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The Impact of Migration on Smoking among Colombian Migrants

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Abstract: *Background*: Colombian migration globally has had many consequences. This study focuses solely on the smoking behavior of Colombian migrants. This study addresses how the act of international migration impacts the likelihood of smoking among Colombian migrants. Smoking has been found to be the leading cause of preventable death, and so it is a health risk for Colombian migrants. This study pertains to the communities sampled in Colombia, where the migrants originated. *Methods*: This study uses the Latin American Migration Project to address how migration impacts the smoking behavior of Colombian migrants. Using logit regression, the statistical analysis predicts the likelihood of smoking among Colombian migrants. This study compares the smoking behavior of current and former Colombian migrants, which is compared to that of Colombian non-migrants. Because current and former migrants were surveyed, the study is able to control for health selectivity. *Results*: After accounting for health selectivity, the study finds that migration, as measured by time abroad, is positively and significantly related with the smoking of migrants relative to non-migrants. Additionally, this study shows that former migrants are more likely to smoke than current migrants, providing support for the salmon effect. *Conclusion*: This study adds to the literature on smoking by studying an understudied group, Colombian migrants, and provides a better measure of the impact of migration on smoking behavior by accounting for health selectivity and the salmon bias. The findings are consistent with assimilation theory, as more time abroad is associated with negative health behaviors that are common in the culture of the receiving country, but the fact that such behaviors are harmful to the migrant is consistent with the immigrant health paradox.

Keywords: smoking; Colombia; migration; health selectivity; salmon bias; assimilation theory; acculturation

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1. Introduction

When Colombians decide to migrate to another country, their health behaviors such as smoking may be impacted by the migration process. There is much variation globally in smoking. In 2018, the rate of smoking cigarettes was 25.9% in Spain, 17.1% in the United States, and 7% in Colombia [1]. Initiating smoking might lead to serious health consequences, as 15% of deaths in the United States, 15.4% of deaths in Spain, and 8.4% of deaths in Colombia are attributable to smoking [2]. Given these disparities, Colombian migration may be associated with an increased risk of health complications if Colombian migrants assimilate to the smoking behaviors they encounter abroad. Assimilation theory predicts that the more time migrants spend abroad, the closer their behavior will resemble that of the receiving country. Smoking is one behavior that might change with acculturation [3]. Acculturation is the cultural movement towards the culture of the receiving country, which is expected with greater exposure to the receiving country. This study predicts the likelihood of smoking among former and current Colombian migrants as compared to Colombians who never migrated to test whether migration is associated with an increased risk of smoking after accounting for selectivity. Selectivity is the way in which migrants are more likely to possess certain qualities, such as being educated, young, skilled, employed, or healthy. A binary logistic regression is used to predict the likelihood of smoking at the time of the

survey. This study uses the Latin American Migration Project-Colombia (LAMP) data to study smoking among Colombians [4].

This study contributes to the literature on migration and smoking in several significant ways. This study focuses on Colombian migrants, an understudied group within the public health and migration literature. This study's methodological design accounts for the selectivity of migration, which is necessary to address since migrants are distinct from non-migrants in terms of their health, human capital, labor market experiences, and smoking behavior. Human capital refers to the resources such as education and skills that migrants offer employers. Selectivity is addressed by comparing the smoking behavior of former and current Colombian migrants to Colombian non-migrants. This study also accounts for the salmon effect, whereby return migrants are distinct in terms of being negatively selected regarding characteristics such as health, education, labor market outcomes, and smoking behavior. By comparing former migrants who returned to Colombia to current migrants who are still abroad, it is possible to account for the salmon effect, which might negatively bias studies focusing solely on return migrants.

Extensive research has been conducted on Mexican migrants [5–12]. Some research focuses on the health and migration of Mexican migrants [6,8,12]. Mexican migration is widely studied as Mexicans are the largest immigrant group in the United States and because Mexican migration to the United States is not recent, with there being a sizeable population in the United States during World War 1 [13]. Mexican migrants are also unique in that they primarily go to the United States [13]. In contrast, Colombian migration is more recent, as Colombian migration began after the 2nd half of the 20th century [14,15]. The top two destinations for Colombian migrants are Spain and the United States [15]. Colombians have a long history of migration to the United States, but their migration to the United States and Spain grew in the 1980s [16]. Studies have consistently documented that Mexican migrants have little human capital, which is untrue of Colombian migrants [11,13]. Colombian migrants are more educated than Mexican migrants and this difference would suggest different migration and adaptation processes. Studying Colombian migration contributes to the literature because it is a more recent migration and because the population possesses higher levels of human capital than Mexican migrants.

