

DAILY AND NONDAILY SMOKING VARIES BY ACCULTURATION AMONG ENGLISH-SPEAKING, US LATINO MEN AND WOMEN

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Background: Higher smoking prevalence and quantity (cigarettes per day) has been linked to acculturation in the United States among Latinas, but not Latino men. Our study examines variation between a different and increasingly important target behavior, smoking level (nondaily vs daily) and acculturation by sex.

Methods: An online English-language survey was administered to 786 Latino smokers during July through August 2012. The Brief Acculturation Rating Scale for Mexican Americans-II (ARMSA-II) and other acculturation markers were used. Multinomial logistic regression models were implemented to assess the association between smoking levels (nondaily, light daily, and moderate/heavy daily) with acculturation markers.

Results: Greater ARMSA-II scores (relative risk ratio, $RRR=.81$, 95% CI: .72-.91) and being born inside the United States ($RRR=.42$, 95% CI: .24-.74) were associated with lower relative risk of nondaily smoking. Greater Latino orientation ($RRR=1.29$, 95% CI: 1.11-1.48) and preference for Spanish language ($RRR=1.06$, 95% CI: 1.02-1.10) and media ($RRR=1.12$, 95% CI: 1.05-1.20) were associated with higher relative risk of nondaily smoking. The relationship between acculturation and smoking level did not differ by sex.

Conclusion: This study found that among both male and female, English-speaking Latino smokers, nondaily smoking was associated with lower acculturation, while daily smoking was linked with higher acculturation. *Ethn Dis.* 2018.28(2):105-114; doi:10.18865/ed.28.2.105.

Keywords: Intermittent Smoking; Hispanic Americans; Gender; Culture; Health; Tobacco

INTRODUCTION

Tobacco use continues to be the leading cause of preventable death and disease in the United States.¹ Latinos are responsible for half of the US population growth in the past two decades and comprise the largest ethnic minority group in the nation,² making tobacco use among this group a significant economic and public health problem.³ Tobacco use is a known cause of cancer and cardiovascular disease, the leading causes of death among Latinos.⁴ Latinos also have high mortality rates from diabetes, which is worsened by tobacco use.⁵ This makes identifying factors linked with smoking behavior in this population a critical public health priority.

Estimates of US Latino smoking prevalence range from 20%-38% for men and 8%-17% for women.⁶⁻⁹

Accounting for part of the variability in smoking prevalence observed across national studies, Latinos are a heterogeneous population, with group diversity related to many factors including country of origin and acculturation.^{8,10-12} The largest percentage of those of Hispanic or Latino origin in the United States are of Mexican descent (63.2%), followed by Puerto Rican (9.5%), Salvadoran (3.8%), Cuban (3.9%), Dominican (3.3%), and Guatemalan (2.5%). The remainder are of other Central American, South American, or other Hispanic or Latino origin.¹³ Previous research has found that smoking prevalence and level (ie, light vs heavy smoking) among subgroups of Latinos varies significantly, eg, Mexicans tend to have higher smoking prevalence than Dominicans¹⁴ and lower prevalence compared with

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Puerto Ricans and Cubans.¹⁵⁻¹⁷

Numerous studies have documented higher rates of nondaily (ie, smoking on only some days) or light smoking (ie, 10 or fewer cigarettes per day [CPD]) among Latinos compared with non-Latino Whites.^{15,18-22} Nondaily smoking is under-studied and under-treated,^{22,23} despite its association with significant health risks,²⁴⁻²⁷ making it an important target for study. Additionally, a nuanced analysis demonstrates that significant proportions of Latino smok-

liefs, and behaviors of one's heritage culture with those of a new culture.²⁹ Within a linear framework, individuals with low acculturation exhibit behaviors resembling their heritage culture while those who are highly acculturated exhibit behaviors akin to the new culture.³⁰ Language is a common marker of acculturation and has been established as a health indicator given its association with smoking behavior among Latinos in multiple studies.^{6,15,31,32} For example, greater Spanish language use (a marker of low acculturation) among the social networks of US Latino youth has been linked with less substance use through greater parental involvement.²⁹ Relatedly, US Latino adults who speak primarily English (a marker of greater acculturation) have been shown to experience greater health risks compared with those who speak primarily Spanish.³³⁻³⁵

