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# Polypharmacy and Depressive Symptoms in U.S.-Born Mexican American Older Adults

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**Abstract:** *Background:* Although some studies have suggested a link between polypharmacy and poor mental health, less is known about the association between polypharmacy and depressive symptomology among U.S.-born older Mexican Americans. *Aim:* This study aimed to test the association between polypharmacy and depressive symptoms in U.S.-born older Latino Americans. *Materials and methods:* Data came from the Sacramento Area Latino Study on Aging (SALSA 2008). A total of 691 U.S.-born older (age  $\geq 65$ ) Mexican Americans entered this analysis. Polypharmacy was the independent variable. Level of depressive symptoms was the outcome. Age, gender, socioeconomic status (education, income, and employment), retirement status, health (chronic medical conditions, self-rated health, and activities of daily living), language, acculturation, and smoking were the covariates. A linear regression model was used to analyze the data. *Results:* We found a positive association between polypharmacy and depressive symptoms, which was above and beyond demographic factors, socioeconomic status, physical health, health behaviors, language, acculturation, and health insurance. *Conclusion:* Polypharmacy is linked to depressive symptoms in U.S.-born older Mexican Americans. More research is needed to test the effects of reducing inappropriate polypharmacy on mental well-being of first and second generation older Mexican Americans. There is also a need to study the role of drug-drug interaction in explaining the observed link between polypharmacy and depressive symptoms.

**Keywords:** Mexican Americans; ethnicity; Hispanics; Latino; ethnic groups; polypharmacy; depressive symptoms

## 1. Introduction

Polypharmacy is associated with undesired physical health outcomes such as death [1]. Given the serious consequences and the social and health care costs involved, epidemiologists have shown an increasing interest in understanding mental health correlates of polypharmacy across diverse populations [2]. This is particularly important because polypharmacy has unequal correlates across ethnic groups [3]. This means one factor may correlate with polypharmacy in one but not another ethnic group [3].

Thus, there is a need to conduct epidemiological studies that investigate mental health correlates of polypharmacy in ethnic groups that are rarely studied [4,5]. Although some studies suggest

polypharmacy is associated with depressive symptoms and psychological distress [6,7], not much is known about the link between polypharmacy and poor mental health in Mexican American older adults.

To test the independent association between polypharmacy and mental health, there is a need to control for a wide range of third variables that can potentially confound such an association. The first group of potential confounders are demographic factors such as age and gender [7–10]. It has been demonstrated that polypharmacy is more common in women, and older individuals, who have a higher number of chronic diseases and frequent contact with the health care system [7–10]. At the same time, depressive symptoms are also more common in women than men [11–15]. Thus, there is a need to control for age and gender when we test the link between polypharmacy and depressive symptoms in a particular population group.

Socioeconomic status (SES) is also associated with both polypharmacy [4,5] and mental health [16,17]. Polypharmacy is more common in people with low educational attainment and income [4,5]. This might be simply because illnesses may emerge as a result of high stress and adversities, and poor health behaviors, which may arise as a result of low socioeconomic status [4,5]. Individuals with low income and low educational attainment also experience more depressive symptoms [16,17]. Thus, any study on the potential link between polypharmacy and depressive symptoms should control for SES indicators such as education, income, and employment [3,6,7,18].

Physical health, particularly self-rated health (SRH), chronic medical conditions (CMC), and activities of daily living (ADL), are associated with polypharmacy and depression [19–21]. Polypharmacy is also a consequence of being diagnosed with multiple conditions [6,7,10,18]. This means that these health indicators are strong determinants and correlates of polypharmacy [6,7,10,18]. Poor physical health (CMC, SRH, and ADL) and depressive symptomatology also have bidirectional associations [19–21]. As a result, there is a need to control for physical health (e.g., CMC, SRH, and ADL) in the studies that wish to understand the association between polypharmacy and depressive symptoms [6,7,10,18].