2. Assimilation Theory

Studies often use the time spent in the receiving country as a measure of acculturation [3,17]. Although acculturation is only one form of assimilation, it is the most widely studied form of assimilation [18]. Assimilation theory predicts changes in health outcomes in the receiving country with acculturation, as the migrants "adopt the norms, values, and practices of their new host society" [19]. In terms of smoking, this approach would predict that migrants are at greater risk of smoking the longer they are abroad, as international statistics show that smoking is often more common in the countries where Colombians migrate [1]. However, there are some studies that actually find the opposite relationship, as some migrants come from places where smoking is more common than in the receiving community, but this is not the case with Colombians [20]. According to assimilation theory, with acculturation, migrants would become more similar culturally to those in the receiving country, which would mean they would be more likely to smoke.

Acculturation and Smoking

Acculturation has long been reported to be associated with harmful health behaviors. Acculturation is said to occur when immigrants acquire the "attitudes, values, customs, beliefs, and behaviors of a new culture" [3]. Acculturation is associated with many negative health behaviors; one behavior it addresses is smoking. The effects of acculturation were stronger for women than men, as highly acculturated Latina women were twice as likely to smoke. This study used a representative sample of the non-institutionalized population in the United States, employing data from the National Health Interview Survey. Latino people were compared to non-Latino white people, although we did not compare

any specific subgroups due to data limitations. The positive relationship between acculturation and smoking is a negative health outcome, which is also predicted to exist for Colombian migrants.

One study examined the relationship between being a Latino immigrant and the likelihood of smoking based on a survey conducted in Los Angeles [21]. The findings show that foreign-born migrants are less likely to smoke than US-born members of this community. A gender difference was reported, where women who prefer to speak Spanish are less likely to smoke, but men who prefer to speak Spanish are more likely to smoke, which suggests that acculturation operates differently for men and women with regard to smoking. In other words, acculturation is positively associated with smoking among women, but negatively associated with smoking among men.

Some studies focus on the smoking behavior of Hispanic youth in California [22]. Acculturation is associated with smoking among girls, but not boys. The effect of acculturation is different for boys and girls, as the relationship between acculturation and smoking only exists for girls.

Acculturation has been found to be associated with the smoking of Hispanic women [23]. Kondo and her colleagues conducted a meta-analysis of 26 studies about acculturation and the smoking behavior of Hispanic women that had been conducted between 1990 and 2010. The meta-analysis included studies focusing on Hispanic people, Mexicans, Puerto Ricans, Cubans, and Central Americans, but none specifically studied Colombians, the group of focus of the current study. This study reports that acculturation is positively associated with smoking behaviors in Hispanic women across all studies. This study suggests that smoking is largely discouraged among women in Latin America, with the exception of Cuba. In contrast with most of Latin America, smoking is considered acceptable for women in the United States. With acculturation, Hispanic women learn that smoking is socially acceptable for women in the United States. Acculturation then leads to increased smoking among Hispanic women.

The impact of acculturation was also documented among Asian and Latino immigrants [17]. This study documented that Asian immigrant women and Latino immigrant women interviewed in the United States were less likely to smoke than men. This study also documented a positive relationship between the duration of U.S. residence and smoking, which was considered a measure of acculturation. The present study employs a similar measure of acculturation.

When immigrants are compared to U.S.-born community members, they are found to be much less likely to smoke [24,25]. Foreign-born people are the least likely group to be daily smokers, according to the results of the TUS-CPS 1995–96 survey [25]. Similarly, being a foreign-born or 2nd-generation migrant with two foreign-born parents significantly lowers the odds of smoking among females. Using the TUS-CPS 2006 data, foreign-born adolescents and young adults were found to smoke less than their U.S.-born counterparts [24]. However, one exception was foreign-born Asian males, who were equally as likely to smoke as their U.S.-born counterparts. This study only applies to adolescents and young adults between the ages of 15 and 34, but the strength of the study is that it compares many racial groups. Additionally, both studies point toward gender differences, where women are significantly less likely to smoke than men, and the same gender dynamics are expected for Colombian women.

Acculturation does not always lead to an increased likelihood of smoking. For example, one study based on interviews with Chinese Americans living in Atlanta, Georgia, found that many respondents quit smoking after coming to the United States as there is a negative stigma associated with smoking in the United States [20]. The study shows that immigrant smoking choices are structured by the environment where migrants came from and where they end up in the United States.

Few studies account for the environment where migrants come from. However, one study undertook an event history analysis and compared the likelihood of smoking while in Mexico to the likelihood of smoking after immigration to the United States, accounting

for selectivity [26]. Immigrants were less likely to start smoking while in the United States. The findings of this study, which accounts for selectivity, stand in contrast with those of previous research that did not. Perhaps the contradictory findings are related to selectivity.