However, the direction of the relationship between acculturation and smoking behavior varies by sex. In most studies, higher levels of acculturation are associated with higher smoking prevalence and/or quantity (CPD) among women, with little effect on men's smoking behavior.^{6,31,32} In contrast, two studies found the opposite for men only, where higher acculturation was linked with lower smoking prevalence and/or quantity.^{15,36} A comprehensive review of acculturation studies determined that the inverse association between smoking status and quantity with acculturation by sex was consistent across different measures including single-item language questions or multi-dimen-

sional surveys.⁶ These seemingly paradoxical results are explained by the Operant Theory of Acculturation, which maintains that opposite effects of a health behavior observed between men and women are due to differences in gender-referenced behavior in the dominant culture.³⁷

A logical next step is to examine the association between acculturation and smoking level (ie, daily or nondaily smoking) among Latino men and women. Nondaily smoking is increasingly common among both native and US Latinos^{19,38} and is associated with significant health risks,²⁴⁻²⁷ yet is under-studied and under-treated.^{22,23} A granular, within smoker analysis among a growing segment of the Latino population that is most at-risk (ie, highly acculturated) stands to make the greatest public health impact. Our study examines variation in the relationship between acculturation and smoking level by sex in order to advance tobacco treatment.

METHODS

Design

This is a cross-sectional, secondary analysis of a larger study that recruited equal numbers of daily and nondaily adult smokers (aged >25 years) among three major racial/ethnic groups in the United States: Latinos, African Americans, and Whites to understand variation in risk factors for smoking, based on smoking level and race/ethnicity. Outcomes with the entire study sample have been published elsewhere.²³ This article focuses only on

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ers are also long-term, heavier daily smokers.²⁸ It is therefore important that investigations of smoking behavior among Latinos include samples across countries of origin and smoker levels (ie, nondaily and daily). Socio-ecological frameworks that account for cultural variables such as acculturation offer valuable models to understand smoking behaviors and create interventions.

Acculturation is a complex process of reconciling the values, be-

the Latino sample, which was representative of English-speaking Latinos from a variety of nationalities.

Participants

Participants completed a cross-sectional English-language survey administered through an online panel survey service, SSI, between July 5, 2012 and August 15, 2012. SSI maintains access to an online panel of 1.5 million people in the United States who have indicated that they are willing to participate

in online surveys. Participants in the parent study self-identified as African American, White, or Latino (of any race). This study focuses on the Latino smokers in the sample. They were at least 25 years old and were English-speaking. Additional sample characteristics are presented in Table 1. In order to sample smokers who were relatively stable in their smoking pattern, study participants were current smokers (ie, smoked at least one cigarette in the past 30 days), had smoked

at least 100 cigarettes in their lifetime, smoked for at least one year, smoked at their current rate (ie, daily or nondaily) for at least 6 months, and had not participated in any smoking cessation treatment in the past 30 days. Women who were currently pregnant or breast-feeding were excluded from the study.

The sample was stratified to obtain equal numbers of non-daily smokers and daily smokers with each ethnicity, which were further stratified to light (1-10 CPD) and