What we know about the interplay between SES, physical health, mental health, and polypharmacy in ethnic minorities is very limited [3]. Across various ethnic minorities in the U.S., less is known about Latinos/Hispanics than African Americans [3,18]. Some studies have suggested different pattern of associations and sometimes inconsistencies in these associations in ethnic minorities [3,18]. These inconsistencies may be due to the role of context and culture in shaping correlates of health across settings [22–26].

As a result, there is a need to explore how polypharmacy and depressive symptoms are linked in Latino older Americans. There is also a need to study how these links are robust after adjusting for demographic factors, SES, physical health, healthcare access, language, and acculturation. As Latino Americans are composed of diverse and heterogeneous groups that vary by country of origin, nativity, legal status, and immigration status, there is a need for studies that explore the link between these factors in each specific group of Latino Americans. To fill such a gap, the current study investigates the association between polypharmacy and depressive symptoms specifically in older Mexican Americans who were born in U.S. We hypothesized that polypharmacy is associated with more depressive symptoms in a national sample of U.S.-born older Mexican Americans, and this association would remain significant after controlling for demographic factors, SES, physical health, healthcare access, acculturation, and language.

## 2. Materials and Methods

### 2.1. Design and Setting

The Sacramento Area Latino Study on Aging (SALSA) is a study of older Mexican Americans in the U.S. [27,28]. Sampling, design, measures, and rationale are extensively described previously [27–33]. To describe the study briefly, SALSA is a representative study of Hispanics in the Sacramento

County and neighboring counties. The data collected comprises rich information on demographics, SES, medication use, physical health, mental health, healthcare access, and cultural factors.

## 2.2. Ethics

All participants signed a written consent form. The SALSA protocol was reviewed and approved by the Institutional Review Boards of the University of California (UC), Davis and University of Michigan (UM), Ann Arbor.

## 2.3. Sample and Sampling

Participants were sampled from counties with proportional densities of Hispanics of at least 5%, based on U.S. Census information 1990. Participants were eligible if they were: (1) self-identified as Latino or Hispanic; (2) Spanish or English speaking; (3) age 65+ years; and (4) U.S. born. The exclusion criterion was living in an institutionalized setting. Both Spanish and English speakers were enrolled. Approximately 22% of the total eligible population of Sacramento County, CA, was recruited into the SALSA study and a total number of 691 individuals entered this study.

## 2.4. Dependent Variable (Outcome)

Depressive symptoms were the outcome. Depressive symptoms were measured using a self-reported measure called Center for Epidemiologic Studies Depression Scale (CES-D). The CES-D includes 20 items that query the participants regarding their depressive symptoms over the past 4 weeks. Item responses range from 0 to 3. The total score ranges from 0 to 60. The CES-D generated a continuous score, with a higher score indicative of more symptoms [28,33,34].

## 2.5. Independent Variable (Predictor)

Polypharmacy was the independent variable. This study defined polypharmacy as use of 5+ medications in a single day. This definition was based on a systemic review of definitions of polypharmacy across studies. Although there is no consensus, this is probably the most common definition of polypharmacy used by researchers [1]. In this study, polypharmacy was calculated based on a comprehensive evaluation of all medications that the individual was taking.

## 2.6. Covariates (Confounders)

This study also included age, gender, SES (education, income, and employment), retirement status, health insurance, self-rated health (SRH), number of chronic medical conditions (CMCs), smoking, language, healthcare access, ethnic identity, and acculturation as covariates. Age was a continuous measure and gender was a dichotomous measure. For gender, male was 1 and female was 0. Participants were asked if they were retired. Health insurance was self-reported, regardless of its type. Three SES indicators were measured as self-reported data. Education was defined as years of formal education and schooling. Household annual income was also self-reported. Education and income were continuous measures. Employment was a dichotomous variable: 1 = employed, 0 = not in the labor market or unemployed. Smoking was also a dichotomous variable where 1 indicated a current smoker, and 0 indicated never smoked or a past history of smoking.