The data for the current study come from the LAMP, which is based on the methodology of the Mexican Migration Project (MMP). Several articles have focused on a variety of health outcomes, including smoking among migrants, using the MMP. One study compared male return migrants to non-migrants and reported that return migrants had a greater likelihood of smoking than non-migrants [12]. Another study used the MMP to focus on gender differences and multiple health outcomes, including smoking [6]. The study reported that return migrants are more likely to smoke than non-migrants. Additionally, the study found a significant gender difference in terms of the impact of migration and smoking on females, even though they were less likely to smoke than men. The studies both showed that, among Mexicans who had returned to Mexico, migration was associated with an increased likelihood of smoking. These studies were able to compare return migrants to non-migrants, which is a better comparison, given the health selectivity of migrants, than undertaken in previous studies focusing on migrants in the United States. The question that remains is whether Colombians who migrated are also more likely to smoke relative to non-migrants once selectivity is addressed.

3. Immigrant Health Paradox

Studies on the public health literature have tested whether there is an immigrant health paradox [27–29]. It is a paradox that immigrants come to the United States poorer than those born in the United States, and yet such immigrants are often found to be healthier than U.S.-born people [27]. Economic well-being is often associated with better health outcomes, so it is surprising that immigrants are healthier than U.S.-born people given than they are generally poorer than people born in the United States [30].

One explanation for the healthy immigrant paradox is related to selectivity. One study focused on the health selectivity of migration to the United States, Canada, the UK, and Australia [29]. The study found widespread health selectivity in all of these countries and one of the health measures was smoking. The study compared immigrants to non-immigrants in the receiving country and immigrants to nonimmigrants from the sending country. The study provides evidence that there is a healthy immigrant effect, whereby immigrants are healthier than nonimmigrants even after accounting for the selectivity of migration. Although the selectivity of immigration does not fully account for the healthy immigrant effect, the study shows that it is best to compare immigrant's health to that of nonimmigrants in the sending country, as immigrants are highly selected in terms of health outcomes such as smoking. Studies solely focusing on migrants in the receiving country are biased if the health of immigrants is positively or negatively selected by the migration process, which is why this research accounts for selectivity.

4. Selectivity of Migration

Some studies have documented the health selectivity of migration. The selectivity of migration means that migrants are physically taller than non-migrants [9]. Migrants are positively selected in terms of hypertension, self-rated health, and height [28]. Studies have also shown that migrants are positively selected in terms of height (Indians) and smoking (Chinese) [27]. Bostean found selectivity in terms of activity limitation [7]. There is a great deal of health selectivity in terms of Mexican migrants [8]. The positive health selectivity of Mexican migrants declined the longer Mexican migrants remained in the United States and the more trips they took; this deterioration of their health was greatest among undocumented immigrants. Undocumented and documented migrants' health was worse than that of non-migrants. One study found mixed results for the healthy migrant hypothesis, finding that those with better overall health were more likely to migrate [10].

Not all studies find evidence of health selectivity [31,32]. In fact, one study finds that with mortality, the Hispanic health paradox is directly attributable to differences in

smoking [31]. According to the study, 60% of the gap in Mexican American mortality relative to non-Hispanic people is related to lower rates of smoking. Although South American countries show the most health selectivity, with Colombia topping the list, health selection is not found to underlie the healthy immigrant effect [32].

Since the LAMP data provide information about former and current migrants and non-migrants, this study is able to account for the selectivity of migration [4]. The distinction between current and former migrants is clear within the survey. Current migrants were abroad at the time of the survey and former migrants had returned to Colombia at the time of the survey. Since some studies find evidence of health selectivity, solely interviewing migrants in the receiving country would be problematic, as migrants are generally healthier than non-migrants. Many studies about smoking among migrants use data collected in the United States, which is problematic given that immigrants are positively selected in terms of health outcomes [27] and such data may suffer from the salmon bias [30]. By interviewing migrants within the sending country, this study is able to address the selectivity issue by comparing former and current migrants to non-migrants to gauge the amount of selectivity. Previous studies have had difficulty distinguishing between selectivity issues and other explanations, as such studies do not typically have information about sending countries [30]. Although using data collected in the sending country may allow scholars to correct for health selectivity, returning migrants may be distinct from those who remain abroad, which is called the salmon bias.

Salmon Bias

The salmon effect occurs when unhealthy migrants return to their sending countries, as unhealthy people have worse labor market outcomes in the receiving country [9]. The salmon bias is a negative form of selectivity. Studying the salmon effect is difficult for most studies, as it requires data about return migrants and migrants who remained in the host country [30]. Some studies have shown that return migrants are shorter [9,28]. Return migrants are more likely to have activity limitations [7]. Return migrants are negatively selected in terms of hypertension, smoking, and self-reported health [28]. Although return migrants have health limitations and frequent stress, there is little evidence that they suffer from chronic conditions or report worse self-reported health [33]. Mexican return migrants were healthier early in life, but when they returned to Mexico, they were more likely to have heart disease, emotional or psychiatric disorders, and obesity than non-migrants, and were also more likely to smoke [12]. Return migrants have been shown to be healthier than non-migrants based on data collected about migrants from North Macedonia [34]. However, less healthy North Macedonia migrants are more likely to return, which attenuates the effect of return migration on health [34]. The studies documenting the salmon effect among return migrants highlight the importance of comparing return migrants to those who are still on their trip. However, most of the literature on the smoking behavior of immigrants fails to account for smoking behavior within the sending countries. One important benefit of using the LAMP data is that they allow current and former migrants to be compared, allowing for the measurement of the salmon effect.

