

# The Effect of Social Support on Prenatal Smoking in Romania

## Economics 399

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Smoking is one of few controllable risk factors for pregnancy and it is associated with poor health outcomes for mothers and children. While prenatal smoking is now low in many places, Eastern European countries continue to see high prenatal smoking rates. My study explores the effect of women's social support on prenatal smoking decisions, a relationship that has not been explored in the context of Romania. To do this I use probit models, which allow me to determine the likelihood that a woman is a current or recent smoker, depending on her level of social support. I find that some facets of social support are more protective against smoking than others, such as the number of people that a woman can count on for recognition of her talents and skills. I also find that having a medium level of social support (e.g., three or four people to count on for support) is just as, if not more effective, than having a high level of social support (e.g., five people or more to count on for social support). I then assess whether the effects of social support on smoking behaviors can be explained by a decline in stress. I find that stress is not a statistically significant predictor of reduced smoking and that social support remains statistically significant when stress is included in the model. While social support is directly linked to a lower probability of women smoking six months before pregnancy, I find little evidence to suggest that it encourages women who smoke within the six months before pregnancy or during her pregnancy to quit. While I cannot reach any causal conclusions, I do conclude that Romania should look further into the social support systems that pregnant women have when assessing how to improve prenatal smoking behaviors.

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## I. Introduction

Smoking during pregnancy is one of few controllable risk factors for poor birth outcomes and poor childhood health, yet it remains prevalent in many societies (Holtrop, Meghea, Raffo, Biery, Chartkoff, Roman, 2010). This health behavior is associated with pregnancy complications, low birth weight, and preterm birth, as well as other poor health outcomes (Lumley, Chamberlain, Dowswell, Oliver, Oakley, Watson, 2009). Postpartum maternal smoking also exposes children to secondhand smoke (SHS), which, in turn, further deteriorates their own health and increases their chances of smoking later in life (Been, Nurmatov, Cox, Nawrot, Van Schayck, & Sheikh, 2014; Lumley et al., 2009; Jackson & Henriksen, 1997).<sup>1</sup> In the long run, children born to women who smoked during pregnancy and/or postpartum have higher rates of respiratory, physical, and behavioral issues (Holtrop et al., 2010).

Many high-income countries, specifically the United States (US) and those in Western Europe, have implemented a variety of programs to reduce prenatal smoking with focuses on health education, mental health, partner involvement, reduced nicotine addiction, and more (Lumley et al., 2009). In the US, 23 percent of women smoked three months before pregnancy in 2010 with 11 percent continuing to smoke during pregnancy (Center for Disease Control, 2010).

However, many countries in Central and Eastern Europe (CEE) do not have targeted interventions for pregnant smokers and continue to have high smoking rates today. In 2008, women's smoking rates in Romania reached a high of 41 percent, with 15 percent of women continuing to smoke while pregnant (Meghea, Rus, Rus, Holtrop, & Roman, 2012). In a more recent study, 24 percent of women sampled smoked six months before pregnancy and 15 percent of all women continued to smoke while pregnant (Meghea et al., 2012). So, while smoking rates

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<sup>1</sup> The postpartum period begins when the child is born and ends when the child is one year old.

prior to pregnancy decreased, smoking rates during pregnancy did not, which may indicate that women addicted to nicotine or those that previously smoked a high number of cigarettes per day were not reached.<sup>2</sup>

Most health outcomes related to smoking are not measured in Romania, but infant mortality rates (IMR) are, as continued smoking during pregnancy increases the chances of infant mortality (Kleinman, Piere, Madans, Land, & Schramm, 1987; Rantakallio, 1978). In Romania, the IMR steadily decreased from 64.1 deaths per 1,000 live births in 1968 to 31.2 deaths per 1,000 live births in 1985 when it started to increase again, as this was a time when health facilities offered poor quality care and Nicolae Ceaușescu's regime was arguably at its most repressive point, which I expand on in the next section (The World Bank Group, 2014A). IMR then decreased again in 1990 and has continued to decrease at a slow rate, reaching 10.5 deaths per 1,000 live births in 2013 (The World Bank Group, 2014A). While this decrease may seem like a success, Romania's IMR is much higher than many neighboring countries'. The Czech Republic, Hungary, and Ukraine have IMRs of 2.9, 5.2, and 8.6, respectively (The World Bank Group, 2014A). Additionally, the US's IMR is 5.9, making it almost half that of Romania's (The World Bank Group, 2014A). While IMR is related to many variables other than smoking, these statistics do serve as a useful frame of reference to show how smoking during pregnancy affects infants.

There is no consensus in Romania or most of CEE as to causes of prenatal smoking and there is a scarcity of current studies comprehensively characterizing pregnant women and their smoking behaviors and exposure to smoke in this region (Meghea, Rus, & Dirle, 2010; Lopez,

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<sup>2</sup> It is interesting that while women's smoking rates in Romania are much higher than those in the US, a similar percentage continue smoking while pregnant. This finding is further indicative that methods to decrease smoking do not often target pregnant women. However, I do not have time to expand on a cross-country analysis here.

Collishaw, & Piha, 1994; Thomas, Fayter, Misso, Ogilvie, Petticrew, Sowden, & Worthy, 2008; Gilman, Breslau, Subramanian, Hisman, & Koenen, 2008).<sup>3</sup> This paper attempts to fill this void by assessing the role of social support on pregnant women's smoking behaviors in Romania. I use probit models to assess whether social support is correlated with women's decisions to smoke six months prior to getting pregnant, and, conditional on smoking six months before pregnancy, whether social support is correlated with quitting within the six months before pregnancy or during pregnancy. I find that women with more social support (specifically women with more people to count on for guidance, friendship, help, comfort, recognition of talents and skills, and emotional support) are less likely to smoke six months prior to pregnancy. However, I find that social support does not influence women's decisions to quit within the six months before pregnancy or during her pregnancy. Having medium levels of social support (e.g., three or four people to count on for support) is just as effective at influencing smoking behaviors than having high levels of social support (e.g., five or more people to count on for support). I also assess whether social support affects smoking decisions indirectly by decreasing a woman's stress levels. I find that the coefficients on social support are virtually unchanged when I control for stress, which suggests that the effects of social support cannot simply be explained by a reduction in stress.

## II. Historical Context

First, I must look at Romania's historical context to fully comprehend why its smoking rates are as high as they were in many other countries three decades ago (Krstev, Marinkovic, Simic,

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<sup>3</sup> There is little consensus as to the causes of smoking during pregnancy in the US and other Western countries as well. However, one study attributes increases in women's smoking to increased social acceptance, liberalization of norms for women's behavior, rebelliousness, and potential weight loss (Waldron, 1991). These findings are not generalizable across societies, so I do not assume that these factors weigh heavily in Romania.

Kocev, & Bondy, 2012).<sup>4</sup> Romania was ruled by a communist government starting in 1947 until the Romanian people revolted in December of 1989. They overthrew Ceaușescu's regime in what is known as the December Revolution and replaced this regime with a semi-presidential republic. Before the revolution, all social institutions, including healthcare, were publically owned, were of poor quality, and were highly centralized. The government infringed upon many of women's sexual and reproductive health (SRH) rights, did not offer health education during or after pregnancy, and outlawed abortion (Hord, David, Donnay, & Wolf, 1991). So, there was no information regarding the harmful effects of smoking, little incentive for women to receive prenatal care, and a fear of the formal medical system.

Since the revolution, most health policy has focused on rebuilding the health system's infrastructure (i.e., free access to medical care in state-owned institutions) rather than on changing health behaviors (i.e., increasing breastfeeding), so most care is geared towards curative physical health in urban areas rather than preventative education that is transferrable throughout the country (Hord et al., 1991).<sup>5</sup> Romania has no central protocol for health-related information given during prenatal care, and while most women are told that smoking is bad for their child's health during prenatal appointments, they are neither given guidance on how to quit nor are told about how grave the consequences from continued smoking can be.