Table 1. Characteristics of survey respondents

	Total, n=786	Nondaily smokers, n=400	Light smokers, n=190	Moderate/heavy smokers, n=196
Sex				
Female, n (%)	422 (53.7)	184 (46.0)	118 (62.1)	120 (61.2)
Race				
White, n (%)	545 (69.3)	287 (71.8)	127 (66.8)	131 (66.8)
Black or African American, n (%)	50 (6.4)	19 (4.8)	9 (4.7)	22 (11.2)
American Indian/Alaska Native, n (%)	18 (2.3)	5 (1.3)	4 (2.1)	9 (4.6)
Asian/Pacific Islander, n (%)	35 (4.5)	13 (3.3)	10 (5.3)	12 (6.1)
Other, n (%)	132 (16.8)	74 (18.5)	37 (19.5)	21 (10.7)
Multiracial, n (%)	24 (3.1)	7 (1.8)	7 (3.7)	10 (5.1)
Mexican origin, n (%)	367 (46.7)	190 (47.5)	92 (48.4)	85 (43.4)
Education				
≤High school, n (%)	194 (24.7)	79 (19.8)	58 (30.5)	57 (29.1)
Some college, n (%)	249 (31.7)	112 (28.0)	74 (39.0)	63 (32.1)
≥College grad, n (%)	343 (43.6)	209 (52.3)	58 (30.5)	76 (38.8)
Acculturation				
ARMSA II Scale Score, -4 to 4 ^a	1.3 (1.5)	1.1(1.5)	1.5 (1.6)	1.7 (1.5)
ARMSA II - Latino Orientation, range 1 to 5 ^a	2.8 (1.3)	3.0 (1.3)	2.7 (1.3)	2.6 (1.2)
ARMSA II – Anglo Orientation, range 1 to 5 ^a	4.2 (0.7)	4.1 (0.8)	4.2 (0.7)	4.3 (0.7)
ARMSA II – Language, range 4 to 20 ^a	11.7 (5.2)	12.4 (5.2)	11.0 (5.1)	10.6 (4.9)
ARMSA II –Media, range 2 to 10 ^a	5.3 (2.7)	5.8 (2.7)	4.9 (2.6)	4.8 (2.6)
ARMSA II - Social, range 2 to 10 ^a	7.1 (2.4)	7.1 (2.45)	6.9 (2.5)	7.2 (2.4)
ARMSA II - Food, range 1 to 5 ^a	4.0 (1.0)	4.1 (1.0)	4.1 (1.0)	3.9 (1.1)
Nativity				
US Born, n (%)	675 (85.9)	332 (83.0)	165 (86.8)	178 (90.8)
Years lived in the US				
>10 years, n (%)	723(92.0)	354 (88.5)	182 (95.8)	187 (95.4)
How well do you speak English?				
Very well, n (%)	721(91.7)	357 (89.3)	176 (92.6)	188 (95.9)
Smoking behavior				
Number of cigarettes on days smoked ^a	9.4 (9.0)	4.9 (5.4)	6.9 (2.9)	21.0 (8.9)
Days smoked/past 30 days ^a	22.0 (8.6)	14.7 (5.9)	29.2 (1.7)	29.8 (0.8)
Smoked first cigarette <30 mins after waking, n (%)	440 (56.0)	174 (43.5)	105 (55.3)	161 (82.1)

a. mean (SD).

moderate/heavy (≥ 11 CPD) daily smokers. Quotas for the number of participants by smoking level were 1,200 for nondaily smokers, 600 for light daily smokers, and 600 for moderate to heavy daily smokers. If the quota for one of the nine subgroups (three race/ethnicity groups and three smoking levels) was filled, participants with those characteristics were no longer recruited.

Overall, 42,715 participants began the screener for this study, 13,775 did not meet the study criteria and were ineligible, 21,891 were ineligible because of full quotas (ie, race/ethnicity, smoking level), and 4,581 discontinued before completing the survey (90% prior to starting the survey). The survey company completed a quality check that ensured no duplicate responses. Participants could discontinue at any time, but to progress through the survey, every question had to be answered. The final study sample consisted of 2,376 participants, one third of whom were Latino ($N=786$) and the focus of analysis in this article.

Procedures

All procedures were approved by the University of Minnesota Institutional Review Board. SSI used preliminary questions (eg, smoking frequency) and existing participant information (eg, race/ethnicity, age) to direct smokers to our study. Potential participants directed to our study were presented with the informed consent page. Following consent, screening questions determined eligibility and eligible participants were then presented

with the survey questions. Participants who completed the survey received SSI's standard incentives, entry into a quarterly drawing for \$12,500 available to the entire panel of 1.5 million and points that could be redeemed for cash.

MEASURES

Demographics

Demographic questions assessed participants' age, race and ethnicity, sex, and highest level of education.

Smoking

Lifetime smoking was assessed with the item "Have you smoked at least 100 cigarettes in your entire life?" Current smoking was assessed with the item "On how many of the past 30 days did you smoke cigarettes?" Smoking quantity was assessed with the item "On the days you smoke, on average, about how many cigarettes do you smoke each day?" Non-daily smoking was defined as smoking at least one cigarette on 4 to 24 days in the past 30 days.³⁹ Daily smoking was defined as smoking 25 to 30 days in the past 30 days⁴⁰ and divided into light daily (1-10 CPD) and moderate/heavy (≥ 11 CPD) daily smoking.^{21,41} Duration of smoking was assessed with the item "How long have you smoked cigarettes?" with response options in years and months.

