEE model adjusted for FPL, age, insurance coverage, number of encounters per year, smoking status report, renal disease, alcohol use disorder, number of times lipids were checked in the study period, and which risk factor made the patient eligible. **Note**: The error bars denote a 95 % confidence interval.

ethnicity, language group. Spanish speaking Latinos and Latinas had the highest adjusted prevalence at about 60 % for each group, while English speaking Lat had the lowest prevalence at 53.4 % (95 % CI=51.7–55.4).

Table 2 presents covariate-adjusted odds ratios derived from the GEE logistic model. Compared to non-Hispanic White males, there was no evidence of a difference in all other sex, ethnicity, language groups except for Spanish speaking Latinos whose odds of ever being prescribed a statin were higher (OR=1.21 95 % CI=1.16–1.27).

Among patients who were prescribed at least one statin, the average unadjusted number of statin prescriptions was 5.7 per year. Fig. 2 illustrates adjusted yearly rates of statin prescriptions by study groups for patients with at least one prescription. Non-Hispanic White females had the highest rates at 5.6 prescriptions per year (95 % CI=5.5–5.6) and English-speaking Latinas had the lowest rates (5.2, 95 % CI=5.1–5.4) followed by Non-Hispanic White males (5.3, 95 % CI=5.3–5.4). Appendix 1 shows figures of the unadjusted prevalence and rates.

Table 2 reports the covariate-adjusted rate ratios by sex, ethnicity, language group derived from the zero-truncated negative binomial GEE model. Of those with at least one statin prescription, Non-Hispanic White female (RR= 1.04 95 % CI=1.03–1.05) had higher rates of yearly statin prescriptions compared to non-Hispanic White males.

Table 2
Odds and rates of statin prescribing using adjusted GEE modeling.

	Odds Ratio (95 % Confidence Interval)	Rate Ratio (95 % Confidence Interval)
Non-Hispanic White Male	Ref	Ref
Non-Hispanic White Female	0.92 (0.90,0.95)	**1.04 (1.03,1.05)**
English speaking Latino	0.99 (0.94,1.04)	1.02 (1.00,1.05)
English speaking Latina	0.89 (0.84,0.94)	0.98 (0.96,1.01)
Spanish speaking Latino	**1.21 (1.16,1.27)**	1.01 (0.99,1.02)
Spanish speaking Latina	1.05 (1.00,1.11)	1.01 (0.99,1.02)

Odds Ratio: binary outcome denoting any statin prescription in the study period using an adjusted logistic GEE model clustered by primary care clinic.
Rate Ratio: Among those with a statin prescription, rates of statin prescriptions using an adjusted zero-truncated negative binomial GEE model clustered by primary care clinic.
Both models were adjusted for FPL, age, insurance coverage, number of encounters per year, smoking status report, renal disease, alcohol use disorder, and number of times lipids were checked in the study period, and which risk factor made the patient eligible.

4. Discussion

This study contributes to the literature as it uses a large, multistate EHR dataset comprised of adults eligible for a statin prescription across 475 community health centers and is the only analysis assessing sex, ethnicity and primary language and prescription prevalence. Our findings contradict studies with less disaggregation, specifically studies looking at sex or ethnicity alone and without language. Studying these patterns within CHCs adds specificity not seen before.

Non-Hispanic White men had lower odds of ever being prescribed a statin compared to Spanish speaking Latinas but no difference in all other groups. While studies have suggested that men in general are prescribed statins more often when indicated compared to women, several studies among CHC utilizers have shown non-Hispanic White men to be lower utilizers of preventive and chronic disease care. Once prescribed though, there were only differences found in number of prescriptions between non-Hispanic White males and non-Hispanic White females. This is consistent with literature specifically looking at CHCs. CHC's have been shown to reduce disparities so while non-Hispanic White men generally do have advantages, it might not occur as much in CHC settings. This indicates that once initiated, yearly statin prescribing might change between sexes [19,20].

In this study, Spanish speaking Latino patients have higher odds of receiving a statin prescription than their female and English speaking or non-Hispanic White counterparts. The opposite has been found true in the larger literature pool which is not limited to CHCs [9,11,12,21]. There are several studies, pertaining specifically to CHCs, that illustrate how compared to non-Hispanic White patients, Spanish speaking Latine adults have higher rates of many preventive measures [16,17]. It is interesting to note that in this study only Spanish speaking Latinos had increased odds and there was no difference between females. This could have to do with women experiencing more side effects as mentioned in the introduction [2]. CHCs are required to provide language services for non-English preferring patients, and these services, combined with robust service utilization by these populations, may produce higher odds of use among these low-income patient panels [22]. This might allow them to receive more health education and face-to-face time with