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<sup>4</sup> For a comparison of smoking rates, the US states had an adult smoking rate of 42.4 percent in 1965, 30.1 percent in 1985, 24.7 percent in 1995, 20.9 percent in 2005, and 19.0 percent in 2011 (Centers for Disease Control and Prevention, 2013). The smoking rate in Romania as of 2011 was 26.7 percent for all adults but was over 37 percent for males (Irimie, 2011).

<sup>5</sup> One consequence of the healthcare system's focus being on urban areas is that the IMR is double for rural areas and minorities (i.e., Roma) (UNICEF, 2014). This is important in my later empirical tests, as location is a covariate in my regression analyses. While I do have observations for those of Roma ethnicity (a marginalized minority), there are too few observations to conduct quantitative analysis on them, but I do include their descriptive statistics in Tables 1, 2, and 4.

Early efforts to decrease smoking lacked conviction (e.g., the Tobacco Control Program), as the health system was uninvolved, the price of cigarettes did not increase, and no actors had a vested interest in lowering smoking rates. In 2005, the Ministry of Health (MOH) began the national program, 'Stop Smoking,' and the World Health Organization (WHO) introduced the Framework Convention on Tobacco Control (FCTC), which showed smoking in a bad light but did not cater to pregnant women and subsequently caused no decrease in Romania's smoking rates (Webb, 2013).

Additionally, Romania's newly liberalized economy allowed multinational tobacco companies to enter the country starting in 1989, gain political power, and advertise smoking as a sign of feminism, all of which increased social pressure for women to smoke (David, Esson, Perucic, & Fitzpatrick, 2010). The combination of the health sector's lack of preventative healthcare and the country's lack of tobacco control have increased Romania's already high smoking rates. This increase is most pronounced for women, as female tobacco usage increased from 11 to 25 percent from 1989-2000 and as smoking rates are even higher for women of childbearing age (Irimie, 2011).<sup>6</sup> In one study conducted in 2008, smoking among women of childbearing age was 41 percent with 15 percent of all women smoking while pregnant (Meghea, 2012).

It was not until smoking became more expensive in 2010 through an increase in the excise tax along with an increased exchange rate with the Euro and an economic crisis that smoking rates began to decrease for all socioeconomic groups (Thomas et al., 2010). Yet, smoking rates in Romania remain around 30 percent (smoking rates for women ages 25-44 remain around 24

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<sup>6</sup> Specifically, between 1995-2000, women's smoking rates increased from 15.2 percent to 25.0 percent while men's smoking rates increased from 42.7 percent to 48.0 percent (Irimie, 2011). So, while men smoke more than women, women experienced a much larger percentage increase in smoking rates after communism fell.

percent), as high as those of the West three decades ago (Irimie, 2011; Krstev et al., 2012). Additionally, the Romanian government was one of only four countries to vote against the Tobacco Products Directive negotiations in the European Union (EU) in 2013, indicating that Romania still lacks the political clout to end smoking (Joossens & Raw, 2014).

### III. Literature Review

An important risk factor affecting smoking during pregnancy is the lack of a spouse, friends, and family that provide psychological and material resources to women (Cohen & Wills, 1985; Meghea et al., 2010; Connor & McIntyre 1999; Harley & Eskenazi, 2006; Elsenbruch, Benson, Rucke, Rose, Dudenhausen, Pincus-Knackstedt, Klapp, & Arck, 2007). Social support is defined as the presence of psychological resources, particularly social stability and social participation, which provide emotional and instrumental support to women (Glazier, Elgar, Goel, & Holzapfel, 2004). Supportive social relationships promote healthy behavioral change, so a lack of social support likely perpetuates unhealthy behaviors (Cohen, Mermelstein, Kamarck, & Hoberman, 1985). This study uses the Social Network Support Scale to measure social support, which has been modified from the Lubben Social Network Scale.<sup>7</sup> I thus focus on how social support can potentially serve as a mediating factor for women to smoke during pregnancy.

#### *Types of Social Support*

The literature considers two types of social support: structural and functional support. Structural support is defined as a numerical measure of social relationships and social network size (e.g., the quantity of support) while functional social support is defined as an individual's own perception of the support available or support received (e.g., the quality of support) (Harley

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<sup>7</sup>Other metrics that are proven to measure social support are the Functional Social Support Questionnaire and the Norbeck Social Support Questionnaire (Harley & Eskenazi, 2006; Schaffer & Lia-Hoagberg, 1997).



& Eskenazi, 2006). Some studies focus on the effect of the number of social relationships on women's smoking decisions. For example, Meghea et al. (2010) finds that women with no one to help with the baby have a higher probability of continued smoking during pregnancy than those that do. However, other studies find that a high number of social relationships is not indicative of support, claiming that a structural measure does not suffice and that we need to look at the quality of social support, not the quantity of social support that a woman has (Berkmann, Glass, Brissette, & Seeman, 2000).

For example, Harley and Eskenazi's study (2006) finds that married women are less likely to continue smoking during pregnancy. If women have a supportive husband and are less likely to smoke, they have functional support (e.g., they have a high quality of social support), but if there is an effect solely from being married, the women have structural support (e.g., they have a higher quantity of social support than unmarried women). When the authors measured both marital status and the husband's social support, they found that a husband's social support does not influence the wife's smoking rates but being married does, indicating that the husband provides only structural support (Harley & Eskenazi, 2006). By separating out marriage and social support the authors were able to extract quality of support from quantity of support and found that being married provides a high quantity, not quality of support.

Studies that measure functional support specifically found a strong, negative relationship between social support and smoking behaviors, meaning that women with high levels of social support typically smoke less (Orr, Blazer, & Orr, 2011; Bradstreet, Higgins, Heil, Badger, Skelly, Lynch, & Trayah, 2012; Harley & Eskenazi, 2006). However, all of these studies have been conducted in the US, emphasizing the need for similar studies to be done in an Eastern

European context as social support may function differently here.<sup>8</sup> Orr's study (2011) found that women without functional support did not seriously consider quitting or attempting to quit.

Bradstreet's study (2012) found that those with more non-smoking friends and family had lower levels of social discounting (e.g., they decreased their generosity hyperbolically within a social network) and Harley and Eskenazi's study (2006) found that those with increasing functional social support were less likely to smoke during pregnancy.<sup>9</sup> Thus, the more functional support that pregnant smokers had, the more likely they were to consider and attempt quitting, have lower social discounting (e.g., a greater likelihood of quitting), and actually quit.<sup>10</sup>

### *Social Support Mechanisms*

In addition to my primary question regarding social support's affect on prenatal smoking, I analyze the different mechanisms through which social support could affect smoking rates. It is largely accepted that smoking is associated with high stress levels, so some studies claim that social support is protective in regards to smoking behaviors by buffering the impact that life stress has on a mother's emotional well-being (Glazier et al., 2004; Schaffer et al., 1997; Meghea et al., 2010; Goedhart, Van der Wall, Cuijpers, & Bonsel, 2008). These studies claim that when a woman has high social support levels, she has lower stress levels, which, in turn, give her a

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<sup>8</sup> For example, Romanians typically report a significantly greater number of family members they feel close to than other Europeans or Americans, so it is possible that they rely on social support more for their mental health than those in other countries do (Coleman, Carare, Petrov, Forbes, Saigal, Spreadbury, Yap, & Kendrick, 2011).