Latino Acculturation

Acculturation was assessed by a widely used language-based measure, the Brief Acculturation Rating Scale for Mexican Americans (ARMSA)-II.³⁰ Although originally created for Mexican Americans, this

measure is not country-specific and has been utilized with other Latinos.⁴² Therefore, ARMSA-II results will be described more broadly referring to Latinos than Mexicans. The Brief ARMSA II is a 12-item measure that consists of two subscales: the Mexican Orientation Scale (MOS; $\alpha_{\text{sample}} = .95$) and Anglo Orientation Scale (AOS; $\alpha_{\text{sample}} = .82$). Items are rated on a 1 (not at all) to 5 (extremely often or always true) scale. A mean score for the MOS and AOS is produced and the MOS mean is subtracted from the AOS mean. This measure yields an overall scale score which ranges from -4 to 4, where positive values reflect greater AOS orientation (more acculturation) and negative values reflect greater MOS orientation (less acculturation).

Additionally, the following ARMSA-II components were examined: Spanish language (four items; $\alpha_{\text{sample}} = .92$), Spanish media (two items; $\alpha_{\text{sample}} = .91$), and Anglo social relationships (two items; $\alpha_{\text{sample}} = .93$). In addition, a single item was added to the scale "I eat Latin American food" using the same response format. Table 2 provides individual scale items and descriptives. The total acculturation scale reliability was .81 with the original 12 items and .83 with 13 items.

Nativity was assessed by asking in what country participants were born. Country of origin was coded to create a dichotomous nativity variable: US born vs foreign born. In addition, participants were asked how many years they have lived in the United States. Number of years living in the United

Table 2. Brief Acculturation Rating Scale for Mexican Americans (ARMSA-II) items and descriptives

Sub-Scale and Item	Range	Mean (SD)
Mexican Orientation Scale ($\alpha = .95$)	1-5	1.3 (1.5)
Spanish language ($\alpha = .92$)	4-20	2.8 (1.3)
I speak Spanish	1-5	3.2 (1.4)
I enjoy speaking Spanish	1-5	3.2 (1.4)
I think in Spanish	1-5	2.6 (1.5)
I enjoy reading in Spanish	1-5	2.7 (1.5)
Spanish media ($\alpha = .91$)	2-10	5.3 (2.7)
I enjoy Spanish language TV	1-5	2.7 (1.4)
I enjoy Spanish language movies	1-5	2.7 (1.4)
Latin American food (added by author)	1-5	4.0 (1.0)
I eat Latin American foods.	1-5	4.0 (1.0)
Anglo Orientation Scale ($\alpha = .82$)	1-5	4.2 (0.7)
English language (factor not analyzed separately)	--	--
I speak in English	1-5	4.5 (0.9)
I enjoy English language movies	1-5	4.5 (0.8)
I write letters in English	1-5	4.5 (0.9)
I think in English	1-5	4.4 (1.0)
Anglo social relationships ($\alpha = .93$)	2-10	7.1 (2.4)
My friends are Anglo	1-5	3.5 (1.3)
I associate with Anglos	1-5	3.6 (1.3)

States was dichotomized into <10 years, and >10 years.^{43,44} All participants reported how well they spoke English, with options including very well, well, and not well.⁴⁵

ANALYSES

We first applied univariate multinomial logistic regression model to assess association between smoking level (nondaily, light daily, and moderate/heavy daily) with each of the acculturation variables (ie, ARMSA-II, ARMSA-II subscales, years living in the United States), country of origin, and sex adjusting for age and education.^{46,47} Moderate/heavy daily is the reference group in all the models.

Due to multi-collinearity between the acculturation variables, instead of building a multiple re-

gression model with variables that were significant in the univariate regression, several regression models to test interactions were conducted one variable at a time. The Bonferroni adjustment was applied to reduce Type I error due to multiple comparisons.

RESULTS

As shown in Table 1, the sample of English-speaking Latino participants were highly acculturated with almost equal sex representation (53.7% were female). Participants' countries of origin were varied, 46.7% Mexican origin, 18.5% Puerto Rican, 6.6% Cuban, and 28.8% other country of origin. Even within a highly acculturated sample, we found distinctions between daily and nondaily smokers based on acculturation.