Number of CMCs was measured using self-reported data. Participants reported the presence of cardiovascular disease (e.g., myocardial infarction, angina pectoris, stroke, heart failure, intermittent claudication, atrial fibrillation, deep vein thrombosis, and heart/coronary catheterization), stroke, diabetes, hypertension, kidney disease, pneumonia, gall bladder problems, and liver disease. Participants were asked if any physician had ever diagnosed them with any of the above conditions. Number of CMCs was conceptualized as a continuous measure, with a higher score indicating multimorbidity.

Self-Rated Health (SRH) was the conventional single item, ranging from 1 to 5, with a higher score indicating worse health. The item read as “Would you say, in general, your health is: 1 Excellent, 2 Very good, 3 Good, 4 Fair, and 5 Poor?”. We treated SRH as a continuous measure.

Activities of daily living (ADLs) were measured applying a standard Likert scale [35,36]. Participants were asked about their ability to perform 13 common ADLs. Responses ranged from 0 to 2, 0 for no need, 1 for needed some help, and 2 needed help all the time. ADL was operationalized as a continuous measure ranging from 0 to 26, with a higher score yielding higher disability [35,36].

Acculturation was measured using the Geriatric Acculturation Ratings Scale for Mexican Americans (G-ARSMA). The G-ARSMA, as developed by Cuellar et al., consists of 19 items. Items assessed English and Spanish media use, spoken language, maintenance of childhood friendships, building new friendships, frequency of contact with Latin America, and cultural and ethnic dietary practices. Highest scores represent Anglo-oriented participants, middle scores represent bicultural participants, and the lowest score represents least acculturated participants (Mexican-oriented) [37–39].

Self-reported language proficiency was the other covariate. Participants rated how well they spoke English and Spanish on a four-point scale: 0—not at all, 1—a little, 2—well, 3—very well. Use of English versus Spanish language was coded if Spanish or English was spoken “very often”, “almost always”, “not very often”, or “not at all”. Latino identity was a single item with 4 item responses, with a higher score indicating stronger ethnic ties.

## 2.7. Statistics

We used SPSS 23.0 for data analysis. Frequencies, means, and standard deviations (SDs) of our variables were reported to describe the sample. For bivariate analysis, we ran the Spearman correlation test. For multivariable analysis, we ran a hierarchical multivariable linear regression model. This model had polypharmacy as the independent variable, and depressive symptoms as the outcome. Specifically, a 6-step hierarchical regression model was applied. Demographics, SES, health, cultural, and health behaviors were conceptualized as blocks of covariates. *Model 1* only included 1 demographic factor. *Model 2* included SES indicators in addition to the variable in *Model 1*. *Model 3* included cultural factors in addition to the variables in *Model 1* and *Model 2*. *Model 4* included health variables in addition to the variables in *Models 1–3*. *Model 5* added smoking in addition to the variables in *Models 1–4*. *Model 6* added polypharmacy in addition to the variables in *Models 1–5*. Beta coefficient (B), 95% confidence interval (95% CI), Standard Error (SE), and *p*-value were reported.

## 3. Results

### 3.1. Univariate Analysis

Table 1 shows a summary of descriptive statistics for our sample. All individuals were at least 65 years old. On average, our sample was 72 years of age. In our sample, 55.2% were women, 85.2% were retired, and only 0.9% did not have health insurance. Only 12.7% of our participants were working at the time of survey. From all participants, 23.2% exhibited polypharmacy.