<sup>9</sup> Social discounting is a significant predictor of smoking status, and is defined as the degree to which one discounts generosity within a social network (Bradstreet et al., 2012). It was used to assess the amount of hypothetical money a person is willing to give up to share with individuals in their social network from the person emotionally closest to them to a mere acquaintance (Bradstreet et al., 2012). The amount women are willing to forgo to share decreased hyperbolically as a function of social distance and smokers had steeper social discounting functions (e.g., less generosity) than quitters or nonsmokers (Bradstreet et al., 2012).

<sup>10</sup> Unfortunately, both of these studies and my study are not able to isolate whether or not those providing functional social support to women are smokers or not themselves.

lower likelihood of smoking during pregnancy. This stance is further supported by a study involving alcohol in which social support increased women's self-efficacy and self worth, which then lowered stress levels and ultimately lowered alcohol-related hospital admission rates (Booth et al., 1992).<sup>11</sup>

However, other studies claim that social support directly influences health behaviors regardless of stress levels (Harley & Eskenazi, 2006). This hypothesis has led to more mixed results. While some studies have controlled for mental health and other measures of wellbeing and find that social support still influences smoking directly, others find that social support only decreases smoking indirectly through stress or even increases smoking depending on the type of social support measured (Schaffer et al., 1997; Aaronson, 1989).

Thus, while there is consensus that social support influences smoking decisions during pregnancy, there is not consensus as to the pathways through which social support functions. These potential mechanisms are important to consider and I address them later in the paper. Also, it is important to remember that pathways between social support and smoking may differ by context and, as most of these studies have been done in the US, may not be transferrable to Romania.

#### IV. Data, Descriptive Statistics, and Correlations

##### *Data*

The primary data source for this paper is Advancing Maternal and Child Health in Romania: an integrated assessment of the determinants of pregnancy outcomes, also known as the MAIA project. This study was conducted at Babes-Bolyai University's Center for Health Policy and

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<sup>11</sup> Smoking and drinking are often considered to be complementary but, because smoking is much more prevalent in Romania, I focus on this. Additionally, rates of alcohol consumption in my data source are incredibly low, so I cannot analyze them further.

Public Health in Cluj, Romania in the department of Community and Behavioral Health from 2012-2014. The timing of this research is ideal because it comes at a time when women in Romania are smoking at high rates but are beginning to see and respond to incentives to quit.

The MAIA questionnaire, given to pregnant women 18 years and older, has 1,395 observations at the individual level and contains smoking, demographic and socioeconomic, pregnancy, and mental health indicators. The survey was conducted at five public hospitals in the Cluj region of Romania, was completely voluntary, and contains self-reported data. For the smoking variable, women were asked if they were a smoker six months prior to pregnancy.<sup>12</sup> If the women answered ‘yes,’ they were asked if they were current or recent smokers. Options included: ‘smoking as much as before,’ ‘smoking a reduced number of cigarettes,’ ‘quit after learning about the current pregnancy,’ and ‘quit before learning about the current pregnancy.’ Women were then asked about their levels of SHS exposure on a daily basis and whether or not they lived with a smoker, both of which allow me to assess how risk factors may differ between direct and indirect smoke exposure.

Basic demographic and socioeconomic questions measure age, education level, ethnicity, urban or rural residence, marital status, and income while pregnancy indicators measure the wantedness of pregnancy and whether or not the woman has other children. I measure social support by the Social Network Support Scale and stress levels by the Perceived Stress Scale (PSS). The Social Network Support Scale targets functional social support, or, the ‘peer effect’ (Hoxby, 2000). This scale has six sub questions that address the number of people that women can count on for specific facets of social support (measured as: zero, one or two, three or four,

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<sup>12</sup> This is an important indicator, because even if women did not smoke six months prior to pregnancy, they may have smoked earlier in life and may still have health problems after giving birth depending on how long they smoked for and they may have a high risk of relapsing after pregnancy (Meghea et al., 2012; Flemming, Graham, Heirs, Fox, & Sowden, 2012).

and five or more people): advice and guidance, friendship, comfort and welfare, help and accountability, recognition of talents and skills, and closeness and emotional stability.<sup>13</sup> While the Social Network Support Scale is measured by conglomerating these six facets of social support into a scale that ranges between zero and 18, I am able to break the scale down into its six components, which I describe later.

### *Descriptive Statistics*

In all descriptive statistics tables (Tables 1-4), the results for the entire MAIA survey are in the left panel and results for the subsample I use are in the right panel.<sup>14</sup> Both panels are displayed in order to see whether or not my sample is representative of the survey. My subsample (N=1,119) includes all observations that contain data for every variable in my regressions and draws only from the MAIA survey.<sup>15</sup> In regards to outcome variables (as shown in Table 3), approximately 30 percent of women smoked six months prior to pregnancy, and 14 percent of all women smoked during pregnancy (45 percent of women smoking six months prior to pregnancy continue to smoke). Of the 30 percent that smoked six months prior to pregnancy, five percent continue to smoke the same amount, 41 percent smoke less than they did before, 45

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<sup>13</sup> While the Social Network Support Scale does measure the number of people that women can count on, it measures the number that provide them with a high quality of support, thus measuring functional rather than only structural support.

<sup>14</sup> As I stated before, for both panels in Tables 1, 2, and 4 I show the descriptive statistics for the Roma specifically. The Roma are a very marginalized minority in Romania and the way in which their social support influences their smoking decisions may be different than how the majority population's social support does so. While there are not enough Roma observations in my sample to conduct analyses on them (N=28), I insert some of their descriptive statistics as a point of reference.

<sup>15</sup> My subsample includes all observations with entries for smoking, social support, education level, marital status, income, and SHS exposure. I do include descriptive statistics for age, unwanted pregnancy, and having other children, but my subsample is not based on these indicators because doing so restricts my sample size and there is not strong enough theory to justify including them. Later, when I introduce stress into the model, my subsample decreases to N=1,024.

percent quit after learning about their current pregnancy, and nine percent quit before learning about their current pregnancy (e.g., with the six months before they were pregnant). In my subsample the statistics for smoking are similar, with about 29 percent smoking six months before pregnancy and 44 percent of prior smokers continuing to smoke during pregnancy. About 50 percent of women in the entire survey are not exposed to SHS daily (which is the same as in the subsample) while the other 50 percent are. Of those that are exposed to SHS on a daily basis, 40 percent are exposed for less than half an hour a day and the remaining 60 percent are exposed for over half an hour a day. Fifty-nine percent of women do not live with a smoker while the remaining 41 percent live with at least one. This variable is similar in the subsample, with about 60 percent of women living with at least one smoker.

As shown in Table 1, the average age of women is 30 years old (Romanian women's average age at first birth is 26), 55 percent of women have had education beyond high school (this seemingly high percentage of women with a post high school education is common for formerly communist countries), 81 percent are ethnically Romanian, 34 percent are rural (the country is 47 percent rural), most have what is considered to be an average Romanian income (their income convergence is common in formerly communist countries), and over 85 percent are married (Central Intelligence Agency, 2011). As seen in Table 2, 73 percent of women wanted their pregnancy at this time, and over 80 percent have at least one other child. All of these percentages are for the entire survey and are comparable to those in the subsample.

Social support levels (my independent variables of interest) are split into their respective sub-questions, with the majority of women in the survey and the subsample having either medium or high levels of support. As a reminder, women listed how many people they could count on for each of these facets of social support (zero, one or two, three or four, or five or

more) and those that answered either nobody or one to two were categorized as having low social support, those that answered either three to four were categorizing as having medium social support, and those that answered five or more were categorized as having high social support. Shown in Table 4, about 35 percent of women have medium levels of advice and guidance while another 43 percent have high levels, over 70 percent have medium-high levels of friendship, about 30 percent have a medium sense of comfort and welfare while another 50 percent have a high sense, about 37 percent have medium levels of help while 43 percent have high levels, about 28 percent have medium recognition of their talents and skills and 53 percent have high recognition, and about 35 percent have medium levels of closeness and emotional stability while 41 percent have high levels.<sup>16</sup> So, for all facets of social support, the majority of women said that they had either medium or high levels of social support with only about 20 or 30 percent of women claiming that they have low levels of social support.