Results from univariate multinomial logistic regression models are presented in Table 3. Univariate regression analysis revealed multiple markers of acculturation were significantly associated with nondaily compared with moderate/heavy daily smoking (Table 3). Higher level of acculturation (ie, greater overall ARMSA II score) was associated with lower relative risk of nondaily smoking relative to moderate/heavy smoking.

For every one point increase in the Latino orientation scale (ranges from 1 to 5), the relative risk for being a nondaily smoker relative to moderate/heavily smoker is 1.29 (95% CI: 1.11-1.483, $P < .001$) times higher while holding age and education constant. Specific components of acculturation, including preference for Spanish language ($RRR = 1.06$, 95% CI: 1.02-1.10, $P < .005$) and Spanish

Table 3. Univariate multinomial logistic regression model of nondaily and light daily smoking vs moderate/heavy daily smoking

Variable	Nondaily smoking ^{a,b}			Light daily smoking ^{a,b}		
	RRR	95% CI	P ^c	RRR	95% CI	P
ARMSA-II	.812	.721, 0.913	.001	.946	.828, 1.081	.416
Latino orientation	1.286	1.114, 1.483	.001	1.027	.873, 1.209	.746
Anglo orientation	.856	.667, 1.097	.219	.839	.634, 1.111	.220
Acculturation-language	1.061	1.024, 1.099	.001	1.009	.970, 1.050	.642
Acculturation-media	1.123	1.050, 1.201	.001	1.001	.926, 1.081	.988
Acculturation-social	1.009	.936, 1.087	.811	.941	.865, 1.023	.156
Acculturation-food	1.087	.919, 1.286	.330	1.093	.901, 1.326	.365
Born in US	.417	.235, .739	.003	.618	.323, 1.182	.146
Mexican nationality	1.053	.737, 1.506	.775	1.192	.794, 1.789	.396
Years lived in the US	.450	.211, .956	.038	1.194	.448, 3.178	.723
Sex, ref= male	.585	.408, .839	.004	1.094	.723, 1.657	.670

a. Model adjusted for age and education.

b. Comparison group is moderate/heavy smoking.

c. Critical P=.005 with Bonferroni adjustment

media ($RRR = 1.12$, 95% CI: 1.05-1.20, $P < .005$) were associated with higher relative risk of being a nondaily smoker adjusting for age and education. Being born inside the United States ($RRR = .42$, 95% CI: .24-.74, $P < .05$), and being female ($RRR = .59$, 95% CI: .41-.84, $P < .005$) were also associated with lower relative risk of nondaily smoking compared with moderate/heavy daily smoking adjusting for age and education. In contrast, there were no variables that distinguished between light daily smoking compared with moderate/heavy daily smoking as shown Table 3.

As shown in Table 4, the regression models adjusting for education and age showed no significant interactions between any acculturation variables and sex with smoking level.

DISCUSSION

Our main finding was that multiple markers of acculturation were

linked with smoking level, and that this relationship did not vary based on sex. Among Latino men and women smokers, greater accul-

A central finding of our present study was that higher acculturation was associated with daily smoking, whereas lower acculturation was linked with nondaily smoking.

turation increased the likelihood of moderate-to-heavy daily smoking whereas less-acculturated Latinos were more likely to smoke nondaily. This pattern of results was found using both a formal acculturation

scale and proxy measures. Our study extends the few studies that have linked acculturation to smoking quantity (ie, cigarettes per day) among both men and women,^{36,48} to include a broader spectrum of smoking levels ranging from nondaily to light and heavier daily smoking. This finding is consistent with the Operant Theory of Acculturation, which maintains that health behaviors of minorities follow dominant culture gender-referenced behavior.³⁷ There is evidence that sex differences in smoking level among Hispanics is narrowing.⁴⁹ An examination of California representative data comparing change over time from 1990 to 2008 showed a significant sex difference in daily and nondaily smoking among Latinos during the period from 1990 to 1996 whereas the sex difference was not significant from the 1999 to 2008 period.⁴⁹

A central finding of our present study was that higher acculturation was associated with daily smok-