**Table 1.** Descriptive statistics.

	<b>n</b>	<b>%</b>
Gender		
Women	369	55.2
Men	300	44.8
Employment		
No	583	87.3
Yes	85	12.7
Retirement		
No	99	14.8
Yes	568	85.2
Insurance		
No	6	0.9
Yes	682	99.1
Smoking (Current)		
No	616	89.4
Yes	73	10.6
Polypharmacy		
No	531	76.8
Yes	160	23.2
	<b>Mean</b>	<b>SD</b>
Age (Years)	72.10	5.60
Education (Years)	2.70	1.53
Household Income	9.10	5.03
Spanish Language (1–4)	2.06	0.91
Acculturation	44.87	10.03
Latino Identity	2.89	0.52
Self-Rated Health [SRH] (1–5)	3.13	1.09
Activities of Daily Living [ADL] (n)	0.76	2.73
Chronic Medical Conditions [CMC] (n)	1.84	1.61
Depressive Symptom	8.33	9.62

### 3.2. Bivariate Analysis

Table 2 shows the results of bivariate correlations in our sample. In bivariate analysis, the level of depressive symptoms was associated with gender, education, income, employment, Spanish language proficiency, acculturation, SRH, ADL, CMC, and polypharmacy. Other variables did not correlate with the level of depressive symptoms in univariate analysis.

**Table 2.** Bivariate correlations among participants.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Gender (Men)	1.00	-0.10**	0.34**	0.14**	0.07	-0.04	0.02	-0.07	0.06	-0.11**	-0.06	-0.05	0.03	0.14**	-0.06	-0.17**
2 Age (Years)		1.00	-0.27**	-0.26**	-0.18**	0.15**	0.04	0.12**	-0.09*	-0.10**	0.08*	0.12**	0.06	-0.09*	0.03	0.10*
3 Household Income			1.00	0.50**	0.19**	-0.15**	-0.01	-0.24**	0.33**	-0.04	-0.32**	-0.18**	-0.09*	-0.02	-0.09*	-0.33**
4 Education (Years)				1.00	0.19**	-0.11**	-0.01	-0.41**	0.52**	-0.02	-0.33**	-0.14**	-0.13**	-0.04	-0.10*	-0.29**
5 Employed					1.00	-0.73**	-0.11**	-0.07	0.12**	-0.05	-0.14**	-0.05	-0.09*	-0.04	-0.11**	-0.13**
6 Retired						1.00	0.05	0.04	-0.05	0.01	0.05	0.05	0.07	0.03	0.07	0.10**
7 Health insurance							1.00	0.04	0.00	-0.02	0.06	-0.01	0.02	0.03	-0.02	0.06
8 Spanish Language (1–4)								1.00	-0.75**	0.05	0.16**	0.19**	0.00	0.03	0.00	0.11**
9 Acculturation									1.00	-0.15**	-0.20**	-0.20**	-0.01	0.00	-0.05	-0.22**
10 Latino Identity										1.00	0.02	-0.02	0.02	-0.02	0.02	0.03
11 SRH (1–5)											1.00	0.25**	0.32**	0.02	0.30**	0.37**
12 ADL												1.00	0.22**	0.05	0.20**	0.21**
13 CMC (n)													1.00	0.01	0.45**	0.22**
14 Smoking (Current)														1.00	-0.07	0.04
15 Polypharmacy															1.00	0.21**
16 Depressive Symptoms																1.00

\*  $p < 0.05$ , \*\*  $p < 0.01$ .

### 3.3. Multivariable Model

Table 3 shows the results of the six-step hierarchical regression model. *Model 1* only included the demographic factor. *Model 2* included SES indicators in addition to the variable in *Model 1*. *Model 3* included cultural factors in addition to the variables in *Models 1 and 2*. *Model 4* included health variables in addition to the variables in *Models 1–3*. *Model 5* added smoking in addition to the variables in *Models 1–4*. *Model 6* added polypharmacy in addition to the variables in *Models 1–5*.

**Table 3.** Summary of hierarchical regression model on social, behavioral, cultural, and health determinants of depressive symptoms.