### *Conditional Probabilities*

Conditional probabilities between social support, smoking status, and various individual characteristics (e.g., marital status and having other children) are presented in Tables 5 and 6. Table 5 reports the probability that a woman is married, has other children, and is either a current smoker, has reduced her smoking, or is a former smoker (also referred to as a prior smoker or a quitter), given her levels of social support. For a switch from low to high social support there is a seven percentage point increase in being married, a four percentage point increase in having other kids, a four percentage point decrease in being a current smoker, a three percentage point decrease in having reduced the number of cigarettes smoked per day, and a seven percentage

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<sup>16</sup> I cannot split friendship into medium and high levels due to data coding issues. All women with three, four, or five or more people to rely on for friendship are coded as having only three or four people to rely on.

point decrease in having been a prior smoker, all of which are similar to the correlations within the subsample.<sup>17</sup>

Table 6 reports the probability of a woman being married, having other children, and having a high level of social support given her smoking decisions. Forty-eight percent of current smokers have high social support, while 53 percent of those that have reduced smoking do, 54 percent of those that quit either in pregnancy or within six months of becoming pregnant do, and 61 percent of those that did not smoke six months before pregnancy do. So, as smoking behaviors improve, social support increases. This relationship is similar in the subsample with 52 percent of smokers, 53 of reduced smokers, 55 percent of quitters, and 62 percent of nonsmokers having high social support. There is no clear association between smoking decisions and having other children. Sixty-one percent of current smokers are married, 64 percent of reduced smokers are married, 83 percent of quitters are married, and 91 percent of nonsmokers are married, so there is a strong association between reduced smoking and being married. Again, this relationship is similar in the subsample.

### *Correlations*

I then look at the correlation coefficients for the social support scales, which are reported in Table 7. Most facets of the scale are highly correlated (between .40 and .60), as I would expect them to be given that they are all elements of a woman's social support. Comfort and guidance, help and guidance, help and comfort, emotional support and comfort, and emotional support and help are all very highly correlated, with coefficients of .60 or greater. Because the regressions each target a different facet of social support, these coefficients are not too concerning, but they

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<sup>17</sup> Low social support is defined as women ranking between zero and 12 on the social support scale and high social support is defined as women ranking between 13 and 18 on the social support scale. As I described earlier, I break down this scale into facets of social support in my main analysis, but, for the sake of simplicity, I use the scale to look at conditional probabilities.



may indicate that comfort and help (because they are very highly correlated with other elements) may not be the strongest predictors of social support.<sup>18</sup> Regardless, as these variables are not completely multicollinear, it is important to split up the social support scale into its components because they may measure different facets of social support.

## V. Empirical Model and Results

### *Modeling Social Support*

My study uses probit regression in order to look at a binary dependent variable constrained between zero and one (i.e., smoking within the six months leading up to pregnancy versus not smoking six months before pregnancy) and then estimates the maximum likelihood that a woman will switch categories from zero (e.g., not smoking) to one (e.g., smoking). I report the marginal effect, which is the probability for an infinitesimal change in each continuous independent variable and for a discrete change in the probability for dummy variables. I also use linear probability models to see whether or not there is a difference between the two models, and find similar results using both specifications.<sup>19</sup> For simplicity, I focus my discussion on the probit results.

### *Not Smoking Six Months Before Pregnancy: Without Controls*

First, I use a probit regression with the following model:

$$(1) \text{Nonsmoker}_i = \Phi(\alpha + \beta_1 \text{SocialSupport}_i + \varepsilon_i),$$

where  $\text{Nonsmoker}_i$  indicates that the woman did not smoke six months prior to pregnancy. I first run the regression without controls to see how social support is correlated to a woman's decision

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<sup>18</sup> While I did run probit regressions with different combinations of the social support sub-questions as my variables of interest, no results were particularly informative. So, for the sake of simplicity, I do not describe them further.

<sup>19</sup> Please see the Appendix for both the results from (Table 1) and discussion of the linear probability model that measures how social support affects women's decisions to smoke six months before pregnancy.

to have smoked six months before pregnancy. I run the regression separately for the number of people that provide the woman with guidance, friendship, comfort, help, recognize their talents and skills, and provide the woman with emotional support. First, these categories are measured on a scale as low, medium, and high with women that have zero, one, or two people to count on for these facets of social support being low, women that have three to four people to count on for these facets of social support being medium, and women that have five or more people to count on for these facets of social support being high. Probit results are reported in Table 8 Panel A in the row 'No Controls.'

Women with medium levels of guidance (rather than low levels of guidance) are four percentage points more likely to have not smoked six months before pregnancy, women with medium-high friendship are six percentage points more likely to not have smoked, women with medium comfort are four percentage points more likely, women with medium help are five percentage points more likely, women with medium recognition of talent are six percentage points more likely, and women with medium emotional support are five percentage points more likely. Seventy percent of women did not smoke six months before pregnancy so women having medium levels of social support increase their likelihood of not having smoked at least six months before pregnancy from about 0.70 to approximately 0.75. Because I measure facets of social support on a scale, the effect of moving from medium to high levels of social support is double the effect of from moving from low to medium levels of social support. So, women with high levels of guidance are then four percentage points more likely to have not smoked six months before pregnancy than those with medium levels of social support and are then eight percentage points more likely to have not smoked six months before pregnancy than those with low levels of social support. This relationship holds true for other facets of social support as well.

### *Not Smoking Six Months Before Pregnancy: With Controls*

While the baseline regression is a useful frame of reference, it is important to control for individual characteristics that may influence a woman's decision to smoke during pregnancy other than the amount of social support that they have. The new regression is as follows:

$$(2) \text{Nonsmoker}_i = \Phi(\alpha + \beta_1 \text{SocialSupport}_i + X\beta_2 + \varepsilon_i),$$

where X includes individual characteristics such as education (bachelor's degree or higher versus high school or lower), urban residence status, marital status, income (making the Romanian Leu equivalent of \$465 or more versus making the equivalent of less than \$465), and SHS exposure (being exposed to SHS daily versus not being exposed daily). Finally,  $\varepsilon$  indicates the error term, which captures unobserved characteristics. In regards to the controls, I expect that someone who is more educated, living in a rural environment, married, wealthier, and not exposed to SHS daily will smoke less than their counterparts. Ebrahim, Floyd, Merritt, Decoufle, and Holtzman (2000) find that women that are more educated and are married are less likely to smoke both while pregnant and while not pregnant in the US and Fukuda, Nakamura, and Takano (2004) find that people that are wealthy are less likely to smoke in Japan.

Additionally, Irimie (2011) finds that in Romania more people in urban areas smoke and that more smokers are exposed to SHS than nonsmokers. Studies also find that younger people are more likely to smoke, women with unwanted pregnancies are more likely to continue smoking during their pregnancy, women with other children are more likely to continue smoking during pregnancy, and women in their first pregnancy are more likely to relapse if they smoked before pregnancy (Fukuda et al., 2004; Hellerstedt, Pirie, Lando, Curry, McBride, Grothauy, & Nelson, 1998; Cnattingius, 2004; Connor & McIntyre, 1999).