5. Data and Methods

The LAMP data are based on an ethnosurvey. The approach was to use ethnographic techniques to locate communities within Colombia that varied in terms of "size, region, ethnic composition, and economic base" [4]. Once communities were selected based on the ethnographic approach, household surveys were conducted, where households were randomly selected. Approximately 200 households were surveyed within each of the 14 communities between 2008 and 2015. The approach yields data that are representative of the selected communities, but the data do not represent Colombian migration or Colombian migration to a specific country.

The LAMP also collected data about migrants who are currently on their trip. These interviews conducted in Spain and the United States are meant to supplement the data

collected in Colombia, as solely focusing on return migrants would miss migrants who are still abroad and whose experiences may differ from those of return migrants. The data include several files, but House and Pers files are used to construct the dataset used for the analyses included in this research.

For the LAMP data, the summary statistics for the sample are included in Table 1a,b. The data included in Table 1a,b were weighted by the author according to the recommendations outlined on the LAMP website [35]. The instructions for weighting the data indicate that weighting is necessary when providing "descriptive statistics for analytic purposes." Small towns and ranchos would be overrepresented and urban areas would be underrepresented without applying weights. Although it seems necessary to weight when providing descriptive statistics, the instructions indicate that it is usually not recommendable to weight when performing causal modeling to account for community dummy coded variables and survey place, since weights are solely a function of community and survey place [35]. This study does not weight the causal models, as these models include measures of departments and include indirect measures of where the surveys were conducted.

Since the dependent variable is binomial, binomial logistic regression is performed. Since there is clustering in the data, both the respondent and their spouse are included in the models; it is necessary to correct for clustering. Given the clustering in the data, robust standard errors are used to correct for clustering.

The study first predicts smoking at the time of the survey, controlling for the parameters of migration, demographics, past smoking behavior, human capital, wealth, employment status in Colombia, and community measures. After determining whether current and former migrants differ from non-migrants in terms of smoking, a model is established that predicts the smoking of former and current migrants. The model adds controls for information about the trip, specifically how long the trip lasted, where they went, and whether they were unemployed during their last or current trip.

Whether a person smokes is the dependent variable used in the analyses. Respondents were coded as 1 if they indicated that they smoked at the time of the survey and 0 if they did not smoke. Information about smoking is only collected for household heads and their spouses, so no other household members are included in the analyses. Since smoking is self-reported, and for absent migrants it is reported by an informant, there are possible social desirability issues with this variable which may mean under/overreporting. Therefore, a control for whether data were collected by an informant, as opposed to collection by migrants, is included in the model to determine whether the migrant was less likely to report smoking.

This study controls for several migration-related measures. The first model predicting smoking compares former and current migrants to non-migrants, where non-migrants are categorized as 0, current migrants are 1, and former migrants are 2.

The second model predicts smoking among migrants, allowing for the direct comparison of former and current migrants. In the models predicting the smoking behavior of migrants, the duration of their international trip was provided in months and a squared term was also included. A dichotomous measure of whether a person had been on a domestic trip was included, where those who took a domestic trip were coded as 1 and those who had not taken a domestic trip were coded as 0. The destinations included in the model were the United States, Spain, and other Latin American countries and these measures were dichotomous. All Latin American countries were combined as there was no single Latin American country with enough cases to permit separate analysis. These destinations were selected for inclusion in the model as 97% of the migrants went to one of these three destinations.

This study controls for commonly used demographic measures. Age at the time of the survey is measured in years. This study includes dichotomous measures for being female and married, where people who are female and married are coded as 1 and the rest are coded as 0. This study includes a continuous measure of the number of children.

This study also includes a dichotomous measure of whether respondents smoked at age 18, where those who smoked at 18 are coded 1 and those did not are coded as 0.

A number of measures of human capital and personal wealth are included in the models. Education is measured in the number of years of education obtained. Homeownership is a dichotomous measure, where homeowners are coded as 1 and others are coded as 0. Business ownership is a dichotomous measure, where business owners are coded as 1 and others are coded as 0. 'Amenities' is an index of the amenities in a house, and includes water, electric, sewers, stoves, refrigerators, washing machines, sewing, radios, TVs, stereos, phones, cellular devices, the internet, and computers. A higher score on this index indicates that the respondent had more of these amenities. This study also included a dichotomous measure of unemployment, where those who are unemployed are coded as 1 and those who are employed are coded as 0. For migrants, the model includes a measure of unemployment during their last trip abroad, where 1 is unemployed and employed is coded as 0.