	B	SE	Beta	95%CI for B		P
<b>Model 1</b>						
Gender (Men)	−1.90	0.80	−0.12	−3.47	−0.33	0.018
Age (Years)	0.10	0.08	0.06	−0.06	0.26	0.211
Intercept	0.49	5.72		−10.75	11.74	0.931
<b>Model 2</b>						
Gender (Men)	−0.59	0.79	−0.04	−2.15	0.97	0.458
Age (Years)	−0.03	0.08	−0.02	−0.18	0.13	0.715
Household Income	−1.27	0.30	0.25	−1.85	−0.68	0.000
Education (Years)	−0.26	0.09	0.16	0.44	0.09	0.004
Employed	−0.23	1.80	−0.01	3.78	3.31	0.898
Retired	−0.78	1.71	−0.04	−4.14	2.59	0.651
Health insurance	3.86	4.28	0.04	−4.55	12.28	0.368
Intercept	12.41	7.38		−2.09	26.92	0.093
<b>Model 3</b>						
Gender (Men)	−0.69	0.80	−0.04	−2.27	0.88	0.387
Age (Years)	−0.02	0.08	−0.01	−0.17	0.14	0.834
Household Income	−1.23	0.30	−0.24	−1.83	−0.64	0.000
Education (Years)	−0.23	0.10	−0.14	−0.42	−0.03	0.021
Employed	0.03	1.82	0.00	−3.56	3.61	0.988
Retired	−0.61	1.72	−0.03	−3.99	2.77	0.722
Health insurance	4.05	4.29	0.05	−4.39	12.48	0.346
Spanish Language (1–4)	−0.49	0.59	−0.06	−1.66	0.67	0.407
Acculturation	−0.08	0.07	−0.10	−0.21	0.05	0.201
Latino Identity	−0.14	0.74	−0.01	−1.59	1.30	0.845
Intercept	16.08	8.62		−0.86	33.02	0.063
<b>Model 4</b>						
Gender (Men)	−1.41	0.78	−0.09	−2.94	0.11	0.070
Age (Years)	0.01	0.08	0.01	−0.14	0.16	0.904
Household Income	−0.91	0.29	−0.18	−1.49	−0.33	0.002
Education (Years)	−0.12	0.10	−0.08	−0.31	0.06	0.196
Employed	0.11	1.75	0.00	−3.33	3.54	0.952
Retired	−1.03	1.65	−0.05	−4.27	2.22	0.534
Health insurance	4.41	4.14	0.05	−3.73	12.55	0.288
Spanish Language (1–4)	−0.65	0.57	−0.07	−1.77	0.47	0.256
Acculturation	−0.10	0.06	−0.11	−0.22	0.03	0.131
Latino Identity	0.03	0.71	0.00	−1.37	1.42	0.970
SRH (1–5)	1.56	0.39	0.22	0.79	2.34	0.000
ADL	0.73	0.36	0.10	0.02	1.44	0.043
CMC (n)	0.67	0.27	0.12	0.15	1.19	0.012
Intercept	7.13	8.43		−9.44	23.70	0.398

Table 3. Cont.

	B	SE	Beta	95%CI for B		P
<i>Model 5</i>						
Gender (Men)	-1.48	0.79	-0.09	-3.03	0.08	0.062
Age (Years)	0.01	0.08	0.01	-0.14	0.17	0.856
Household Income	-0.89	0.30	-0.17	-1.48	-0.31	0.003
Education (Years)	-0.12	0.10	-0.08	-0.31	0.07	0.212
Employed	0.10	1.75	0.00	-3.33	3.54	0.952
Retired	-1.05	1.65	-0.05	-4.30	2.20	0.525
Health insurance	4.37	4.15	0.05	-3.78	12.52	0.293
Spanish Language (1-4)	-0.66	0.57	-0.08	-1.78	0.46	0.247
Acculturation	-0.10	0.06	-0.11	-0.22	0.03	0.126
Latino Identity	0.04	0.71	0.00	-1.36	1.44	0.955
SRH (1-5)	1.57	0.39	0.22	0.80	2.35	0.000
ADL	0.73	0.36	0.10	0.02	1.44	0.044
CMC (n)	0.66	0.27	0.12	0.14	1.19	0.014
Smoking (Current)	0.54	1.16	0.02	-1.75	2.83	0.643
Intercept	6.79	8.47		-9.86	23.45	0.423
<i>Model 6</i>						
Gender (Men)	-1.43	0.79	-0.09	-2.97	0.12	0.070
Age (Years)	0.01	0.08	0.00	-0.15	0.16	0.938
Household Income	-0.94	0.29	-0.18	-1.52	-0.36	0.002
Education (Years)	-0.13	0.10	-0.08	-0.32	0.06	0.186
Employed	0.20	1.74	0.01	-3.22	3.61	0.909
Retired	-1.03	1.64	-0.05	-4.26	2.20	0.530
Health insurance	5.60	4.15	0.06	-2.56	13.76	0.178
Spanish Language (1-4)	-0.60	0.57	-0.07	-1.71	0.52	0.294
Acculturation	-0.09	0.06	-0.10	-0.22	0.03	0.146
Latino Identity	0.01	0.71	0.00	-1.37	1.40	0.983
SRH (1-5)	1.40	0.40	0.19	0.62	2.19	0.000
ADL	0.67	0.36	0.09	-0.04	1.38	0.064
CMC (n)	0.42	0.28	0.08	-0.14	0.98	0.139
Smoking (Current)	0.70	1.16	0.03	-1.57	2.98	0.543
Polypharmacy	2.54	1.06	0.12	0.45	4.62	0.017
Intercept	6.40	8.42		-10.15	22.95	0.447