Probit results from regression (2) are located in Table 8 Panel A in the second row. Here, being recognized for talents and skills is statistically significantly associated with not having smoked six months prior to pregnancy but all other sub questions of social support are not significant. Specifically, women with three or four people that recognize them for their talents and skills are three percentage points more likely to have not smoked six months prior to pregnancy than are those with zero, one, or two people that recognize them for their talents and skills. This means that women with five or more people that recognize them for their talents and skills are then six percentage points more likely to have not smoked six months prior to pregnancy than those with zero, one, or two people to recognize them for their talents and skills.

*Not Smoking Six Months Before Pregnancy: Nonlinear Effects*

There may be differential effects depending on whether women have three to four people to count on for social support or five or more people to count on for social support. By previously measuring social support on a scale (zero, one, two), I forced the effect of having high support to be double that of medium support. I rerun the regressions with and without controls and allow for medium and high levels of social support to have different effects. The coefficients for medium and high levels of all facets of social support are now large and statistically significant. However, because I am not able to separate out medium and high levels of social support for friendship, the results for friendship are the same as those from above. First I run the regressions without controls to establish initial relationships, which is shown in Table 8 Panel B in the first row. For most facets of social support, having medium support has a stronger effect than having high support, indicating that having a fifth person to rely on for support may not be important. Additionally, this fifth person may even indicate that a woman has too many people providing her with support (e.g., too high a quantity) so that quality of support decreases because the

coefficient from medium to high support actually decreases rather than stays the same for some facets of social support.

Women with either medium or high guidance are 11 percentage points more likely to have not smoked six months prior to pregnancy, and this relationship is similar for the different facets of social support. Thus, there is no consensus as to whether medium or high social support is more important. But, the coefficients on both are over twice as strong as the coefficients when I combined medium and high levels of support in Panel A and they are different from one another, so I separate medium and high levels of support for the remainder of my analysis.

When I introduce controls (e.g., educational status, urban or rural residence, marital status, income, SHS exposure) into this regression, social support coefficients mostly remained significant and all coefficients on medium levels of social support remained significant, indicating that having three or four people to rely on for support may be the most accurate social support measure. These results are in Table 8 Panel B in the second row. Having medium guidance makes women nine percentage points more likely to have not smoked six months prior to pregnancy while having high guidance makes women seven percentage points more likely, medium comfort makes women eight percentage points more likely, medium help makes women 11 percentage points more likely, medium and high talent both make women nine percentage points more likely, and medium emotional support makes women nine percentage points more likely. The remaining indicators lose their statistical significance when I introduce controls.

Because friendship loses statistical significance, it may be that having many friends is only a measure of structural support (quantity), not functional support (quality), which is why it is not statistically significant. The number of friends a woman has may only get at the quantity of social support a woman has but indicators such as the number of people providing women with

emotional support may get at the quality of support more directly. However, because I cannot separate medium friendship from high friendship, I cannot be sure that this is why, as most facets of social support were only significant once I separated medium and high effects.

As I said earlier, it is possible that high levels of social support may not be as important as medium levels of social support, which holds true when I introduce control variables. This could mean one of two things: (1) having a fifth friend to count on does not matter, or (2) having a fifth friend proxies for a woman having a high quantity of support but not a high quality of support.<sup>20</sup>

#### *Not Smoking Six Months Before Pregnancy: Stratified Controls*

The prior regressions control for many potential covariates, but it is possible that these covariates have differential effects. For example, the relationship between social support and smoking may operate differently for women with high education versus those with low education. To assess whether or not these effects are different, I run each regression with controls but stratify each regression by the level of the controls, the results of which are in Table 9. Table 9 Panel A shows high and low education, with women with high education typically having a stronger association between social support and smoking rates than women with low education. For women with high education, having medium levels of guidance makes them 13 percentage points more likely to have not smoked six months prior to pregnancy but for women with low education the effect is not statistically significant. This means that women with high education may benefit from having higher levels of social support but women with low education may not. For most facets of social support, this relationship remained stronger for women with

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<sup>20</sup> To test for whether or not medium and high levels of social support are statically different from one another, I run t-tests for all facets of social support, which are reported in the Appendix in Table 2. I find that only medium and high levels of comfort are statistically significantly different from one another, which may explain why many coefficients for medium and high support are similar or the same.

high education, but for some, having either high or low education is statistically significant, and for a couple (high help and high talent), only low education is statistically significant. Because I earlier established that medium levels of social support are robust to more specifications, I focus most on the relationship between controls and medium levels of support.

When I separate urban and rural areas (Table 9 Panel B), I find that for those living in an urban area, the relationship between social support and smoking status is strong but for those living in a rural area, the relationship is weaker. This may mean that for people living in an urban area, social support is more protective against smoking than for people living in a rural area. However, for those living in a rural area, measures of comfort, help, and talent are important.

When I separate women who are married from those who are not (Table 9 Panel C), I find that social support is more statistically significant for smoking when women are married. When women are not married, social support may not be as important. What is important here is that social support remains statistically significant when I restrict my sample to married women. This indicates that structural (quantity) support from being married exists as opposed to functional (quality) support, which I spoke about earlier.

For most measures of social support, having low income makes social support buffer against smoking but having high income does not (Table 9 Panel D). For example, for women with low income, having medium help makes them 22 percentage points more likely to not have smoked six months prior to pregnancy but for women with high income there is no statistically significant effect. This may mean that for people with low income, having social support is more helpful than for women with high income.

Finally, I separate out women that are exposed to SHS and those that are not (Table 9 Panel E). For women that are exposed to SHS daily, having medium guidance results in a 17

percentage point increase in the likelihood that the woman did not smoke six months prior to pregnancy. For women that were not exposed to SHS regularly, having medium comfort results in a 14 percentage point increase in the likelihood that the woman did not smoke six months prior to pregnancy. So, the relationship between social support and smoking does change depending on the type of social support studied.

### *Social Support, Smoking, & Stress*

Because there is a debate as to the mechanisms that social support functions through, I introduce stress into the probit model. By including stress, I am able to test whether social support directly influences women's smoking decisions or whether it only indirectly influences women's smoking decisions by buffering women's stress levels. If the variable for social support remains statistically significant, then there is a direct effect. If the variable for social support loses statistical significance and the variable for stress level is significant, then there is only an indirect effect. I split stress into high and low stress by using the mean response level for the PSS, as there is no established threshold by which to split the PSS.<sup>21</sup> By splitting the PSS at the mean, the actual categories for high and low stress are uninteresting but they are still useful for my analysis. The equation used here is the following and the results are reported in Table 10:

$$(3) \text{Nonsmoker}_i = \Phi(\alpha + \beta_1 \text{SocialSupport}_i + \beta_2 \text{StressLevel}_i + X\beta_3 + \varepsilon_i)$$

When controlling for stress but no other covariates, women with medium levels of guidance are 12 percentage points more likely to have not smoked six months prior to pregnancy than those with low guidance. Additionally, those with high stress are six percentage points more likely to have smoked six months prior to pregnancy than those with low stress. These results

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<sup>21</sup> The PSS ranges from zero to 40 and the mean response for this study is 14.35 and the median response is 14. Because the mean and median are so similar, I split the PSS at the mean level with low stress being zero to 14 and high stress being 15 to 40.



may indicate that both social support and stress directly influence women's smoking decisions. However, when I introduce covariates into the model (e.g., education, residence, marital status, income, and SHS exposure), the statistical significance on stress goes away but the statistical significance on social support stays the same. This indicates that the effect of stress on smoking is due to these other covariates and not to stress itself. Most importantly, because the social support indicator (e.g., guidance) remains statistically significant and the strength of the coefficient remains high, I conclude that social support directly effects women's smoking decisions. I see the same relationship for other facets of social support, with stress losing its significance when adding controls but social support remaining significant.