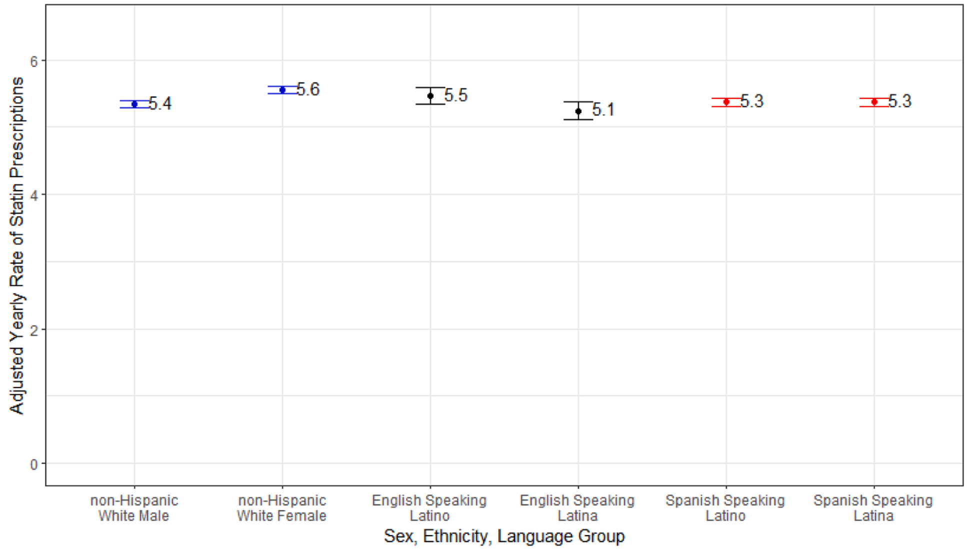

Fig. 2. Adjusted Yearly Rate of Statin Prescriptions of Patients With 1+ by Sex, Ethnicity, Language Groups.
Note: Statin prescription prevalence at the means was calculated from the zero-truncated negative binomial GEE model adjusted for FPL, age, insurance coverage, number of encounters per year, smoking status report, renal disease, alcohol use disorder, number of times lipids were checked in the study period, and which risk factor made the patient eligible. **Note**: The error bars denote a 95 % confidence interval.

bilingual staff, interpreters or community health workers. In this network, there are a lot of increased services for Spanish preferring patients which might also be an explanation for these differences. Being Spanish speaking could be a marker for other characteristics that could influence statin uptake. Spanish speaking Latine patients might be less likely to decline a prescription due to an unbalanced power dynamic with the healthcare professionals prescribing statins [23]. There is also the paradox of foreign born Latines having better health outcomes than US Born Latines which has been documented in other health research [24]. Overall, the results indicate there is more that goes into prescribing than solely statin eligibility.

We found evidence of sex disparities between non-Hispanic White males and females but not between Latinos and Latinas in terms of prescription rates. While most other studies either compared women to men or Latine patients to White patients, our results do not align with the previous literature stating women are prescribed statins less often than men. This is an indication that clinicians in CHCs may serve an important role in ASCVD preventive prescribing, particularly for systemically marginalized groups as made evident by the observed Spanish Speaking Latine populations.

5. Limitations

Our findings may not be generalizable to all adults eligible for statins because the data come entirely from CHCs which serve primarily individuals with lower socio-economic status. We did not have a large enough sample to analyze those whose sex was neither male nor female. Additionally, our dataset does not contain information on statin allergies or prescription fill data, so while we are able to determine whether statins were ordered by clinicians, we don’t know if they were filled and/or used. We also are unable to determine the supply amount for each prescription. Future research using pharmacy data may be able to provide more insight into if there are sex, ethnic, or language differences in medication adherence and fill amount. We didn’t have enough data to truly evaluate the impact of COVID-19. Lastly, our data are based off patient ambulatory encounters, so the exact dates of statin eligibility are estimated by patient’s closest visit or lab date where they become eligible. Statin use before eligibility might create a bias in the calculated rates.

6. Conclusion

We found compared to non-Hispanic White men, Spanish speaking Latinos had higher odds of being prescribed a statin, but once one statin was prescribed, non-Hispanic White women had higher rates. We found a higher percent of Spanish speaking Latine patients regardless of sex had a statin prescription. Overall, we found ethnicity, language, and sex differences. Clinicians in CHCs play an important role in the process to eliminate the sex gap in preventive health but there is still work that need to be done. The attention to statin prescribing in Spanish speaking Latine patients indicates more conscious care is being implemented in these vulnerable populations. There is a need for future work to investigate each risk factor and the individual impacts on this population.

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Disclosures

Authors have no conflicting or competing interests.

Author agreement

This author agreement certifies that all authors have seen and approved the final version of the manuscript being submitted. They warrant that the article is the authors’ original work, hasn’t received prior publication and isn’t under consideration for publication elsewhere.

CRediT authorship contribution statement

Tahlia Hodes: Conceptualization, Data curation, Formal analysis, Visualization, Writing – original draft, Writing – review & editing. **Miguel Marino:** Conceptualization, Funding acquisition, Investigation, Methodology, Writing – review & editing. **Jorge Kaufmann:** Methodology, Writing – review & editing. **Jennifer A Lucas:** Conceptualization, Investigation, Methodology, Project administration, Writing – review &

editing. **Sophia Giebultowicz:** Data curation, Project administration, Writing – review & editing. **John Heintzman:** Funding acquisition, Methodology, Writing – review & editing.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.ajpc.2024.100873.

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