This study also includes a few measures about the community. Pueblo is a dichotomous measure, where those from rural areas are coded as 1 and all others are coded as 0. This study includes a continuous measure of the annual number deaths within the community. The models include controls for the departments. Although the survey is based on 14 communities, such communities are anonymous. However, their departments are provided and are included in the models to account for unexplained variation that might be tied to differences between the communities.

This study includes a variable that addresses a bias that might be present in the models. The variable is whether the person was the informant. This is necessary, as the survey may have been filled out by another household member. Controlling for the informant accounts for the possibility that other household members may provide different information about the household member than they may have provided themselves.

6. Findings

Table 1a provides the weighted descriptive statistics for the Colombians in the first row and migrants in the second row. The Colombians include all respondents included in the analyses, and the statistics for migrants are also presented. A *T*-test of difference in means is performed as well to test whether the means are statistically different for migrants relative to all Colombians.

The dependent variable for the analysis is smoking at the time of the survey. About 11% of the Colombians and migrants surveyed smoke. The level of smoking is very similar for all Colombians and migrants.

The table also provides information about migration. About 15% of the total population surveyed are migrants, roughly 6% have returned to Colombia, and 9% are currently abroad. Of the migrants, 38% have returned to Colombia and 62% are abroad. Of the total population, 53% have taken a domestic trip, while only 39% of the migrants have, which is significantly less than the rate in the total population surveyed. The average trip duration for the international migrants is 138 months, which is over 11 years. The most popular destination was Spain, where just under half (49%) of the migrants went. A third of the migrants (33%) went to the United States and 15% went to another Latin American country. In total, 97% of Colombian migrants migrated to these three destinations.

The table also provides the means for the demographic characteristics of the population. Migrants are younger than most Colombians within these communities, as their average age is roughly 47 as compared to 51 for the total population, and the *T*-test of difference in means indicates that this is a statistically significant difference. About 29% of the total population and the migrant population is female. Roughly 79% of all respondents and 81% of migrants are married. The average number of children for the whole population is 2.59, which is significantly more than the 1.82 recorded for migrants.

Table 1. (**a**) Weighted descriptive statistics for Colombians and migrants. (**b**) Weighted descriptive statistics for former migrants and current migrants.

	(a) Colombian		Migrants			
	Mean	**SD**	**Mean**	**SD**	***T*-Test**	
Smoking Behavior						
Currently smokes at time of survey	0.11	0.31	0.11	0.31	−0.19	
Smoked at age 18	0.17	0.38	0.17	0.38	−0.04	
Migration						
Non-migrant	0.85	0.35	--	--	--	
Former migrant	0.06	0.23	0.38	0.49	25.35	*
Current migrant	0.09	0.29	0.62	0.49	35.18	*
Domestic trip	0.53	0.50	0.39	0.49	−6.10	*
Duration of last international trip (years)	--	--	137.86	117.60	--	
United States	--	--	0.33	0.47	--	
Spain	--	--	0.49	0.50	--	
Latin America	--	--	0.15	0.36	--	
Demographic						
Age at time of survey	50.58	15.07	47.05	11.04	−4.93	*
Female	0.29	0.45	0.29	0.46	0.27	
Married	0.79	0.40	0.81	0.40	0.57	
Children	2.59	1.96	1.82	1.20	−8.32	*
Human Capital and Wealth						
Education	9.03	4.68	11.83	3.56	12.56	*
Owns home	0.54	0.50	0.38	0.49	−6.51	*
Owns business	0.25	0.43	0.26	0.44	0.78	
Amenities	11.18	2.16	12.07	1.79	8.61	*
Unemployed	0.44	0.50	0.19	0.39	−10.66	*
Unemployed last trip	--	--	0.11	0.31	--	
Department						
Pueblo	0.24	0.43	0.18	0.39	−2.92	*
Deaths	4626	5044	4460	5076	−0.68	
Risaralda	0.32	0.46	0.39	0.49	3.35	*
Quindío	0.08	0.27	0.12	0.33	3.61	*
Cundinamarca	0.15	0.36	0.09	0.29	−3.51	*
Caldas	0.07	0.25	0.02	0.15	−3.57	*
Valle	0.31	0.46	0.31	0.46	0.31	
Atlántico	0.08	0.27	0.05	0.23	−2.18	*
Interviewed Abroad						
Informant	0.50	0.50	0.58	0.49	3.47	*
N	4647		466			

	(b) Former Migrants		Current Migrants			
	Mean	**SD**	**Mean**	**SD**	***T*-Test**	
Smoking Behavior						
Currently smokes at time of survey	0.17	0.37	0.07	0.26	−3.11	*
Smoked at age 18	0.18	0.39	0.16	0.37	−0.54	
Migration						
Domestic trip	0.49	0.50	0.33	0.47	−3.55	*
Duration of last international trip (years)	5.66	6.59	15.03	9.74	12.17	*
United States	0.28	0.45	0.36	0.48	1.82	
Spain	0.27	0.44	0.62	0.49	8.28	*
Latin America	0.37	0.48	0.02	0.13	−10.57	*
Demographic						
Age at time of survey	47.90	11.96	46.53	10.43	−1.31	
Female	0.25	0.44	0.32	0.47	1.45	
Married	0.77	0.42	0.83	0.38	1.64	
Children	2.12	1.27	1.64	1.11	−4.37	*