#### *Quitting Smoking Either During Pregnancy or Within Six Months of Pregnancy*

Next, I assess the effects of social support on a woman's decision to quit smoking within six months of becoming pregnant or during her pregnancy, conditional on her having smoked six months before pregnancy. I estimate equation (2) again, but this time I use *Quitter* as my dependent variable, making it equation (4):

$$(4) \text{ Quitter}_i = \Phi (\alpha + \beta_1 \text{SocialSupport}_i + X' \beta_2 + \varepsilon_i),$$

where *Quitter* indicates that a woman quit smoking either during pregnancy or within the six month time period before becoming pregnant. This allows me to assess whether social support predicts whether or not a woman smoking six months prior to pregnancy quits before or during pregnancy. Here my sample size is much smaller, only capturing women that are either currently smoking or have quit recently (N=326).

The results from these regressions are in Table 11. First, I run the regression with linear effects and find that once introducing controls, no facets of social support are statistically significant. Then, I run the regressions with nonlinear effects to see if a different relationship

exists when stratifying medium and high levels of social support. The relationship is much weaker here than when assessing the likelihood of not smoking six months before pregnancy. Here, women that have medium-high friendship, medium or high talent, or high emotional support are more likely to quit smoking than to continue smoking but there are no statistically significant results for other facets of social support.

When I control for education, living in an urban or rural area, marital status, income, and exposure to SHS, the significance for all facets of social support go away. However, the strength of the coefficients for some facets of social support is still fairly high. For example, those with medium levels of recognition of talent and skills are 10 percentage points more likely to quit than those with low levels. Medium and high levels of friendship and emotional support have similar results, but medium and high amounts of guidance, comfort, and help are not strongly associated with quitting smoking. Because there is no statistical significance here and the strength of the indicators varies greatly, I conclude that social support does contribute to women's decision to not smoke six months before pregnancy but does not contribute to women's decision to quit during pregnancy or within six months of getting pregnant rather than continuing to smoke when controlling for education, residence, marital status, income, and exposure to SHS.

## VI. Concerns

In the results above, I find that social support most influences women's decisions to smoke six months before pregnancy. However, one should be careful when interpreting these coefficients as causal effects of social support. Reverse causality is a large issue, as smoking rates may determine the amount and type of social support a woman has rather than the other

way around.<sup>22</sup> I also worry about omitted variables, especially those related to women's personalities, as these variables likely impact both the features of women's social networks and how she responds to health information about smoking.

There are large issues with self-reporting, as women's responses about their smoking status are likely biased downward and women's responses about the number of people they can rely on for social support are likely biased upwards. Additionally, the women were interviewed at different stages in their pregnancy, which may affect women's answers regarding smoking. However, prior studies have found that a variable for the week of pregnancy at interview is not statistically significant (Meghea et al., 2012).

Because the data only captures women who are 18 years and older, it misses many teen pregnancies, which make up approximately three percent of live births in Romania (The World Bank Group, 2014B). These teen pregnancies are disproportionately Roma, so discarding them makes the sample less representative of all people in Romania but likely does not impact the relationship between social support and smoking for ethnically Romanian women. Abortion rates are incredibly high in Romania, as abortion was outlawed during communism when Ceaușescu advocated for a pronatalist state and is now used at a very high rate (David & Baban, 1996). The year after communism fell there were over 3,000 abortions for every 1,000 live births and there are still almost 480 for every 1,000 live births (Hord et al., 1991; UNFPA, 2013). This means that the MAIA data does not capture all pregnancies because many unwanted pregnancies are terminated.

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<sup>22</sup> Splitting the social support scale into its respective sub-questions may help to correct for this. For example, the question targeting the number of people the woman can rely on for guidance isolates the 'wise peer effect'; there is likely less of an impact of smoking on the number of wise people in your life as opposed to the number of friends in your life. However, I cannot be certain that splitting up the scale corrects for endogeneity, so it is still a large concern.

## VII. Conclusions and Implications

When assessing if and how social support effects women's smoking decisions during pregnancy in Romania, I find that social support levels are significant contributors to these decisions. Social support effects whether or not a woman has smoked six months before pregnancy more so than whether or not a woman has quit within those six months or during her pregnancy. By introducing stress into the model, I am able to conclude that social support directly impacts women's smoking behaviors and does not only impact smoking through lowering women's stress levels.

I also find that social support effects these women's decisions differentially by the type of social support looked at. For example, the number of people that a woman says recognize her talents and skills has a different effect than the number of people that a woman says provide her with help and accountability. It is thus important to stratify the types of social support looked at rather than creating an index. Finally, once a woman can count on three or four people for these types of social support, the fifth person may not be of benefit, as women having medium levels of support (three or four people) often having a stronger effect than women having high levels of support (five or more people).

While I cannot draw causal conclusions here, I do find that social support is an important mechanism through which women's continued smoking during pregnancy can be mitigated. While smoking cessation programs are likely beneficial, most Romanian women that report quitting smoking say they have done so without professional guidance (Irimie, 2011). So, by increasing the focus put on social support, women's prenatal smoking rates in Romania could significantly fall.

## Tables and Figures

Table 1: Panel A				
Entire Survey				
Demographic Characteristics	Survey		Roma	
	N	%	N	%
<i>Age</i>				
18-27	243	28.55	9	56.25
28-30	230	27.03	2	12.50
31-34	191	22.44	2	12.50
35-44	187	21.97	3	18.75
<i>Education</i>				
High School or Lower	611	45.3	27	96.4
Undergraduate or Higher	739	54.7	1	3.6
<i>Ethnicity</i>				
Romanian	1,104	81.2	N/A	N/A
Hungarian	224	16.5	N/A	N/A
Roma	28	2.1	N/A	N/A
Other	4	0.3	N/A	N/A
<i>Current Residence</i>				
Rural	443	33.7	16	84.2
Urban/Suburban	871	66.3	3	15.8
<i>Living Arrangement</i>				
Married	1,165	85.6	13	50.0
With Partner	168	12.3	12	46.2
Other	28	2.1	1	3.8
<i>Monthly Income</i>				
\$0-216	158	11.8	11	44.0
\$217-464	327	24.3	12	48.0
\$465-928	523	38.9	1	4.0
\$929-1,547	262	19.5	0	0.0
\$1,548-2,166	40	3.0	1	4.0

Table 1: Panel B				
Sample				
Demographic Characteristics	Survey		Roma	
	N	%	N	%
<i>Age</i>				
18-27	185	26.62	4	44.4
26-30	189	27.19	1	11.1
31-34	170	24.46	2	22.2
36-44	151	21.73	2	22.2
<i>Education</i>				
High School or Lower	475	42.45	12	92.3
Undergraduate or Higher	644	57.55	1	7.7
<i>Ethnicity</i>				
Romanian	899	80.7	N/A	N/A
Hungarian	199	17.9	N/A	N/A
Roma	13	1.2	N/A	N/A
Other	3	.27	N/A	N/A
<i>Current Residence</i>				
Rural	369	33.0	10	76.9
Urban/Suburban	750	67.0	3	23.1
<i>Living Arrangement</i>				
Married	976	87.2	11	84.6
With Partner	122	10.9	2	15.4
Other	21	1.9	0	0.0
<i>Monthly Income</i>				
\$0-216	116	10.4	6	46.2
\$217-464	261	23.32	6	46.2
\$465-928	447	40.0	1	7.7
\$929-1,547	233	20.82	0	0.0
\$1,548-2,166	62	5.5	0	0.0

Table 2: Panel A				
Entire Survey				
Reproductive History & Health Behaviors	Survey		Roma	
	N	%	N	%
<i>Unwanted Pregnancy</i>				
Wanted Pregnancy	989	73.4	7	26.9
Wanted Pregnancy Later or Did Not Care	290	21.5	11	42.3
Unwanted Pregnancy	69	5.1	8	30.8
<i>Other Children</i>				
First Birth	102	17.1	3	20.0
One Child	400	67.0	5	33.3
Two or More Children	95	15.9	7	46.7