Table 4. Acculturation and smoking behavior by sex interactions

	Nondaily smoking ^{a,b}			Light daily smoking ^{a,b}		
	RRR	CI	P ^c	RRR	CI	P ^c
ARMSA-II						
ARMSA-II	.773	.636, .939	.010	.898	.714, 1.130	.360
Sex	.548	.332, .905	.019	1.019	.568, 1.828	.949
ARMSA-II x sex	1.129	.883, 1.444	.334	1.071	.809, 1.418	.632
Latino orientation						
Latino orientation	1.449	1.140, 1.841	.002	1.122	.846, 1.488	.425
Sex	1.449	1.140, 1.841	.002	1.122	.846, 1.488	.425
Latino orientation x sex	.792	.587, 1.068	.126	.885	.628, 1.248	.485
Acculturation language						
Acculturation language	1.089	1.027, 1.155	.005	1.026	.957, 1.100	.464
Sex	1.155	.462, 2.890	.758	1.419	.506, 3.978	.506
Acculturation language x sex	.950	.882, 1.022	.167	.978	.899, 1.064	.602
Acculturation media						
Acculturation media	1.191	1.065, 1.331	.002	1.059	.928, 1.208	.397
Sex	1.163	.516, 2.620	.716	1.639	.657, 4.091	.289
Acculturation media x sex	.891	.775, 1.025	.107	.922	.784, 1.084	.325
US born						
US born	.490	.211, 1.140	.098	.368	.145, .933	.035
Sex	.764	.260, 2.245	.625	.454	.131, 1.576	.214
US born x sex	.751	.239, 2.358	.623	2.837	.756, 1.648	.122

a. Model adjusted for age and education.

b. Comparison group is moderate/heavy smoking.

c. Critical P=.02 in each model with Bonferroni adjustment.

ing, whereas lower acculturation was linked with nondaily smoking. Latinos are among the ethnic minority groups with the highest rates of nondaily smoking and are under-treated,^{50,51} placing them at-risk for adverse health consequences. Increased attention to nondaily smoking is needed by public health officials and policy makers, and our current findings suggest that these efforts should be culturally tailored for less-acculturated Latinos.

Study Limitations

The finding that acculturation is differentially linked to nondaily vs daily smoking in our study must be interpreted within the context of methodological limitations. The administration of the survey was in

English only and the sample was highly educated, thereby limiting generalizability. Although English proficiency among US Latinos has risen to a majority of 68%⁵² and greater acculturation is linked with greater health risk behaviors,³³⁻³⁵ it will be important that future work is conducted in both Spanish and English to validate the present findings. Additionally, participants' country of origin was diverse which addresses a limitation of previous research conducted with a predominant or exclusive sample of Mexican Americans,⁶ but the sample size was not large enough to examine the research question by national origin. Finally, the study was parameterized by cigarette smoking (as opposed to use of other combustible

products) and excluded those currently seeking cessation treatment and women who were pregnant or breastfeeding; extrapolations to groups not represented in the sample must be made cautiously.

CONCLUSION

Because increased acculturation reflects behavior changes that resemble mainstream culture,^{6,53} diminishing the link between acculturation and smoking level may be fostered by decreased national smoking rates.³² This underscores the need for continued US tobacco-control efforts. There is evidence that US rates of heavy smoking are declining, particularly among mem-

bers of ethnic minority groups,⁵⁴ and the tobacco control efforts that have driven these changes should be continued. Given health risks, interest in stopping smoking, and feasibility of reaching Latino smokers,⁵⁵ culturally appropriate assessment, advice, and treatment for Latinos, including nondaily smokers, are needed.⁵⁶ Policy makers and public health officials are called to prioritize efforts for this growing, at-risk, underserved group.

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CONFLICT OF INTEREST

No conflicts of interest to report.

AUTHOR CONTRIBUTIONS

Research concept and design: Scheuermann, Ahluwalia; Acquisition of data: Cupertino, Scheuermann; Data analysis and interpretation: Pulvers, Cupertino, Cox, Ho, Nollen, Cuellar, Ahluwalia; Manuscript draft: Pulvers, Scheuermann, Cox, Ho, Nollen, Cuellar; Statistical expertise: Cupertino, Ho; Acquisition of funding: Ahluwalia; Administrative: Pulvers, Cupertino, Scheuermann, Cox, Nollen, Cuellar, Ahluwalia

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