SRH: Self-Rated Health. ADLs: Activities of Daily Living. CMCs: Chronic Medical Conditions.

In *Model 1*, gender was associated with depressive symptoms, with men reporting lower depressive symptoms than women. In *Model 2*, which also included SES indicators, retirement, and health insurance, high education and income were associated with less depressive symptoms. In *Model 3*, no cultural variables were associated with depressive symptoms. In *Model 4*, all health variables, including SRH, ADL, and CMCs, were positively associated with depressive symptoms. In *Model 5*, smoking did not correlate with depressive symptoms. In *Model 6* polypharmacy was associated with depressive symptoms, above and beyond all the covariates.

#### 4. Discussion

Using data from the SALSA-2008 study, the current study showed that polypharmacy is associated with depressive symptoms in U.S.-born older Mexican Americans. This association was independent of all confounders including demographic factors, SES, retirement, health insurance, acculturation, language proficiency, smoking, physical health, and health behaviors.

Previous studies have shown an association between polypharmacy and poor mental health (e.g., clinical depression and psychological distress) in other ethnic groups [6,7]. These studies have been unable to determine if the diagnosis of depression and antidepressant pharmacotherapeutic agents directly increase the risk of polypharmacy, or if polypharmacy deteriorates mental health

through drug–drug interactions [6,7]. Thus, more research is needed on the direction of the effect between polypharmacy and depressive symptoms in ethnic older adults.

Inappropriate polypharmacy should be prevented in Latino older Americans, and this may contribute to mental health promotion in this population. Several strategies are proposed to reduce inappropriate polypharmacy in older adults [40]. Deprescribing is considered one of the most evidence-based approaches for reducing inappropriate polypharmacy [40]. Recommended protocols include spending more time reviewing patients' medications. It has been demonstrated that even spending 10 minutes to review elderly patients' medications can reduce the rate of polypharmacy [41]. Deprescribing has promising effects on increasing medication adherence, by simply reducing the number of medications taken [40]. These efforts can be applied by physicians, nurses [40], or pharmacists [42]. Mnemonics, algorithms, clinical practice guidelines, and clinical strategies have proposed tools to address polypharmacy in a variety of health care settings [43]. Furthermore, a systematic review of the strategies to reduce psychiatric polypharmacy demonstrated that modest interventions that utilize educational approaches, as well as more assertive interventions that directly caution physicians to avoid polypharmacy, have both been effective in reducing polypharmacy [44].