Table 2: Panel B				
Sample				
Reproductive History & Health Behaviors	Survey		Roma	
	N	%	N	%
<i>Unwanted Pregnancy</i>				
Wanted Pregnancy	827	74.4	5	38.5
Wanted Pregnancy Later or Did Not Care	230	20.7	5	38.5
Unwanted Pregnancy	55	5.0	3	23.1
<i>Other Children</i>				
First Birth	92	17.9	3	33.3
One Child	339	66.1	1	11.1
Two or More Children	82	16.0	5	55.6

Table 3: Panel A		
Entire Survey: Smoking Characteristics		
	N	%
<i>Smoking Status</i>		
Prior Smoker	380	29.7
Never Smoker	898	70.3
<i>Of Prior Smokers</i>		
Smoking Same Amount	19	5
Smoking Reduced Amount	159	41
Quit After Pregnant	171	45
Quit Before Pregnant	34	9
<i>Other Smokers in the Home</i>		
Yes	452	41.3
No	643	58.7
<i>Exposure to Secondhand Smoke</i>		
Yes	632	50.1
No	630	49.9

Table 3: Panel B		
Sample: Smoking Characteristics		
	N	%
<i>Smoking Status</i>		
Prior Smoker	323	28.9
Never Smoker	796	71.1
<i>Of Prior Smokers</i>		
Smoking Same Amount	11	3.4
Smoking Reduced Amount	130	40.0
Quit After Pregnant	153	47.1
Quit Before Pregnant	31	9.5
<i>Other Smokers in the Home</i>		
Yes	384	39.6
No	587	60.5
<i>Exposure to Secondhand Smoke</i>		
Yes	553	49.4
No	556	50.6

Support Characteristics	Survey		Roma	
	N	%	N	%
<i>Advice &amp; Guidance</i>				
Medium	497	36.6	6	22.2
High	589	43.4	2	7.4
<i>Friendship</i>				
Medium High	971	71.6	12	44.4
<i>Sense of Comfort &amp; Welfare</i>				
Medium	421	31.4	4	14.8
High	696	51.9	6	22.2
<i>Amount of Help</i>				
Medium	493	36.6	6	23.1
High	565	42.0	5	19.2
<i>Recognition of Talent &amp; Skill</i>				
Medium	377	28.1	7	25.9
High	706	52.7	4	14.8
<i>Closeness &amp; Emotional Stability</i>				
Medium	463	34.3	5	18.5
High	538	39.8	4	14.8

Support Characteristics	Survey		Roma	
	N	%	N	%
<i>Advice &amp; Guidance</i>				
Medium	418	37.4	5	38.5
High	501	44.8	2	15.4
<i>Friendship</i>				
Medium High	812	72.6	7	53.9
<i>Sense of Comfort &amp; Welfare</i>				
Medium	347	31.0	2	15.4
High	592	52.9	4	30.1
<i>Amount of Help</i>				
Medium	417	37.3	4	30.1
High	482	43.1	3	23.1
<i>Recognition of Talent &amp; Skill</i>				
Medium	317	28.3	3	23.1
High	600	53.6	4	30.8
<i>Closeness &amp; Emotional Stability</i>				
Medium	388	34.7	3	23.1
High	461	41.2	3	23.1

Survey		
Conditional Probabilities: Social Support		
	Low Support	High Support
Married	.82	.89
Kids	.15	.19
Current Smoker	.16	.12
Reduced Smoker	.73	.70
Former Smoker	.34	.27

Sample		
Conditional Probabilities: Social Support		
	Low Support	High Support
Married	.87	.94
Kids	.13	.21
Current Smoker	.15	.10
Reduced Smoker	.83	.69
Former Smoker	.36	.21

Table 6: Panel A				
Survey				
Conditional Probabilities: Smoking Rates				
	Smoke	Reduced	Quit	No Smoke
Married	.61	.64	.83	.91
Kids	.11	.27	.18	.16
High Support	.48	.53	.54	.61

Table 6: Panel B				
Sample				
Conditional Probabilities: Smoking Rates				
	Smoke	Reduced	Quit	No Smoke
Married	.88	.62	.87	.95
Kids	.00	.31	.17	.17
High Support	.62	.42	.43	.64



	<i>Guidance</i>	<i>Friendship</i>	<i>Comfort</i>	<i>Help</i>	<i>Talent</i>	<i>Emotional</i>
<i>Guidance</i>	1.00					
<i>Friendship</i>	.50	1.00				
<i>Comfort</i>	.60	.53	1.00			
<i>Help</i>	.60	.49	.63	1.00		
<i>Talent</i>	.51	.42	.55	.55	1.00	
<i>Emotional</i>	.57	.47	.64	.64	.58	1.00

	<i>Guidance</i>	<i>Friendship</i>	<i>Comfort</i>	<i>Help</i>	<i>Talent</i>	<i>Emotional</i>
<i>Panel A: Linear Effects</i> <sup>23</sup>						
No	.04**	.06*	.04**	.05***	.06***	.05***
Controls	(.02)	(.03)	(.02)	(.02)	(.02)	(.02)
Controls	.02	.03	.01	.01	.03*	.02
	(.02)	(.03)	(.02)	(.02)	(.02)	(.02)
<i>Panel B: Non-Linear Effects</i> <sup>24</sup>						
	<i>Med</i>   <i>High</i> <i>Guidance</i>	<i>Med/High</i> <i>Friendship</i>	<i>Med</i>   <i>High</i> <i>Comfort</i>	<i>Med</i>   <i>High</i> <i>Help</i>	<i>Med</i>   <i>High</i> <i>Talent</i>	<i>Med</i>   <i>High</i> <i>Emotional</i>
No	.11***	.06*	.12***	.11***	.13***	.15***
Controls	(.04)	(.03)	(.04)	(.04)	(.04)	(.03)
Controls	.09**	.03	.08**	.04	.09**	.09***
	(.04)	(.03)	(.04)	(.04)	(.04)	(.04)

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

N = 1,119

<sup>23</sup> ‘Linear Effects’ indicate that the facets of social support are measured on a scale in one variable (e.g., zero is low social support, one is medium social support, and two is high social support).

<sup>24</sup> ‘Non-Linear Effects’ indicate that the facets of social support are split between low, medium, and high using two variables. Those in the low category (which is the omitted variable) rely on zero, one, or two people for social support, those in the medium category rely on three or four people, and those in the high category rely on five people.