Table 1. *Cont.*

Human Capital and Wealth						
Education	10.86	4.38	12.41	2.79	4.54	*
Owns home	0.55	0.50	0.27	0.45	−6.39	*
Owns business	0.41	0.49	0.18	0.38	−5.71	*
Amenities	12.05	1.83	12.09	1.76	0.26	
Unemployed	0.28	0.45	0.13	0.34	−4.01	*
Unemployed last trip	0.10	0.31	0.11	0.32	0.27	
Department						
Pueblo	0.22	0.42	0.16	0.37	−1.66	
Deaths	4783.83	5102.59	4264.00	5059.00	−1.10	
Risaralda	0.36	0.48	0.41	0.49	1.27	
Quindío	0.09	0.28	0.15	0.36	2.07	*
Cundinamarca	0.16	0.37	0.05	0.22	−3.80	*
Caldas	0.06	0.23	0.00	0.07	−3.22	*
Valle	0.26	0.44	0.34	0.48	1.82	
Atlántico	0.08	0.27	0.04	0.19	−1.75	
Interviewed Abroad						
Informant	0.52	0.50	0.62	0.49	2.38	*
N	236		230			

* statistically significant at the 0.05 level [4].

Table 1a also provides the means for human capital and wealth. The total population has an average of 9.03 years of education, which is significantly less than the 11.83 of migrants. About half (54%) the total population owns a home, but only 38% of migrants do, and this difference is statistically significant. About a quarter (25%) of the total population owns a business, which is similar to the level seen among migrants (26%). In terms of amenities in their home, the average amount of amenities for Colombians is 11.18, but this number is 12.07 for migrants, which is significantly more. Within their community, most Colombians have a high unemployment rate at 44%, but it is 19% for migrants, which is a significant difference. Interestingly, migrants report that about 11% were unemployed during their last trip abroad.

In terms of their community, 24% of the total population come from rural areas and this percent for migrants is 18%; this difference is statistically significant. In terms of the number of annual deaths, the level in the total population is 4626, which is similar to the 4460 seen for migrants. There is variation in terms of which departments migrants come from. Migrants are less likely to come from Cundinamarca, Caldas, and Atlántico and are more likely to come from Risalda and Quindio.

The table includes some information about the interview. For example, 'informant' measures whether the interview was conducted with an informant, meaning that they provided information about all household members. About 50% of the interviews conducted within the communities were collected through an informant, but this percent was 58% for migrants, which was significantly higher.

Table 1b provides the means for former and current migrants. The *T*-test for difference in means is performed to evaluate whether the two group's means differ from each other. There appear to be many differences between the two groups. Only significant differences are described, since non-significant differences are similar to what is presented in Table 1a.

In terms of smoking behavior, the groups differ greatly in terms of their smoking at the time of the survey. About 17% of the former migrants smoked at the time of the survey, but this percent was 7% for migrants who were still abroad. However, their smoking behavior at age 18 was not statistically different.

In terms of their migration behavior, former and current migrants differ greatly. Former migrants have a higher percent who had taken a domestic trip, as 49% took a domestic trip among former migrants compared to 33% of current migrants. Former migrants had a shorter trip abroad, as on average they spent 5.66 years abroad, but this percent was 15.03 years for current migrants. More current migrants went to Spain than former migrants,

as 62% went to Spain compared to 27% for former migrants. On average, 37% of former migrants went to Latin America, but the percent for current migrants was 2%.

Former migrants and current migrants differ in terms of the number of children, human capital, business ownership, and unemployment. Former migrants have on average 2.12 children, but this figure is 1.64 for current migrants. Former migrants have less education than current migrants, with an average education of 10.86 years compared to 12.41 years for current migrants. Of former migrants, 55% own homes, which is much more than the 27% of current migrants. With regard to business ownership, 41% of former migrants and 18% of current migrants own a business. Former migrants experienced greater unemployment in Colombia, as 28% were unemployed relative to 13% of current migrants.

There is variation in terms of which department they come from and whether an informant reported their information. Roughly 15% of current migrants and only 9% of former migrants come from Quindío. A greater percentage of former migrants come from Cundinamarca and Caldas as the percentage of former migrants from these departments is 16% and 6% respectively, while 5% of current migrants are from Cundinamarca and none are from Caldas. The percent of former migrants whose information came from an informant is 52% compared to 62% for current migrants.

The descriptive statistics from Table 1a show that migrants are distinct relative to the total population within their communities. Table 1b shows that former and current migrants are quite distinct in many respects. Notably, former migrants have a higher rate of smoking, current migrants have spent three times more time abroad, current migrants possess more education than former migrants, and current migrants experience less unemployment than former migrants. These significant differences may help to explain their much different smoking behaviors, but also highlight that current migrants are more positively selected than former migrants and this selectivity should be accounted for when predicting smoking behavior.