More research is needed on the most effective ways by which we can reduce inappropriate polypharmacy, particularly in ethnic minority groups. This includes tailored interventions that are targeted specifically to each cultural group. The present literature has several limitations including lack of adequate control variables, low sample size, poor measurement, lack of access to medications taken by participants, duration of follow up, poor randomization, and inadequate monitoring of potential adverse effects. More research is needed to overcome these methodological limitations [45]. More research is also needed to understand how we can reduce inappropriate polypharmacy across ethnic groups including Mexican Americans. Very few studies have tested the role of tailored interventions for this specific population.

We went beyond exploring social determinants of polypharmacy [3,18], and suggested that depressive symptoms may be a consequence of polypharmacy in Mexican Americans. As polypharmacy is more commonly seen in individuals with low educational attainment and income [3,46], ethnic minorities with low SES should be a key target population for program and intervention planning to prevent inappropriate polypharmacy [3,18].

Unfortunately, prevalence of polypharmacy is particularly increasing in low SES individuals [4]. Very few studies have been conducted on trends of polypharmacy in Latino and Mexican Americans based on country of origin, immigration, nativity, and culture. Thus, there is a need to conduct more research on this population.

This study focused on older Mexican Americans in Sacramento county. The same results may not apply to other ethnic groups including older White and African Americans who reside in Sacramento county, or even Mexicans who were born and reside in other geographical areas within the United States. As such we cannot simply assume that what is relevant to U.S.-born older Mexican Americans would apply to other groups of Mexicans. Thus, more tailored and intersectional research is needed that considers country of origin, ethnicity, and immigration status. These social factors shape available resources, vulnerabilities, values, health needs, mindset, health care use, and response to health care need.

Severity of depressive symptoms, which reflects a clinical diagnosis of depression, can directly increase the risk of polypharmacy, particularly in individuals with multiple chronic conditions. Individuals with clinical depression, severe depression, and suicidality may receive medications specifically to treat depression. Similarly, treatment resistant depression may increase the chance of receiving multiple medications. This study, however, did not assess the type of medications that were prescribed. The complex interplay between antidepressant pharmacotherapeutic agents and other medications requires more research [47].

This study was a quantitative rather than a qualitative analysis of polypharmacy and depressive symptomatology. Future research may assess the exact types of medication that are being taken by the

included participants. We do not know which percentage of the sample receive psychopharmacotherapy or what medications were most frequently prescribed in the sample. The lack of such information in the current analysis requires additional research.

## 5. Limitations

No study is without limitations. One limitation of this study was its cross-sectional design. While depression predicts polypharmacy, polypharmacy may also impact mental health. In addition, SES and health behaviors may also impact both polypharmacy and mental health. Thus, we cannot draw any causal conclusion from our observation of a cross-sectional association between depressive symptoms and polypharmacy. Another limitation was that we only included U.S.-born older Mexican Americans. Other ethnic groups, immigrants, and Latinos of differing nativity, such as Puerto Ricans and Cubans, should also be included in future research regarding depressive symptoms and polypharmacy. We used a self-rating scale of depressive symptoms. The results from these self-rating scales may differ from those standardized rating scales such as the Hamilton depression measure.

We still do not know why older people who are using five or more medications a day should have higher depressive symptoms. We did not exclude subjects who used psychiatric medications, however, as participants' full psychiatric and medication histories were not assessed. The type of medications, as well as components of polypharmacy, may differ in individuals with and without depression and other psychiatric disorders. One hypothesis is that more prescriptions may reflect the presence of clinical depression from several psychiatric and/or chronic comorbidities that have resulted in polypharmacy. We also did not know for how long the subjects had been taking their medications prior to the assessment of their polypharmacy or depressive symptoms. Despite these limitations, this study still makes a contribution by extending the existing knowledge on mental health correlates of polypharmacy in ethnic minority groups in the U.S.

## 6. Conclusions

Polypharmacy is linked to high depressive symptoms among U.S.-born older Mexican Americans. This link is independent of demographic factors, SES, health behaviors, physical health, healthcare access, acculturation, and language proficiency. More research is needed on interceptions that can most effectively reduce inappropriate polypharmacy among older Mexican Americans.

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