Table 9: Social Support and the Probability of Not Smoking Six Months Before Pregnancy with Stratified Controls

	<i>Med</i>	<i>High</i>	<i>Med/High</i>	<i>Med</i>	<i>High</i>	<i>Med</i>	<i>High</i>	<i>Med</i>	<i>High</i>	<i>Med</i>	<i>High</i>
	<i>Guidance</i>		<i>Friendship</i>	<i>Comfort</i>		<i>Help</i>		<i>Talent</i>		<i>Emotional</i>	
<i>Panel A: Education</i>											
High Education	.13*** (.05)	.09* (.05)	.00 (.04)	.16*** (.05)	.10* (.06)	.14*** (.05)	.07 (.05)	.11** (.05)	.07 (.05)	.13*** (.04)	.08* (.04)
Low Education	.05 (.06)	.08 (.05)	.07 (.05)	.04 (.06)	.09 (.05)	.09* (.05)	.13** (.05)	.10* (.05)	.16*** (.05)	.14*** (.05)	.11** (.05)
<i>Panel B: Residence</i>											
Urban	.12*** (.04)	.10** (.04)	.04 (.04)	.16*** (.04)	.12** (.05)	.14*** (.04)	.09** (.04)	.10** (.05)	.10** (.05)	.19*** (.04)	.12*** (.04)
Rural	.09 (.06)	.10 (.06)	.08 (.05)	.04 (.07)	.11* (.06)	.14** (.06)	.16*** (.06)	.15** (.06)	.18*** (.06)	.06 (.06)	.08 (.06)
<i>Panel C: Marital Status</i>											
Married	.06 (.04)	.05 (.04)	.02 (.03)	.08** (.04)	.07* (.04)	.11*** (.04)	.07* (.04)	.09** (.04)	.11*** (.04)	.11*** (.03)	.08** (.03)
Not Married	.22** (.10)	.16 (.10)	.17** (.08)	.14 (.11)	.15 (.10)	.21** (.10)	.16 (.10)	.13 (.11)	.11 (.10)	.24** (.10)	.04 (.10)
<i>Panel D: Income</i>											
High Income	.09* (.05)	.05 (.05)	.02 (.04)	.11** (.05)	.07 (.05)	.06 (.05)	.04 (.05)	.11** (.04)	.10** (.05)	.11** (.04)	.06 (.04)
Low Income	.12** (.06)	.17*** (.05)	.12** (.05)	.10* (.06)	.17*** (.05)	.22*** (.05)	.20*** (.05)	.13** (.06)	.19*** (.05)	.20*** (.05)	.18* (.05)
<i>Panel E: Secondhand Smoke Exposure</i>											
Exposed to SHS	.17*** (.06)	.11* (.06)	.07 (.05)	.05 (.06)	-.01 (.06)	.20** (.05)	.06 (.05)	.18*** (.06)	.15*** (.05)	.10* (.05)	.06 (.05)
Not Exposed to SHS	.06 (.04)	.08** (.04)	.03 (.04)	.14*** (.04)	.17*** (.05)	.13*** (.04)	.11*** (.04)	.06 (.04)	.08** (.05)	.13*** (.04)	.11*** (.04)

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

N = 1,119

Table 10: Social Support and the Probability of Not Smoking Six Months Before Pregnancy with Stress Controls											
	<i>Med</i>	<i>High</i>	<i>Med/High</i>	<i>Med</i>	<i>High</i>	<i>Med</i>	<i>High</i>	<i>Med</i>	<i>High</i>	<i>Med</i>	<i>High</i>
	<i>Guidance</i>		<i>Friendship</i>	<i>Comfort</i>		<i>Help</i>		<i>Talent</i>		<i>Emotional</i>	
No Controls	.12*** (.04)	.10*** (.04)	.06* (.03)	.13*** (.04)	.10*** (.04)	.14*** (.04)	.11*** (.03)	.14*** (.03)	.12*** (.04)	.16*** (.03)	.10*** (.03)
Controls	.10* (.04)	.06* (.04)	.03 (.03)	.08*** (.04)	.03 (.04)	.10*** (.04)	.04 (.04)	.11** (.04)	.08* (.04)	.09*** (.04)	.04 (.04)
<i>Stress</i>											
No Controls	-.06** (.03)		-.07** (.03)	-.06** (.03)		-.06** (.03)		-.05* (.03)		-.06** (.03)	
Controls	-.04 (.03)		-.04 (.03)	-.04 (.03)		-.04 (.03)		-.03 (.03)		-.03 (.03)	

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

N = 1,024

Table 11: Social Support and the Probability of Quitting Smoking During Pregnancy or Six Months Before Pregnancy											
	<i>Guidance</i>		<i>Friendship</i>	<i>Comfort</i>		<i>Help</i>		<i>Talent</i>		<i>Emotional</i>	
<i>Panel A: Linear Effects</i>											
No	.00		.16***	.05		.06*		.05		.06	
Controls	(.03)		(.06)	(.03)		(.03)		(.03)		(.03)	
Controls	-.04		.10	.01		.00		-.00		.03	
	(.04)		(.07)	(.04)		(.04)		(.04)		(.04)	
<i>Panel B: Nonlinear Effects</i>											
	<i>Med</i>	<i>High</i>	<i>Med/High</i>	<i>Med</i>	<i>High</i>	<i>Med</i>	<i>High</i>	<i>Med</i>	<i>High</i>	<i>Med</i>	<i>High</i>
	<i>Guidance</i>		<i>Friendship</i>	<i>Comfort</i>		<i>Help</i>		<i>Talent</i>		<i>Emotional</i>	
No	-.00	.01	.16***	.02	.09	.00	.11	.12*	.11*	.10	.11*
Controls	(.07)	(.07)	(.06)	(.08)	(.07)	(.07)	(.07)	(.07)	(.07)	(.07)	(.06)
Controls	-.09	-.09	.10	-.01	.02	-.06	-.00	.07	.01	.06	.06
	(.09)	(.08)	(.07)	(.09)	(.08)	(.08)	(.08)	(.08)	(.08)	(.08)	(.07)

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

N = 326

## Appendix

### I. Linear Probability Model

I now run regression (2) using a linear probability model, which then becomes regression (5) due to the new model specification:

$$(5) \text{Nonsmoker}_i = \alpha + \beta_1 \text{SocialSupport}_i + X\beta_2 + \varepsilon_i$$

Because the dependent variable is between zero and one, a probit model should be a better fit, but running linear probability allows me to clarify whether or not the probit model is sufficient. Here I use equation (5) and report my findings in Table 1.

I find that using a linear probability model produces similar results to using a probit model, indicating that the probit model is sufficient. In the linear probability model, when controls are included, women with medium guidance are nine percentage points more likely to have not smoked six months prior to pregnancy versus those with low guidance. Without controls, the R-squared values range from between 0.4 percent and 1.9 percent, and with controls the R-squared values range from between 12 percent and 13 percent. This means that with a linear probability model, controlling for a woman's level of social support, educational attainment, marital status, residence, income, and exposure to SHS explains about 13 percent of the variation in her smoking decisions. In the probit model the results are exactly the same, as women with medium guidance are nine percentage points more likely to have not smoked as well. This holds true for other facets of social support, thus indicating that the probit model is sufficient.

Table 1: Social Support and the Probability of Not Smoking Six Months Before Pregnancy Pregnancy Using A Linear Probability Model											
	<i>Med</i>	<i>High</i>	<i>Med/High</i>	<i>Med</i>	<i>High</i>	<i>Med</i>	<i>High</i>	<i>Med</i>	<i>High</i>	<i>Med</i>	<i>High</i>
	<i>Guidance</i>		<i>Friendship</i>	<i>Comfort</i>		<i>Help</i>		<i>Talent</i>		<i>Emotional</i>	
No Control	.12*** (.04)	.11*** (.04)	.06* (.03)	.14*** (.04)	.12*** (.04)	.16*** (.04)	.13*** (.03)	.15*** (.04)	.15*** (.04)	.16*** (.04)	.13*** (.03)
Controls	.09** (.04)	.07* (.04)	.03 (.03)	.07** (.04)	.04 (.04)	.11*** (.04)	.05 (.04)	.10** (.04)	.09** (.04)	.09*** (.04)	.06 (.03)

Standard errors in parentheses  
 \*\*\* p<0.01, \*\* p<0.05, \* p<0.1  
 N = 1,119

## II. T-Tests

<i>Table 2: T-Tests</i>		
	<i>F</i>	<i>Prob &gt; F</i>
Medium and High Guidance	1.28	0.26
Medium and High Friendship	N/A	N/A
Medium and High Comfort	1.48	2.22
Medium and High Help	3.99	0.05
Medium and High Talent and Skills	0.10	0.75
Medium and High Emotional Support	1.73	0.19

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