Table 2 displays the principal findings of this research. The first model compares the smoking behavior of all Colombian migrants, both former migrants and current migrants, to test whether migrants are more likely to smoke. The analysis also distinguishes between former and current migrants, as their smoking behaviors might be distinct due to the selectivity just detailed. Both models predict the likelihood of smoking at the time of the survey. The analyses included both household heads and their spouses, as the dependent variable was only collected for household heads and their spouses. Both models use binary logistic regression to predict whether respondents smoked at the time of the survey and robust standard errors are used to correct for clustering. The coefficients are provided, and the exponent is taken to exhibit the effect of each variable.

The first model shows that former migrants were 1.733 times more likely than non-migrants to smoke at the time of the survey (significant at the 0.05 level). However, current migrants were not statistically more likely to smoke than non-migrants. The model also shows that migrants taking a domestic trip were 22.5% less likely to smoke than those who did not take a domestic trip (significant at the 0.05 level).

The model accounted for whether respondents smoked at age 18. There was a robust relationship between smoking at age 18 and smoking at the time of the survey, as those who smoked at age 18 were 16.18 times more likely to smoke at the time of survey (significant at the 0.01 level).

The model accounts for human capital, wealth, and unemployment. Education is negatively related with the likelihood of smoking, as each year of education is associated with a 3.6% decrease in the likelihood of smoking (significant at the 0.05 level). Those who own a business are 24.8% less likely to smoke than those who do not own a business (significant at the 0.05 level). Those who were unemployed when last in Colombia are 31% less likely to smoke (significant at the 0.01 level).

There are some important differences at the community level. Those from small towns and ranchos are 34.7% less likely to smoke than those from metropolitan areas and smaller urban areas (significant at the 0.05 level). Each death within a community is associated with

0.00007% less smoking (significant at the 0.01 level). Those from Cundinamarca are about 2.04 times more likely to smoke than those from Risalda, which is the reference department (significant at the 0.01 level).

Table 2. Logit regression predicting smoking.

	All Respondents			Migrants		
	B	**Robust SE**	***p***	**B**	**Robust SE**	***p***
Migration						
Former migrant	0.550	0.247	0.03	2.642	0.643	0.00
Current migrant	−0.386	0.273	0.16	--	--	
Domestic trip	−0.254	0.119	0.03	−0.678	0.472	0.15
Duration of last international trip	--	--	--	0.220	0.096	0.02
Duration of last international trip^2				−0.006	0.003	0.05
United States	--	--	--	0.179	0.933	0.87
Spain	--	--	--	0.786	0.957	0.41
Latin America	--	--	--	0.197	0.868	0.82
Demographic						
Age at time of survey	−0.009	0.005	0.08	−0.023	0.022	0.29
Female	0.124	0.149	0.40	−0.107	0.406	0.79
Married	0.020	0.177	0.91	0.416	0.468	0.37
Children	−0.026	0.034	0.44	0.012	0.181	0.95
Past smoking behavior						
Smoked at age 18	2.784	0.125	0.00	2.817	0.408	0.00
Human capital and wealth						
Education	−0.036	0.017	0.03	−0.032	0.060	0.59
Owns home	−0.152	0.125	0.22	−0.168	0.400	0.68
Owns business	−0.285	0.139	0.04	−1.097	0.506	0.03
Amenities	−0.051	0.032	0.11	−0.011	0.130	0.93
Unemployed	−0.372	0.133	0.01	−0.140	0.593	0.81
Unemployed last trip	--	--	--	0.541	0.772	0.48
Community						
Pueblo	−0.425	0.208	0.04	−0.581	0.931	0.53
Deaths	−0.000	0.000	0.00	−0.000	0.000	0.20
Quindío	0.417	0.261	0.11	−0.424	1.095	0.70
Cundinamarca	0.715	0.282	0.01	1.659	0.782	0.03
Caldas	0.146	0.264	0.58	0.069	1.088	0.95
Valle	0.025	0.219	0.99	0.657	0.701	0.35
Atlántico	−0.277	0.222	0.21	0.087	0.771	0.91
Interviewed Abroad						
Informant	−0.214	0.120	0.08	0.454	0.438	0.30
Constant	−1.094	0.424	0.01	−4.500	2.153	0.04
N	4495			526		
Psuedo R^2	0.26			0.28		

[4].

The second model in Table 2 predicts the smoking of migrants at the time of the survey. Although the first run in Table 2 shows that former migrants are more likely to smoke than non-migrants, model 2 addresses whether former and current migrants differ in their smoking behaviors. The models predicts smoking at the time of the survey.

The second row in Table 2 provides the coefficients for the binary logistic regression predicting smoking at the time of the survey. Former migrants are 14.04 times more likely to smoke than those who are currently migrants (significant at the 0.01 level). There is a positive relationship between the duration of the last international trip and smoking and the squared term shows that the returns decrease through time (both coefficients are significant at the 0.05 level). The predicted probability was plotted to evaluate the relationship and

there was a steady increase in the probability of smoking with time abroad, but this increase started to slope downward at 8 years abroad and was quite small by 14 years abroad.

The model controls for whether migrants smoked at age 18. Those who smoked at age 18 were 16.72 times more likely to smoke at the time of the survey than those who did not smoke (significant at the 0.01 level). It is important to control for migrants' early behavior when considering the impact of migration on smoking.

Two more relationships are statistically significant in terms of predicting smoking at the time of the survey. Those who own a business are 66.7% less likely to smoke than those who do not (significant at the 0.05 level). Additionally, those who are from Cundinamarca are 5.25 times more likely smoke as compared to those from Risalda (significant at the 0.05 level).

Comparing former and current migrants indirectly accounts for the selectivity of migration and the salmon effect. The fact that former migrants had an increased likelihood of smoking relative to non-migrants and current migrants suggests that there may be a salmon effect for smoking. However, given that the smoking behavior of current migrants does not differ much from that of non-migrants suggests that there is little evidence for the positive selection of current migrants in terms of smoking.

7. Discussion and Conclusions

Previous research focusing on the smoking behavior of migrants has found that the longer migrants remain abroad, the greater their likelihood of smoking [17]. This finding is consistent with assimilation theory, which predicts that the longer migrants are in a country, the closer their behaviors will resemble that of the receiving society. The current study finds support for the prediction that the longer a migrant remains abroad, the greater their likelihood of smoking, but the relationship tapers off after about 8 years and is small by 14 years. This relationship is significant in light of the fact that former migrants are abroad on average for 5.7 years while current migrants spend 15 years abroad. The findings show that the migration process increases the smoking behavior of migrants which may in turn harm their health. The findings suggest a correlation between migration and smoking, but without an experimental design or quasi-experimental design do not establish a definitive causal relationship due to the possibility of other uncontrolled underlying factors explaining away the relationship. Additionally, this study controls for migration behavior, demographic controls, human capital and wealth, and the region of Colombia, but the LAMP data do not provide measures of stress levels, mental health, cultural integration processes, anti-smoking regulation, or public health campaigns that might also impact smoking behavior.

Several studies looking at the relationship between health and migration found that the relationship between acculturation and health is highly gendered [3,21–23]. The models presented in Table 2 control for gender, but gender is not statistically significant. In addition, interactions were evaluated with regard to the relationship between the duration of the last international trip and smoking by gender, which was not statistically significant. Although the literature provides evidence that the relationship between acculturation and health differs for men and women, the findings from these analyses do not provide support for the argument with regard to smoking for Colombians. Instead, the findings show that the process applies to all Colombian migrants regardless of gender.

Few studies reporting that acculturation is positively associated with smoking account for migrant selectivity and the salmon effect. The findings of this study are consistent with previous studies in that the longer the duration of the trip, the greater the likelihood of smoking, even after accounting for selectivity and the salmon effect. The findings do not provide evidence of immigrant selectivity in terms of smoking. However, there is evidence of the salmon effect, as former migrants are more likely to smoke than Colombians who never migrated, even after controlling for the length of trip, destination, demographic characteristics, past smoking behavior, human capital and economic wealth, and community

effects. These findings are in line with the expectation that returning migrants might be negatively selected in terms of smoking.

In line with the immigrant health paradox, migration might be associated with economic benefits from foreign employment, but migrants may experience negative health consequences as a result of the initiation of smoking. If migrants begin smoking as a result of migration, they are exposing themselves to the many negative health consequences associated with smoking. Given that smoking is the leading cause of preventable death in the United States [36], this may mean lung cancer and a shorter life expectancy.

International migration has been portrayed as a beneficial tool for migrants to meet their needs in the sending communities. This study's findings show that migration may result in negative health outcomes including smoking. While sending countries such as Colombia may benefit from the migradollars associated with migration, they also have to contend with the possible negative health outcomes associated with smoking, such as increased cancer rates, when migrants return to Colombia [36]. Migration is typically viewed through a cost/benefit analysis, and the associated health consequences should be part of the discussion. Additionally, sending countries may need to invest in health care and smoking prevention programs to contend with this behavior.

Since the study is able to account for health selectivity and the salmon effect, it provides a more accurate assessment of the impact of migration on the likelihood of smoking among migrants than previous studies. Although previous studies, mostly based on data collected in the receiving country, indicate that migrants are generally less likely to smoke than natives and that their likelihood of smoking increases the longer they remain in the receiving country, such studies do not account for health selectivity or the salmon effect. The current study's findings about Colombians are consistent with previous studies looking at other national origin groups, despite correcting for the health selectivity of migration and the salmon effect.

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